



School of the Built Environment

An Exploration of Learning in the Community Energy Sector in England and the Role of Networks in its Facilitation

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Declaration of originality:

I confirm that this is my own work and that all material used from other sources has been properly and fully acknowledged.

Mohamed AlZarouni.

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Abstract

Despite recent growth, a changing policy landscape challenges the long-term position of community energy [CE]. Organisational learning [OL] is argued to offset the negative impacts of removing key financial mechanisms, ensuring continued CE growth. This thesis, conducted between January 18' and June 23', offers a learning-based exploration of CE and the contributing role of networks to these processes. An extended interpretation of the '4I' learning framework is adopted as the main theoretical lens to investigate how learning processes unfold within and between CE organisations.

This is achieved through a mixed-methods research design comprising 15 semi-structured interviews with senior CE representatives alongside a 17-question survey, returning 38 responses, distributed across national and regional mailing lists. Together, the data draws a picture of CE organisations' current state and networks in England by providing insights into their core characteristics, propensity to learn and network interactions.

Findings highlighted the role of individuals operating within the sector. Their high skillsets and expertise saw them operating across multiple roles, spanning organisational boundaries and engaging in simultaneous learning processes between organisational levels.

Contrary to initial perceptions, the created classification profiles suggested that CE organisations are much more alike than they differ. Social impact was surprisingly undervalued, suggesting they were becoming a secondary feature of the CE approach.

CE networks were found to play an important role, initially offering learning and partnership opportunities with multiple CE and non-CE actors to their members. These new relationships were found to substitute network engagement for CE members, allowing them to benefit from joint partnerships and further learning opportunities.

Developed CE networks were found to be well coordinated and comprise strong structures allowing for cooperation and engagement. However, regional discrepancies between CE networks suggest a shortage of cross-regional learning capabilities that impede CE development in cohorts represented by less-developed networks, necessitating greater cross-regional network collaboration.

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Tables of Acronyms:

General Acronyms:			
BAME	Black, Asian and minority ethnic	KMO	Kaiser Meyer Olkin
CBS	Community benefit society	LCT	Low carbon transport
CE	Community energy	MW	Mega Watt
CIC	Community interest company	OL	Organisational learning
CLS	Company limited by shares	PCA	Principle components analysis
CoP	Communities of practice	PPA	Power purchase agreement
CSR	Corporate social responsibility	PV	Photovoltaic
FTE	Full-time equivalent	R&D	Research & Development
GHDI	Gross household disposable income	RE	Renewable Energy
IPS	Industrial provident society	SNA	Social Network Analysis
Policy frameworks, grants & subsidies:			
CARES	Community and Renewable Energy Scheme	NFFO	Non-Fossil Fuel Obligation
CCA	Climate Change Act	RCEF	Rural Community Energy Fund
CEPMF	Community Energy Peer Mentoring Fund	RESP	Renewable Energy Support Programme

CoF	Community Ownership Fund	RHI	Renewable Heat Incentive
EST PV	Energy Saving Trust PV Programme	SCOLAR	SCOLAR Programme for Photovoltaics
FIT	Feed-in-Tariff	SEG	Smart Export Guarantee
LCBP	Low Carbon Building Plan	UCEF	Urban Community Energy Fund
LCCC	Low Carbon Communities Challenge		

CE organisations & networks:			
BEN	Bristol Energy Network	E4A	Energy for All
CEE	Community Energy England	GMCE	Greater Manchester Community Renewables
CEL	Community Energy London	LCH	Low Carbon Hub
CECOT	Community Energy Scotland	LES	Local Energy Scotland
CES	Community Energy South	MORE	Morecambe bay Renewables
CEW/YCC	Community Energy Wales/ <i>Yinni Cymunedol Cymru</i>	PLF	Pure Leapfrog
		ZCY	Zero-Carbon Yorkshire
Non-CE organisations & networks:			
BHA	British Hydro Association	GSENZH	Greater Southeast Net-Zero Hub

CSA	Centre for Social Action	LEP	Local Enterprise Partnership
CSE	Centre for Sustainable Energy	NCVO	National Council for Voluntary Organisations
DNO	District Network Operator	ONS	Office for National Statistics
ENA	Energy Networks Association	SSCE	Scottish & Southern Electricity Networks
EST	Energy Saving Trust	WPD	Western Power Distribution
Public bodies and governmental departments:			
DBEIS	Department for Business, Energy & Industrial Strategy		
DECC	Department of Energy & Climate Change		
DTI	Department of Trade & Industry		
CCC	Committee for Climate Change		
MHCLC	Ministry of Housing, Communities & Local Government		
Nations, devolved nations and international coalitions:			
EU	European Union	UK	United Kingdom
NI	Northern Ireland		

Glossary of terms:

Organisational learning terminologies	
Term:	Definition:
Organisational learning	The process of improving actions through better knowledge and understanding (Fiol & Lyles, 1985 p. 803).
Intraorganisational learning	Processes of learning which exclusively occur internally, within organisational settings (Holmqvist, 2003a; Knight, 2002). In the context of this study, intraorganisational learning represents learning at the individual, group and organisational levels respectively.
Interorganisational learning	Processes in which collaborating organisations can learn from each other through experience by producing and reproducing dominant routines and practices (Holmqvist, 2003a).
Network learning	Knowledge that is developed or resides within the network that is discovered and documented by a network-level knowledge storage mechanism (Dyer & Nobeoka, 2000 p. 364).
Levels of learning terminologies	
Term:	Definition:
Individual	Lowest unit of analysis representing key members involved in the day-to-day activities of a given organisation.
Group	Representative of amalgamations of individuals divided into organisational units, concerned with the collective advancement of a specific activity or task (Crossan et al., 1999). An organisation may be entirely reliant on a single unit or multiple units depending on its activities, scale and size. Similarly, individuals may either

	<p>represent a single unit within an organisational setting or, as in the case of many community energy organisations, represent multiple units simultaneously.</p>
<p>Organisation</p>	<p>A dynamic and changing objective-based (Schein, 1998) system whose primary purpose is facilitating interactions between human agents, who in turn shape the wider organisational setting through feedback processes (Argyris, 1999; Weick, 1979). Its purpose and objectives change over time and are a reflection of the changing collective vision of the members operating within its boundaries (Becker et al., 2017). An organisation is more than the amalgamation of the capabilities and capacities of its members as it also contains systems, structures, strategies and routines (Crossan et al., 1999) that are shaped by but independent of human agents that allow it to better fulfil its objectives and in turn also influences its culture and methods of achieving the set-forth objectives.</p>
<p>Network</p>	<p>Shared spaces (Gibb et al., 2017), that may be formal or informal (Mozzato & Bitencourt, 2014), where affiliated organisations with a shared common cause may come together to interact, share information, lessons and other resources for their collective advancement (Easterby-Smith et al., 2008; Knight, 2002).</p>
<p>Hub</p>	<p>A hub represents a central focal point within networks responsible for intermediation (Kanda et al., 2020) through coordination of activities and distribution of knowledge within a network setting (Dyer & Nobeoka, 2000). Its main responsibilities involve ensuring efficiency within the network by providing and creating learning capabilities (Gulati, 1999) whilst also absorbing and disseminating lessons learned from the individual network members (Dyer & Nobeoka, 1999).</p>

Intermediary	Organisations responsible for the overall representation and coordination of network-related activities among their members (Bird & Barnes, 2014).
Processes of learning terminologies	
Term:	Definition:
Intuition	A cognitive process constituting a form of search by an individual to acquire knowledge guided by their own experience (Orlikowski, 2002) and expertise (Cohen & Levinthal, 1990; Easterby-Smith & Lyles, 2012).
Interpretation	The process of transforming tacit intuition into an explicit form through the individuals' ability to deliver an initially conceived concept to a broader audience (Jenkin, 2013) for multiple individuals and various units within an organisation to reflect on through dialogue (Hilden & Tikkiamakki, 2013).
Integration	The process of developing a shared understanding between the individuals and various groups involved within a single organisation. The dynamics of integration concern the developing of shared mental models through dialogue and interaction between organisational units within a common organisational setting (Castaneda & Rios, 2007; Crossan et al., 1999).
Institutionalisation	The processes constituting the embedment of knowledge into the organisations' memory through changes in the culture, structure and routines of the respective organisation (Crossan et al., 1999).
Cooperation	Processes where collaborating organisations collectively learn through the production and embedment of routines in their structures (Holmqvist, 2003a).
Other terminologies	

Term:	Definition:
Regional-level	A description of decisions, policies, organisations and networks whose scope of reach and representation are conducted within certain geographical parameters within a single nation. For example, in the context of this study, the regional level may constitute counties such as Devon, Oxfordshire or Sussex in addition to collections of counties such as the Northwest of England and the Southeast of England.
National-level	Decisions, policies, organisations and networks whose scope of reach and representation are conducted on a nationwide scale, incorporating the entirety of England and recognising that this may, in some cases, encompass the UK as a whole.

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Chapter 1 – Introduction

1.1 Purpose of research

This thesis explores organisational learning [OL] and its manifestation within England's community energy [CE] sector. This study is interested in furthering our understanding of how CE organisations learn, where learning occurs and what the contributions of networks are to these learning processes. To achieve this, this study intends to explore how learning processes unfold at various levels, within and between CE organisations and the further contributions of being in collaborative settings such as networks. This study may contribute to a better understanding why some CE organisations are better at learning than their counterparts by gaining insight into these processes, their associated levels, and their intensity. This is considered a potential avenue for ensuring the continued growth of CE, given the rapidly changing environment in which they find themselves.

Over the past two decades, community-led energy management approaches have been steadily gaining prominence (Nolden et al., 2020), establishing themselves as a potential long-term zero-carbon solution (Bauwens et al., 2022). Four factors were identified as the main facilitators of CE growth (Ruggiero et al., 2018), these are; (1) increased awareness regarding issues of climate change and energy security (Department for Business, Energy & Industrial Strategy [DBEIS], 2022a), (2) Decreased cost of renewable energy [RE] uptake (Taylor et al., 2020), (3) The ability to tailor initiatives around the unique requirements of stakeholders (Berka, 2017) and most importantly, (4) Favourable financial mechanisms fostering economic opportunity and rewarding its uptake (Nolden et al., 2020).

CE initiatives are increasingly regarded as a potential solution to sustainably achieving RE targets (Sioned, 2016). CE represents an umbrella term (Bauwens et al., 2022; Walker & Devine-Wright, 2008) encompassing a variety of initiatives targeting any or all the energy-related activities¹ set out by the former Department of Energy and Climate Change [DECC]² (DECC, 2014a: 2014c). Although they share a common term, CE organisations vary in their

¹ Energy-related activities constitute the involvement of an organisation in any or all of the following: (1) Demand reduction, (2) Energy efficiency measures, (3) Generation activities, (4) Trade of RE (DECC, 2014a) ² The DECC was founded in 2008, combining energy and climate change issues from the larger Department of Trade and Industry (DTI). It was later dissolved in 2016 and replaced by the DBEIS.

activity, size, structure, membership and ownership (Raven et al., 2008). In their regional report on CE in the Northeast of England, Hempshall et al. (2012) note that CE may be visualised as a spectrum, placing small groups of individuals meeting every few months to share energy-related information at one end, and large social businesses owning assets that may be worth millions of pounds at the other end (Hempshall et al., 2021, p.6). An important feature that sets CE apart from other RE initiatives is their part or full ownership by a recognised community (Fell et al., 2020) and broader emphasis on socially driven causes (Bauwens et al., 2016; Becker et al., 2017).

As a label, however, the CE term has been adopted rather inclusively within the broader literature surrounding the topic (Goedkoop & Devine-Wright, 2016) to allow for accelerated sectoral growth (Walker & Devine-Wright, 2008). In their 'Call for Evidence' report, the DECC defines CE as:

'A CE project is one with an emphasis on community ownership, leadership and/or control in which the community benefits from the outcome of the project' (DECC, 2013 p.15)

Across the UK, the DECC has identified over 5000 community groups engaged in energy-related activities (DECC, 2014b: 2015). This, however, is likely to be an overestimation, reflecting an inclusive term that resulted in a broader range of initiatives with elements of CE but not necessarily focused on CE activities (Seyfang et al., 2013). A more recent and conservative estimate identifies approximately 500 CE organisations across the UK, with an estimated 331 MW of electricity generation capacity under their collective ownership (Community Energy England [CEE] et al., 2022). This suggests that CE accounts for approximately 0.7% of the total RE electricity generation capacity as of 2022² (DBEIS, 2022b). However, it is worth noting that these values are simply estimations given that the true scale of CE needs to be clarified, with a lack of a definitive database, and huge variations between sectoral reports that are likely overestimated in some sources and underestimated in others.

Therefore, whilst the CE approach may be considered as a tiny subset of the wider RE sector in terms of its capacity contribution to the RE energy mix, the CE approach as a sector is able to deliver numerous non-energy related contributions that extend beyond

² This is calculated as 331 MW of combined CE generation per the joint State of the Sector 2022 report (CEE et al., 2022). The total RE generation capacity of 49.7 GW, as indicated in the DBEIS quarterly Energy Trends report (DBEIS, 2022b p.19).

immediate zero-carbon commitments (Hillman et al., 2018; Seyfang et al., 2013). Some of these contributions include, but are not limited to; (1) increased social cohesion throughout communities by bringing people together to encourage and act within the framework of active participation to climate driven goals which may ultimately lead to an increased sense of community and strengthening social ties within the host communities themselves (Walker et al., 2007), (2) to increase awareness and educate non-participating individuals within these host communities of the immediate issues of climate change in the hopes of developing more energy and sustainability cautious behaviours (Berka, 2017), (3) Both direct and indirect local economic development through CE initiatives they may stimulate local economies by increasing skillsets of individuals throughout their host communities as well as allowing a financial flow to pass through its organisation in addition to the redistribution of its profits to further contribute to a variety of socially driven causes targeting a multitude of causes depending on their urgency in their respective communities (Hillman et al., 2018).

Therefore, whilst the CE approach may be considered small, its societal contributions are to be commended and are worthwhile for exploration due to their environmental and social reach that extend far beyond immediate profits and realisation of energy related targets (Berka, 2017).

Until 2019, financial mechanisms provided by the government in the form of grant and subsidy payments have been the most significant driver of the CE sector (Nolden et al., 2020; Saintier, 2019). Most notably, the Feed-in-Tariff [FIT], a subsidy payment mechanism awarding the generation and export of RE generation up to 5MW (Nolden, 2013; Ofgem, 2019), is regarded as the primary driver of CE uptake due to its guaranteed payment structure alongside initially lucrative payment rates

(Braunholtz-Speight et al., 2020; Nolden et al., 2020). The Rural and Urban Community Energy Funds [RCEF and UCEF] are also credited for their essential roles in increasing CE uptake in England as the two main grant mechanisms (CEE, 2021a; DBEIS,2019; DECC, 2014b:2015). Despite its popularity and widespread uptake by the CE sector, changes in FIT payment rates in 2012 and 2015, respectively, followed by its announced closure in 2019, have had a detrimental impact on CE uptake (Nolden et al., 2020). This is further compounded by the closure of the UCEF in 2016 and RCEF in 2022 (Mawhood & Adcock, 2021).

Removing these mechanisms and needing adequate replacement (CEE et al., 2019; 2021) imply a loss of government support towards the sector (Saintier, 2019). Understandably, a key concern is whether CE organisations can adapt and offset these policy changes to continue their development or if these changes will eliminate them from the sector, regarding them as an ambitious experiment that can only be sustained with ongoing governmental support.

Putting further pressure on the economic viability of this sector, CE organisations have relatively limited resources to contend with in general; they often rely on a majority voluntary workforce (CEE, 2021a; Hoffman & High-Pippert, 2005) and must compete in a competitive energy sector whilst simultaneously providing socially impactful services as part of their broader objectives (Becker et al., 2017). Whilst some relatively large organisations with exclusively full-time equivalent [FTE] workers exist (CEE, 2020; Radtke, 2014), only some CE organisations fit into this bracket.

Combinations of these dynamics often dictate that CE organisations are highly dependent on the limited funding they receive and have severely limited capabilities (Berkhout & Westerhoff, 2013). Generally, these capabilities are often reduced to the immediate expertise of its individuals, earning them the nickname ‘CE champions’ (Hoffman & High-Pippert, 2010). As part of their annual State of the Sector reports, CEE has identified several barriers associated with CE development; they suggest that a lack of adequate policy support (28%), limited organisational capabilities (28%) and time (14%) to be its key barriers (CEE, 2020).

CE remains resilient despite these barriers, limitations and uncertainties (Busch & Hansen, 2021). During these past 20 years, the CE sector in England has grown from a handful of individual approaches to a strong cohort involving a multitude of stakeholders such as governmental bodies, public institutions, private enterprises and tens of thousands of respective shareholders/owners (CEE, 2020; Goedkoop & Devine-Wright, 2016; Hamilton et al., 2014; Wirth, 2014).

As a result, organisations and individuals within this sector have acquired a wealth of experience that has been transposed into knowledge and meaningful lessons to share (Parag & Janda, 2014; Seyfang et al., 2013; Warbroek et al., 2019). Moreover, the initial success in CE development has spurred several hub organisations to coordinate sectoral growth by creating and coordinating CE networks throughout multiple regions in England

(Bird & Barnes, 2014; Parag et al., 2013). Networks represent shared spaces (Gibb et al., 2017), that may be either formal or informal (Mozzato & Bitencourt (2014), where affiliated organisations with a shared common cause may come together to interact, share information, lessons and other resources for their collective advancement (Easterby-Smith et al., 2008; Knight, 2002). A hub represents a central focal point within networks responsible for intermediation (Kanda et al., 2020) through the coordination of activities and distribution of knowledge within a network setting (Dyer & Nobeoka, 2000). Its main responsibilities involve ensuring efficiency within the network by providing and creating learning capabilities (Gulati, 1999) whilst also absorbing and disseminating lessons learned from the individual network members (Dyer & Nobeoka, 1999). Similarly, intermediaries which will also be used throughout this thesis is taken to represent organisations responsible for the overall representation and coordination of network-related activities among their members (Bird & Barnes, 2014). Whilst the terms may be used interchangeably in the context of networks, it is important to note that any organisation can perform the act of intermediation (Kivimaa, 2014) and may become an intermediary in its own right.

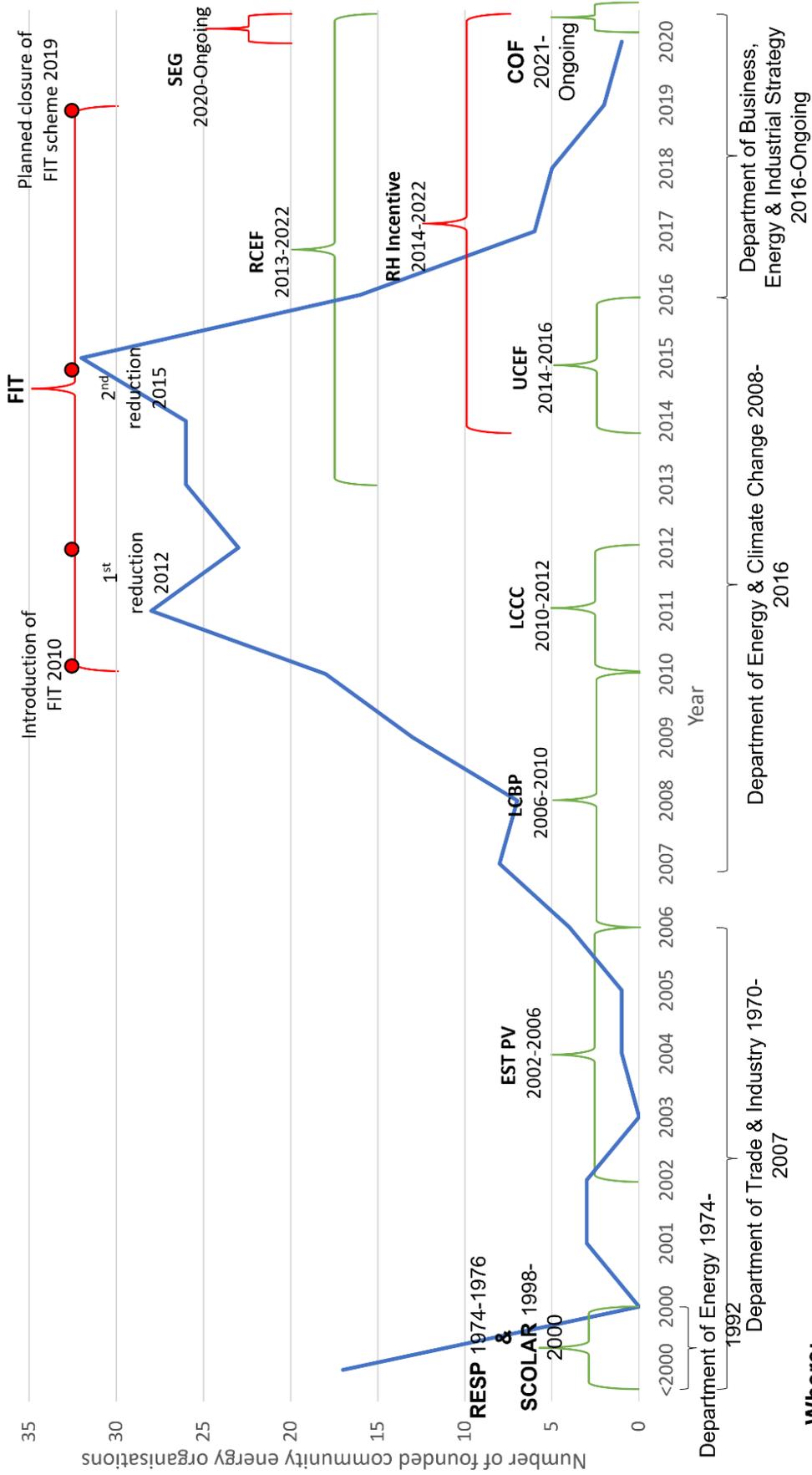
This study stipulates that the knowledge acquired by the CE sector thus far may offset the negative impacts caused by policy changes through cooperation between organisations (Gibb et al., 2017). This study argues that CE organisations are expected to survive as a sector if they continue to learn and exchange knowledge cooperatively and collectively. Mutually, they have acquired a wealth of knowledge-based resources over their development (Parag & Janda, 2014; Warbroek et al., 2019), which may now be shared across channels and between developed networks (Hargreaves et al., 2013; Hodson et al., 2013), marking an evolution in the CE approach that was thus far a heavy subsidy reliant to one that is self-sustaining and learning-driven.

The remainder of the chapter will provide background information on the development of CE in the UK and its devolved constituent nations. A conceptualisation of learning theory and its application to the CE sector is provided alongside the potential value of this approach to CE organisations. The chapter will then justify the geographic focus of this study, being limited to England as the main scope of focus as opposed to the UK. Finally, the chapter concludes by listing the explicit research aims and subsequent objectives which will allow the study to realise what it intends to achieve.

1.2 Historical development of CE

This section provides some context into the historical development of CE in England by exploring the relevant policy landscape that has influenced and later contributed to CE development. Figure 1 has been developed to help visualise sectoral growth alongside its external environment and policy landscape; the figure combines multiple forms of data showing the annual number of founded CE organisations in England which was largely adopted from the CEE2020 database, relevant policies (differentiating between grants and subsidies), relevant public bodies, and their rebranding, associated with energy-related decisions.

Number of annual founded community energy organisations and policy landscape



Where:
 {=Grant scheme / =Subsidy payment / = Annual number of founded community energy organisations

Figure 1: Timeline representing the annual number of founded CE organisations in England (N=240), the relevant policy landscape during these periods and the main governmental body responsible for energy-related decisions. **Data adapted from multiple sources:** (Berka & Creamer, 2018; Brauholtz-Speight et al., 2018; Brauholtz-Speight et al., 2020; CEE Anonymised database 2020; DBEIS, 2019; DECC, 2011; Gul et al., 2016; Nolden, 2013; Nolden et al., 2020).

Abbreviations: RESP= Renewable Energy Support Programme, SCOLAR= The Scholar Programme for Photovoltaics, EST PV= Energy Saving Trust PV Programme, LCBP= Low Carbon Building Plan, LCCC= Low Carbon Communities Challenge, FIT = Feed-in-Tariff, RHI= Renewable Heat Incentive, RCEF= Rural CE Fund, UCEF=Urban CE Fund, SEG= Smart Export Guarantee, CoF= Community Ownership Fund.

The foundations of the CE approach have been linked to the broader cooperative movement of the 19th century (Berka, 2017). More recent roots may be traced back to the 1970s when events such as the oil embargo and a broader anti-nuclear movement created a need for alternative forms of energy (Toke, 2011). As policy mechanisms have been linked to the development of CE (Bauwens, 2016; Nocht & Skelcher, 2020; Nolden, 2013; Radtke, 2014), sectoral growth can be classified into four distinct phases based on the changing policy landscapes. These are (1) New market entrants (Before 2000), (2) Grant driven (Up to 2010), (3) Subsidy driven (2010-2019), and (4) Post subsidy (Ongoing).

Although policies such as the RESP were early introductions, they were deemed mainly unsuccessful due to their failure to support the early establishment of a RE sector (Wilson, 2012). Privatisation of the energy sector in the UK in the 1980s saw several policies supporting fossil fuel production, which continued to impede the development of its RE sector. Focusing on competitive markets and needing RE experience (Berka, 2017; Wilson, 2012) deepened dependence on fossil fuels. The introduction of the Non-Fossil Fuel Obligation [NFFO] in England and Wales in 1990 saw the RE prices decrease, allowing for the foundations of a RE sector to take shape (Mitchell, 2000). This marked a significant turning point (Wilson, 2012) as its criteria allowed for establishing what is now considered the first CE organisation in England, Baywind Energy Cooperative (Toke & Elliott, 2000). Since that period, CE has been gaining slow momentum, focusing mainly on self-consumption-based models. These models involve RE generation for direct, on-site use and allow excess energy to be exported via the grid. The restrictive nature of these approaches was partly due to a lack of experience and limited regulatory support (Berka, 2017). Only 17 CE organisations were identified before the turn of the century in England

during its initial development phase. These entrants would catalyse CE growth by demonstrating their organisations' more comprehensive non-economic benefits and contributions to their respective communities (Berka, 2017; Department of Trade & Industry [DTI], 2007; E4A, 2019; Nolden, 2013; Walker et al., 2007).

Throughout the upcoming period (2000-2010), a series of grant-based policies sustained the sector's continued growth (Braunholtz-Speight et al., 2018), increasing the number of established CE organisations threefold, from 17 to 57 (CEE, 2020). Policies in the form of the Energy Saving Trust PV programme [EST PV] and the Low Carbon Building Programme³ [LCBP], introduced in 2002 and 2006, respectively, continued to support the development of decentralised RE initiatives (Gardiner et al., 2011; Nolden et al., 2020) and encouraged CE uptake. Unfortunately, this encouragement mainly came as an offset to broader RE programmes as opposed to policies specifically targeting CE. Sectoral growth of CE was still primarily reliant on single-asset projects spurred by individuals with the knowledge, resources and, most importantly, time to make them happen (Berka, 2017).

After a nationwide commitment to reducing 80% emissions, (and to net-zero in 2019) by 2050 through the Climate Change Act [CCA] 2008 and the introduction of the Committee of Climate Change [CCC], several policies were introduced to accelerate a UK-wide renewable transition (Barton et al., 2018), of which the CE approach fit into (Kanda et al., 2020), boosting its uptake. Changes at the government level saw the establishment of the DECC in 2008, substituting the DTI (1970-2007) for energy sector responsibilities, in recognition that the issues surrounding climate change and energy were intertwined (DECC, 2014b).

Notably, introducing a FIT in 2010 aimed to significantly accelerate RE uptake by providing guaranteed payments for generating and exporting RE (Behrens et al., 2016; Nolden, 2013; Ofgem, 2019). This marked the beginning of a new phase in CE development, as it is widely acknowledged as the most significant driver of CE initiatives (Behrens et al., 2016; Nolden et al., 2020). Additionally, introducing other programmes during this period, such as the Low Carbon Communities Challenge [LCCC], allowed for important lessons to be learned

³ The LCBP aimed to increase microgeneration capabilities within the UK by awarding grants to individuals and organisations for installing microscale technologies (Gardiner et al., 2011). In total, 19,216 projects are reported to have received a total of £91.37m in funding awards (DECC, 2011). Of the recipients, 82 CE organisations benefitted from the scheme, securing £1.3m in funding (Gardiner et al., 2011).

and provided a basis of knowledge resources to inform future policy developments (DECC, 2011:2012).

Despite its popularity, FIT rates were amended and reduced twice in 2012 and 2015 (DBEIS, 2019; Ofgem, 2019; Nolden et al., 2020). Whilst the first reduction did not significantly impact CE uptake, the second reduction in 2015 led to a sharp drop in newly founded organisations (Saintier, 2019), from 32 in 2015 to 16 the following year (CEE, 2020). Announcements of its closure to new applicants in 2019 had a detrimental impact on CE growth (Nolden et al., 2020); fewer organisations were being founded in the years leading to the scheme's closure. Although the closure of the FIT scheme was extended due to Covid-19, its replacement in the form of the Smart Export Guarantee (SEG) was heavily criticised as an inadequate replacement due to a non-fixed rate that is believed to disadvantage small-scale RE providers (CEE et al., 2019).

In addition to the FIT, other schemes such as the RCEF and UCEF administered in five regional Local Enterprise Partnership Net Zero Energy Hubs, through the DBEIS and Local Enterprise Partnerships [LEPs] in addition to the Renewable Heat Incentive [RHI] supplemented sectoral growth throughout England (DBEIS, 2014; Greater Southeast Net-Zero Hub [GSENZH], 2021; Liverpool City Region LEP, 2017). A key to these programmes has been their ability to target learning-based outcomes and make these available through dissemination (DECC, 2012).

Government funding related to CE has totalled over £30m since 2010 (DBEIS, 2019), with further broader commitments through the Community Ownership Fund [CoF], which will see another £150m be distributed to similar causes as part of the larger £4.8Bn levelling-up fund (Ministry of Housing, Communities & Local Government [MHCLG], 2021). Despite favourable policies and an appetite for CE, the removal of critical policies that directly supported CE, such as the UCEF in 2016, FIT in 2019, RHI in 2020 and RCEF in 2022 (Mawhood & Adcock, 2021), have had a detrimental impact on CE growth (Nolden et al., 2020). National bodies representing CE in England, Scotland and Wales suggest that because of these changes, *“CE now struggles to make a business case to get active”* (CEE et al., 2021, p.5).

Although these schemes have been cited as a crucial element in sectoral development, they have been heavily criticised due to their uncoordinated nature (Nolden et al., 2020). They are believed to have been disparaged as a series of rushed attempts by multiple

government departments to offer mechanisms to respond to national-level⁴ climate and energy-related commitments without a clear interpretation of how they unfold at a community level (Nolden et al., 2020). This poses deep concerns, especially when considering the energy-related ramifications and implications of the UK's exit from the European Union [EU], which may see total reliance on these schemes without assistance from European funding bodies (Cairney et al., 2019).

Uncoordinated efforts by various governmental bodies, further accentuated by a deeper socioeconomic divide between the different regions (Martin, 1988), have led to uneven sectoral development. Early uptake of CE was mainly situated within the Southeast, Southwest, London, and the Northwest of England (CEE, 2020; Hempshall et al., 2021; Scene Connect, 2019). Within certain regions where CE has gained a foothold, relationships between the organisations naturally began to form; these relationships involve open dialogue, collaborative exchanges in the form of knowledge, limited finance and, more recently, joint approaches to activities (CEE, 2021a). Growing relationships between organisations and increased collaboration accentuated the necessity for a formalised body acting as a hub representative to coordinate these exchanges in addition to the overall collection, processing, storage and broader sharing of lessons learned by its members in a meaningful and efficient way.

As the sector grew, formalised intermediaries were established within specific regions (Warbroek et al., 2019). These generally represent geographical regions such as counties (i.e., Devon, Oxfordshire) and cities (i.e., London, Manchester). Additionally, this also necessitated the creation of a single body that may represent the CE as a whole to non-CE actors, coordinate sector wide activities and aggregate regional lessons which may not necessarily spill over throughout England.

Following this, intermediary organisations fostered the development of network structures and channels, within particular regions, for exchanging financial and knowledge-based resources (Kanda et al., 2020; Parag et al., 2013). These channels have provided further

⁴ Throughout this thesis the national level will apply to decisions, policies and for organisations whose scope of reach and representation are conducted on a nationwide scale, incorporating the entirety of England and appreciating that this may, in some cases, extend to the UK.

support to existing clusters of CE organisations⁵ (Berkhout & Westerhoff, 2013; Parag & Janda, 2014).

Intermediary organisations are often formed from existing CE organisations or as a collective approach between multiple organisations. For example, Repowering London⁶ is involved in cofounding Community Energy London [CEL], a regional intermediary operating in the heart of the capital, and CEE, the national representative of CE in England. Both organisations (Repowering London and CEL) are reported to be founded to foster cross-organisational corroboration, sharing lessons learned and as a formalised representative for lobbying and advocacy on behalf of their members (Repowering London, 2019a). Other intermediaries, such as Community Energy South [CES] were founded collectively by the sector. They were founded by multiple organisations within the same geographical regional boundaries that collectively recognised a need for an intermediary body (CEE, 2020; CES, 2022).

1.3 The conceptualisation of organisational learning

Although the concept of OL is accepted within the broader field of organisational studies (Prange, 1999), its exploration is complicated due to a need for more consensus around what it should constitute (Huber, 1991). Inherently an interdisciplinary topic, it draws on contributions from economics, organisational behaviour, sociology, and strategic management (Argote & Miron-Spektor, 2011). As a result, multiple theoretical strands have developed in the literature (Easterby-Smith & Lyles, 2012), often with contradicting conceptualisations that target several aspects of learning and focus on different units of analysis (Holmqvist, 2003a) whilst failing to recognise the other dynamics which are inevitably at play (Crossan et al., 1995; Fiol & Lyles, 1985). Although multiple definitions were put forward, at their core is the idea that OL is a process of change occurring as a function of individuals' experience (Argote & Miron-Spektor, 2011). As a basis, this study adopts the definition put forward by Fiol & Lyles (1985):

⁵ An example of this involves CES. As part of their establishment, they mentored 12 CE organisations throughout their region, funded by the Cabinet Office and West Sussex County Council (CES, 2022).

⁶ Repowering London is a relatively large CE organisation operating throughout London. They seek to empower communities by developing CE projects that they may be employed by, own and benefit from. As of 2021, the organisation reports 20 CE projects throughout various areas in London (Repowering London, 2019c).

“OL means the process of improving actions through better knowledge and understanding”

P.803

Whilst initially broad, the definition suggests OL is a process-based phenomenon. The literature indicates that the learning process concerns knowledge creation, retention, and transfer as its context (Argote & Miron-Spektor, 2011; Easterby-Smith & Lyles, 2012). Furthermore, this definition focuses on improving actions as OL's key organisational outcome, suggesting that while learning may be a factor in improved performance, it does not necessarily translate into immediate organisational gains (Knight & Pye, 2005). Lastly, the definition does not recognise a specific level of learning, implicating that learning is achieved if there is an improvement (Fiol & Lyles, 1985).

To expand on this definition, the process of improving actions through an OL lens entails that the organisation can identify areas of improvement and possess the means to enhance and embed the amendment within the organisation itself (Lawrence et al., 2005). This embeddedness may be in the form of routines (Cyert & March, 1963), structure (Argote et al., 2020), or even learning what not to do (March & Olsen, 1976).

When examining previous OL literature reviews, several consensus points are clear. A learning approach recognises that an organisation is not simply an amalgamation of individuals. Instead, they are complex and dynamic (Weick, 1979) entities which facilitate interactions (Cyert & March, 1963) of multiple human agents grouped into units (Dyer & Nobeoka, 2000). Furthermore, these processes are supplemented through technological capacities (Child & Mansfield, 1972) to ensure the dissemination and embeddedness of valuable lessons within its routines (Perez-Nordtvedt et al., 2008). These complexities, such as individual experience (Cohen & Levinthal, 1990) and organisational structure (Burns & Stalker, 1961), may also influence an organisation's ability to learn (Easterby-Smith & Lyles, 2012). Learning may be viewed as an ongoing, multi-faceted process (Crossan et al., 1999; Huber, 1991). Furthermore, the levels themselves are recognised to be interdependent (Crossan et al., 2011) and must dynamically interact, suggesting that they are interrelated and self-reinforcing (Di Milia & Birdi, 2009). Although studies oppose adopting a multi-level unit of analysis to examine OL due to the inherent complexities of an approach of this nature (Crossan et al., 2011), this study would argue against this.

Whilst there is undoubtedly merit in focusing on a single level, especially that of the individual in the CE context, it can be argued that the precedence of one level over another may restrict an analysis due to its undoubted neglect of the inter-level dynamics at play

(Holmqvist, 2003b). These dynamics are an underrepresented yet often important determinant in shaping the overall learning capabilities of the organisations (Di Milia & Birdi, 2009). This is especially important when applied to CE organisations as their structures are often less clear due to the multi-role nature of their individuals.

Often these individuals are representative of multiple groups and the organisation itself.

This study recognises that learning may occur within organisational settings, involving individuals, groups and the organisation itself, as well as between organisations, dyadically between two organisations (Larsson et al., 1998), informally between a cohort and formally within a network setting (Mozzato & Bitencourt, 2014). Lastly, it is recognised that in the CE sector, interactions between organisations are generally coordinated by hubs (Warbroek et al., 2019).

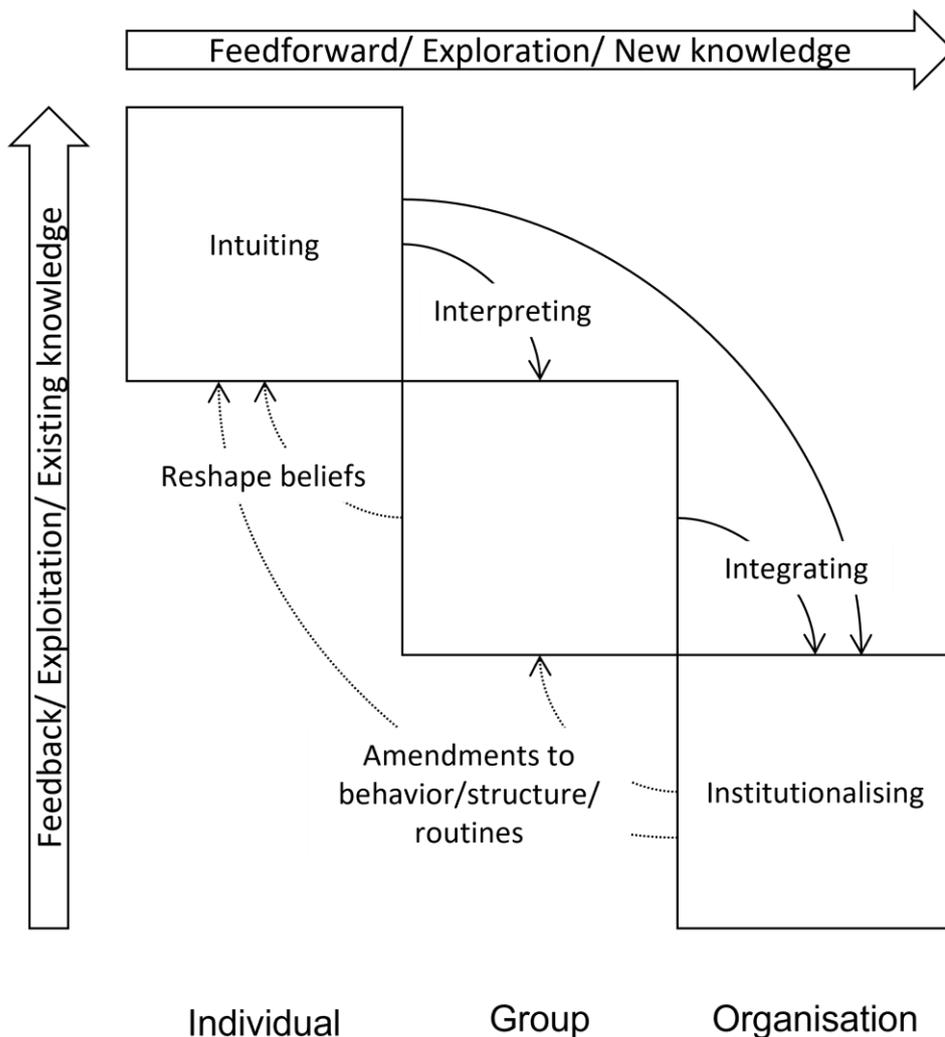


Figure 2: Original 4I learning framework, self-created, adopted from Crossan et al. (1999)

To provide a working lens for investigation, this study intends to adopt the '4I' learning framework developed by Crossan et al. (1999), as shown in Figure 2. Its selection stemmed from its ability to bring together multiple concepts of OL, recognising the inherent overlaps between previously put forward models and frameworks for its analysis. In brief, the selected '4I' learning framework envisions learning as a series of dynamic and interconnected learning processes (intuition, interpretation, integration, institutionalisation) split across an initial three levels of learning (individual, group, and organisation). In the context of the 4I framework, and throughout the remainder of this thesis, the individual is considered to be the lowest unit of analysis representing the basic building blocks from which learning is incepted and lessons absorbed (Crossan et al., 1999), these represent key members involved in the day-to-day activities of the organisation. The group is representative of amalgamations of individuals divided into organisational units, concerned with the collective advancement of a specific activity or task (Crossan et al., 1999). An organisation may be entirely reliant on a single unit or multiple units depending on its activities, scale and size. Similarly, individuals may either represent a single unit within an organisational setting or, as in the case of many CE organisations, represent multiple units simultaneously. An organisation may be viewed as a dynamic and changing objective-based (Schein, 1998) system whose primary purpose is the facilitation of interactions between human agents, who in turn shape the wider organisational setting through feedback processes (Argyris, 1999; Weick, 1979). Contrary to traditional assumptions of an organisation, its purpose and subsequent objectives are subject to change overtime and are a reflection of the changing collective vision of the individuals and groups operating within its boundaries (Becker et al., 2017). Furthermore, it should be recognised that an organisation is more than just an amalgamation of the capabilities and capacities of these individuals and groups, it also contains systems, structures, strategies and routines (Crossan et al., 1999) which are shaped by but independent of human agents which allow it to better fulfil its objectives and in turn also influence its culture and methods of achieving its set-forth objectives.

As part of its development, a study by Mozzato & Bitencourt (2014) concerning learning episodes within more expansive interorganisational spaces proposes an extension of the previously put forward 4I framework to include a network level, recognising interorganisational interactions followed by cooperation as its corresponding process. Although an initially simple concept, this recognises that modern-day organisations are

seldom independent. Instead, they have become entirely interdependent (Larsson et al., 1998), especially in the CE sector, where partnerships and joint initiatives have begun to take precedence over individual approaches (CEE,2021a). A learning approach incorporating the network level must consider the dynamics of the network itself as they are perceived to be one of the main influences of the broader learning processes between organisations. This approach considers the role of the intermediary itself (Bird & Barnes, 2014), the maturity of the network (Dyer & Nobeoka, 2000), learning-based systems (Templeton et al., 2002) and the relative positions of the member organisations within these network settings (Tsai, 2001).

Expanding on the processes set out by the 4I learning framework, a more simplified way to consider these processes is to view intuition as a form of search by the individual to acquire knowledge guided by their experience (Orlikowski, 2002) and expertise (Cohen & Levinthal, 1990; Easterby-Smith & Lyles, 2012). Interpretation may be viewed as a form of translation (Castaneda & Rios, 2007; Lawrence et al., 2005); once the individual has acquired a potential form of learning through intuition, this must be critically appraised by the individual against past forms of knowledge concerning the same thing. If it is deemed better, the individual must then communicate these concepts to their colleagues, work groups and various organisational units within the organisation with the goal that it is accepted as a potential improvement and taken on by the organisation (Bapuji & Crossan, 2004). Ideas other members of the organisation accept often lead to the development of a shared understanding (Botnis et al., 2002).

Lastly, suppose the integrative process can gain traction within the organisation, with it being a clear improvement from what was previously in place. In that case, these lessons are then institutionalised within the organisation, meaning that it is embedded within the organisation, whether through its activities, routines, structures, personnel or training (Orlikowski, 2002).

An important aspect to consider within the 4I framework, which this study will attempt to address, is its focus on 'larger' organisations (Crossan et al., 1999) compared to the average CE organisation. They envision the organisation to have a series of units or groups working on different tasks; the integrative process concerns the development of shared understandings within units, allowing them to cross-interact and share these ideas (Crossan et al., 2011). However, when the units and levels themselves have no clear boundaries, such as those observed throughout CE organisational structures, the processes

and how they unfold might be more fluid, and this should provide the potential for insights on the adoption of the 4I framework allowing for differentiation between the learning processes between conventional larger organisations and CE organisations.

The 4I framework differentiates between the nature of knowledge, recognising that knowledge may come in two forms, tacit and explicit, a concept popularised by Nonaka & Takeuchi (1995) through their spiral model concerning the transformation of several types of knowledge. In addition, the '4I' learning framework also recognises that learning flows between the levels through its processes in a bidirectional manner (Crossan et al., 1999; Dutta & Crossan, 2005). This means that lessons learned may flow from the individual upwards to the organisation. Later, the network or the knowledge may be acquired from the higher levels and then trickle down to its groups and individuals or organisations in the case of networks.

A final aspect that the framework recognises is the concept of strategic renewal within an organisation. Strategic renewal concerns the change process as a response mechanism from the organisation to adapt to its external environment (Botnis et al., 2002; Chiva, 2007). Within the field of OL, strategic renewal may be achieved in one of two ways: the exploration of new ways of doing things or the exploitation of what already works (March, 1991). Often organisations have a limited resource base and must be selective over which of the two forms of renewal they will dedicate resources to (Easterby-Smith & Lyles, 2012). Within the framework, the concepts of exploitation vs exploration first put forward by March (1991) are termed feedforward and feedback, corresponding to the directional learning flow.

The '4I' Learning framework then envisions learning as a series of five dynamic learning processes (intuition, interpretation, integration, institutionalisation, and cooperation) across four levels of learning (individual, group, organisation, and network), guided through the premise of strategic renewal (Botnis et al., 2002; Crossan et al., 1999). This view of learning stipulates that an organisation must find an appropriate balance between the tension experienced by organisations regarding the assimilation of new knowledge and the refinement of existing knowledge [Premise 1] (March, 1991) through multi-levelled [Premise 2] interactive processes [Premise 3] (Crossan et al., 1999). Finally, the '4I' framework recognises that cognition and action are seen to impact one another [Premise 4] (Crossan et al., 1999).

One goal in this study is to adopt the 4I learning as a basis to develop and test a method for measuring learning within the CE sector; this will be achieved through adopting and replicating established measures of OL (Botnis et al., 2002; Chiva et al., 2007; Templeton et al., 2002) that use 4I learning framework. A key difference, however, will be the extension of the measure to include the network level of analysis, following the theoretical framework extension by Mozzato & Bitencourt (2014). This will be conducted to extend the measurement of the framework to the CE network level of learning and to generate insights into the relationship between intra and interorganisational learning in the CE context.

To supplement these findings, a secondary aim of this study is to capture CE interactions through network mapping to examine the extent of cooperative behaviour within the sector through their network interactions. Although this form of Social Network Analysis [SNA] has its limitation in that it only captures interactions at a specific point in time rather than longitudinally, it is still deemed worthwhile to gain an insight into the interorganisational interactions within the CE sector through its networks. Whilst only capturing a single point in time, it is essential to recognise that these interactions and relationships are built over time, and instances at one point in time often reflect the deeper connections between the organisations and the overall coordinative capabilities of the network.

1.4 Scope and geographical focus of study

Within the UK, differences between the devolved constituents regarding energy policy and the overall approach towards CE development have shown variations in how the sector has developed between its four constituent nations. When writing, 323 CE organisations were identified in England, only 3 in Northern Ireland (NI), 103 in Scotland and 67 in Wales (CEE, 2022; CEE et al., 2022).

In England, several stakeholders contribute to the sector's existence. The sector is characterised by multiple tiers involving national-level government bodies such as the DBEIS, regional public bodies, such as the LEP energy hubs, CE intermediaries representing the sector throughout multiple regions, which sometimes cross over and a myriad of overlapping forms of funding and learning opportunities. In their latest State of the Sector report, CEE identified over 12 sources of financing obtained by CE organisations in England (CEE et al., 2022). Although this may suggest diversity in sourcing funding, it also indicates

a need for a national policy framework from which the other devolved nations may easily benefit.

On the other hand, CE in NI remains undeveloped, with only four organisations identified in the CEE datasets (CEE, 2020). A consumer attitudes report relating to issues associated with the broader energy transition in NI reveals that although the cost was a significant factor in influencing CE uptake, a secondary factor was uncertainty and an overall lack of trust in a community-led approach (The Consumer Council, 2021). The potential to become dependent on others, difficulties in agreement within communities, and the preference to be left alone were all cited as inhibitors of CE uptake in NI, suggesting an overall lack of belief in its potential (The Consumer Council, 2021).

In Scotland, sectoral development is mainly contained through Local Energy Scotland [LES], a consortium founded by the Energy Saving Trust [EST] that brings together several stakeholders under a unified body. Additionally, LES administers the Community and Renewable Energy Scheme [CARES], a national governmental scheme to support CE development in Scotland (LES, 2022). Apart from the EST, Community Energy Scotland [CESCOT] acts as a community-led intermediary representing the sector.

Although Wales fell behind its counterparts in founded groups, it reportedly has the highest number of CE organisations per citizen (Regen, 2021). The framework for CE development in Wales is highly centralised and directly dependent on governmental funding. Further inquiry showed a national representative in Community Energy Wales/ 'Ynni Cymunedol Cymru' [CEW/YCC]. However, no specific governmental bodies were identified.

Devolution politics has impacted the development of CE between England, NI, Scotland and Wales. Scotland and Wales appear to have a clearer idea of how they envision the role of CE in their energy futures due to their clear policy framework, support mechanisms and reaffirmed support in its development.

For this study, only CE in England will be considered due to its unique policy landscape, regional differences in CE development and the growing role of intermediaries and network support. The unique combination of a lack of legislative backing coupled with established regional intermediaries and an increasing two-tiered system between the local and national public bodies creates a setting where the role of intermediaries is expected to

be further accentuated. This creates an exciting and promising setting for applying and testing the 4I learning framework.

1.5 Research question aims and objectives.

The overarching research question posed in this study is: How do CE organisations in England collectively learn? To adequately answer this, several aspects of learning within the CE sector must be considered, such as its prerequisites, towards both the individuals engaging in the learning processes and their organisations in creating and fostering these processes and later disseminating the lessons learned from them. How differences between the priorities of the organisations towards key facets of CE characteristics may impact their overall propensities to learn, their broader interorganisational relationships and how those interactions may influence learning and lastly, how the external environments in which they find themselves may either foster or impede this interorganisational and network learning capabilities.

This question is underpinned by two aims guided by the listed objectives. The aims are: (1) to understand how the different learning processes across multiple levels unfold within and between the CE sector and (2) to investigate how CE networks contribute to these learning processes. Each of these objectives is expected to contribute to shaping the overall discussion and arguments into a better understanding of the learning-based dynamics in the CE sector. Successful implementation of these aims and objectives is expected to enable this study to draw meaningful conclusions relating to collaboration and information sharing within the sector to allow for continued sectoral development of what is believed to be a promising avenue to energy management.

Objectives:

- To review CE literature to identify the main characteristics of CE organisations and how variations in the displayed characteristics between CE organisations in England may impact their learning.
- To operationalise a measure of OL by adapting and refining quantitative scales for measuring OL within and between CE organisations in England.
- Developing further conceptual constructs of OL in the CE sector.
- To capture network-level exchanges by mapping financial and knowledge exchanges of CE organisations within a network setting in England.

The points mentioned above shape the overall concepts which this study attempts to address, the specific gap in knowledge that is being targeted is the examination of CE organisations and their respective networks from a learning-specific lens and the integration of learning theory, specifically the 4I learning framework to better understand these concepts in the CE case. Due to their unique nature, the CE sector is expected to learn and exchange resources more effectively than its conventional counterparts by utilising the main aspects underpinning the sector's ethos, which is collaboration and collective development as opposed to a primarily competitive mindset for growth. As this study perceives learning to offset the impacts of a changing landscape, it is then considered essential and worthwhile to explore how these processes unfold across levels of learning within the sector and how, through networks, these processes are influenced.

1.6 Personal motivation

My motivation stems from a keen interest in the broader field of RE and how we can collectively improve society through this zero-carbon transition. This formed a natural attraction towards the concept of CE. The unique opportunity presented by a zero-carbon transition may be addressed in a manner that transcends a technological change that embraces a societal shift by providing communities with a chance to become involved in their zero-carbon futures.

Further benefits may also be extended to the international context to empower previously deprived communities by providing locally owned zero-carbon solutions to communities with no previous electricity, incorporating them into our electrified economy. This belief stems from my earlier research, which focused on electricity generation and economic growth, where a key finding suggests a causal relationship between electrification and economic development.

1.7 Timeline of study

This study took place between January 2018 and June 2023. An initial 6-month period was dedicated to exploring broader literature around the RE transition, decentralised systems, and the CE sector. An exploration of relevant theoretical strands of literature, such as institutional theory, the multi-level perspective, and learning and network learning theory, followed this. A review of the relevant literature and its write-up was conducted after that (September 2018 – March 2019), followed by the methodology and research design (April

2019 – November 2019). Although the data collection was due to commence at this stage, restrictions and limitations due to the Covid-19 pandemic delayed this for approximately a year where the researcher attended online CE network events, made initial contact with CE members, refined the data collection methods and subsequent selection process to reflect the changing circumstances. Data collection started in March 2021, which involved a period of semi-structured interviews up until June 2021, followed by two questionnaire instruments which were open for a total of 6 months (June 2021- December 2021 (September 2021)). The qualitative instrument was analysed and processed during this period up to February 2022. In the upcoming period (June 2022– June 2023), the researcher focused on addressing the provided corrections to the thesis.

1.8 Thesis structure

This thesis comprises seven chapters. **Chapter 1** introduced the main topic this thesis intends to explore, which is adopting an OL lens to examine learning within and between CE organisations, followed by a broad overview of the energy policy landscape in England.

Chapter 2 contains a review of the literature. An introduction to the CE sector in England is provided, and the main characteristics of its organisations are explored. This is followed by reviewing OL literature, specifically the 4I learning framework and its operationalisation in the CE sector. The chapter is concluded by exploring current CE networks in England.

Chapter 3 develops the research approach and clarifies the overriding research paradigm that informs the emergent methods and data collection techniques. This chapter will show that the intended mixed-methods approach, comprised of semi-structured interviews followed by a questionnaire, would be best suited to achieving the proposed aims and objectives.

Chapter 4 describes the procedures for participant selection for the semi-structured interviews and the selected organisations and networks to be included in the questionnaire mailing list. The chapter also provides some details on the settings of how the data was collected and how each of the different forms of data was processed before their analysis.

Chapter 5 presents the integrated findings of the study. The first section of the chapter relates to internal learning inputs, processes and considerations within CE organisations. This is followed by interorganisational dynamics focusing on external relationships and

learning processes. Finally, the chapter presents network-level findings alongside subsequent interaction maps of exchanges.

Chapter 6 comprises the discussion where the study's main findings are interpreted, examined and related to the subsequent literature from Chapter 2.

Lastly, **Chapter 7** concludes the thesis by revisiting the aims and objectives, showing that each has been adequately addressed throughout the study before providing the contributions to knowledge, implications, limitations, areas for further research and concluding remarks.

Chapter 2 – Literature Review

2.1 Introduction

This chapter focuses on the evolving field of organisational studies and how OL episodes manifest within the energy sector at the community level. The main characteristics distinguishing CE organisations are examined to develop a classification profile that forms the basis of this study. An overview of the sector will provide insight into the current scale, operations and networks associated with CE in England.

As the study adopts a learning lens, it reviews the literature around learning within, between and throughout network settings alongside facets such as the development of the network itself. The chapter concludes by discussing the selection of a relevant conceptual framework that will allow it to operationalise the aforementioned explored concepts concerning learning within the CE sector.

2.2 Evolving organisational view and its integration into energy management.

Traditionally, an organisation constitutes formalised collective action whose primary purpose is to pursue the shared goals of its members. They are objective-based (Schein, 1988) and profit-driven organisations (Coase, 1988; Williamson, 1981). Access to perfect market information also brought about the rational decision-making model, achieved through a hierarchical structure of authority (Argyris & Schon, 1978; Burns & Stalker, 1961; Coase, 1988; Cyert & March, 1963), of whom the primary decision maker has been dubbed the entrepreneur (Dutta & Crossan, 2005).

Subsequent theoretical developments have since challenged these views (Jensen & Mckling, 1976; Weick, 1979), recognising that previous assumptions were not reflective of reality and could lead to the exclusion of organisational forms and their respective actors due to them not satisfying a restrictive classification (Baumol, 1993; Hamid et al., 2017; Jensen & Mckling, 1976).

Inherent complexities within organisations, further compounded by external factors influencing these settings, further accentuates the need for a comprehensive approach

(Argyris & Schon, 1978; March & Olsen, 1976; Schein, 1988). Not only was the view of the purpose of the organisation challenged, but also its internal dynamics and the broader external landscape in which it operates.

Favourability towards mechanistic modes of governance reflected broader ideologies at that time (Kannonier, 1985). It has since been argued to affect organisational outcomes negatively (Du et al., 2020). Shifts in societal preferences changed attitudes towards a more inclusive and empowering mode of governance within organisational settings (Burns & Stalker, 1961). The emergence of new governance structures rendered authoritarian and bureaucratic structures one of many options organisations can adopt (Child, 1972; Child & Mansfield, 1972). Neoclassical studies emphasised profit maximisation (Coase, 1988; Cyert & March, 1963; Williamson, 1981) through capitalising market opportunities. An alternative suggestion postulates that organisations are goal-oriented in their approach, and their primary motivation is to further the interests of their stakeholders (Argyris, 1999; Cyert & March, 1963; March & Olsen, 1976). Substituting profit maximisation with financial sustainability and suggesting information gain to maintain a competitive advantage (Cyert & March, 1963). In addition to financial drive (Williamson, 1979; Williamson, 1981), curiosity, power, and societal benefit are contributing factors influencing the overall organisational purpose and direction (Wiley, 1997).

Cyert & March (1963) recognise that access to perfect market information and rational decision-making are unreflective of reality. Although decisions are generally taken with the best intentions, they are sometimes rational. Bounded rationality is poised as it recognises imperfect information, suggesting that knowledge may be a competitive advantage to those who obtain it (Senge, 1994:2006).

A common factor in organisational studies is their shared view of the inherent complexity of the organisations themselves, suggesting that they are genuinely unique entities (Huber, 1991). This is attributed to having multiple interactions with human agents, organisational systems and technological assets simultaneously. Multiple facets may enhance or impede further interactions and efficiency (Zahra & George, 2002).

Central to these concepts is the role of the human agent as the central orchestrator within organisational settings. Weick (1979) suggests that organisations should be viewed as dynamic systems facilitating interactions between human agents who shape the wider organisational setting through feedback processes (Argyris, 1999). The shifting purpose of

an organisation is a reflection of the changing collective vision of its individuals (Becker et al., 2017).

Differences in how values are reflected within organisational settings have seen an increase in third-sector⁷ activities in addition to broader forms of corporate social responsibility, environmental awareness and social impact activities (Besley & Ghatak, 2017; Chapman et al., 2020; Charity Commission for England & Wales, 2018; Eon, 2012). Although there is a large degree of variability relating to the extent that these values are upheld, most organisations possess a mix of traits, both commercially and socially driven (Besley & Ghatak, 2017; Rogers et al., 2012).

Social enterprises [SE] are presented as a hybrid organisational form which seeks to achieve a balance between economic drive whilst integrating aspects of sustainability and social impact (Besley & Ghatak, 2017; Dacin et al., 2011; Hamid et al., 2017; Hillman et al., 2018; Wai Ko & Liu, 2015). As these are contradictory, a challenge is to manage the tension caused by the need to grow and remain competitive in its ability to sustain socially impactful activities (Baumol, 1968; Johansova et al., 2012). They are democratically structured organisations involved in a market, with a clear cultural, environmental and social purpose rooted in serving their local community (Johansova et al., 2012).

Theoretical development of the evolving role and contribution of SEs, and by extension, the entrepreneurs themselves, has lagged behind its real-world application (Hamid et al., 2017) due to their previous omission in classifications put forward by the theory of the firm (Coase, 1988; Jensen & Mckling, 1976). The accepted theory has overlooked an agent of innovation (Baumol, 1993), limiting our understanding of a crucial economic actor (Baumol, 1990).

The role of SEs has been known to adapt to the state of the economy (Baumol, 1990). In his article exploring entrepreneurship development, Baumol (1993) concludes that this behaviour reflects economic performance. During prosperous times of growth, dominant behaviours reflect aspects of capitalism. During periods of downturn, such as recessions,

⁷ The third sector is an umbrella term covering a collection of not-for-profit and voluntary organisations, including charities, cooperatives, community benefit societies and others that conduct mission-driven activities to create a positive impact, sustain meaningful change and improve the community. This sector operates in a unique space between the public and private (commercial) sectors, often filling in the gaps which other and often larger players have failed to address (Salamon & Anheier, 1998).

SEs are socially driven. Hamid et al. (2017) forward this by suggesting that SEs play a vital role during periods of an economic downturn due to their ability to fill in a gap left by the government as the primary welfare provider due to resource constraints in these periods.

There appears to be a disconnect between public opinion and the current state of affairs in the energy sector, creating a necessity for implementing alternative solutions. In a survey of over 34,000 respondents, the energy sector was shown to be the least trusted in the UK, with only 46% noting that they trust businesses operating within its parameters (Edelman, 2021). The BEIS Public Attitudes Tracker⁸ for energy shows that 85% of respondents supported using RE⁹ (DBEIS, 2022a). However, the RE mix currently accounts for only 42.6% of the electricity supply¹⁰ (DBEIS, 2021). Although increasing in proportion to the total annual electricity energy mix, there remains to be a lag in the delivery of RE. Furthermore, the survey reports that 79% of respondents agreed that RE projects should directly benefit the communities they are situated (DBEIS, 2022a).

There is clear support for RE with expectations that RE should be embedded within local communities and act as a catalyst for a broader societal change instead of simply a technological upgrade. It can be stipulated that these factors contribute to a growing interest in the CE approach due to its ability to deliver on all these fronts (Hamilton et al., 2014).

SEs in the form of CE (Becker et al., 2017; Hillman et al., 2018) are filling in a gap within the energy sector by providing an alternative model, shifting how energy is created, managed and owned (Hewitt et al., 2019). CE empowers individuals and their communities by placing them at the heart of the energy system (Radtke, 2014). This is achieved through a decentralised and grassroots approach (Hargreaves et al., 2013), which champions community inclusion (Berka & Dreyfus, 2021), ownership (Fell et al., 2020) and impact whilst maintaining high standards of operation (Berka, 2017; Berka & Creamer, 2018; Hoffman & High-Pippert, 2010; Seyfang et al., 2013; Walker et al., 2007).

⁸ BIES attitudes tracker results taken in Spring 2022

⁹ Most notably, support for (1) Solar was highest (87%), followed by (2) Wave and tidal (83%), (3) Offshore wind (82%), (4) Onshore wind (78%) and (4) Biomass (72%)

¹⁰ Calculated based on data gathered in DBEIS (2021) UK Energy in the brief report were RE used in the generation of electricity was divided between Wind & Solar (28.4%), Hydro (2.2%) and other renewables (12.6%)

CE can contribute towards broader net-zero targets while fostering local economic activity through localised investment and broader contributions to relevant social issues (Hillman et al., 2018; Hoffman & High-Pippert, 2005; Walker & Cass, 2007).

2.3 Overview of CE in England

The following section will expand on the aforementioned historical development of CE (Section 1.3) by providing an overview of the current shape of the sector and its organisations. It was previously noted that favourable policy mechanisms were a strong driver of the initial development of the CE sector (Bauwens, 2016; Nolden, 2013; Radtke, 2014). However, a common landscape has not inherently resulted in equal and distributed sectoral development across England.

2.3.1 Geographical distribution of CE in England

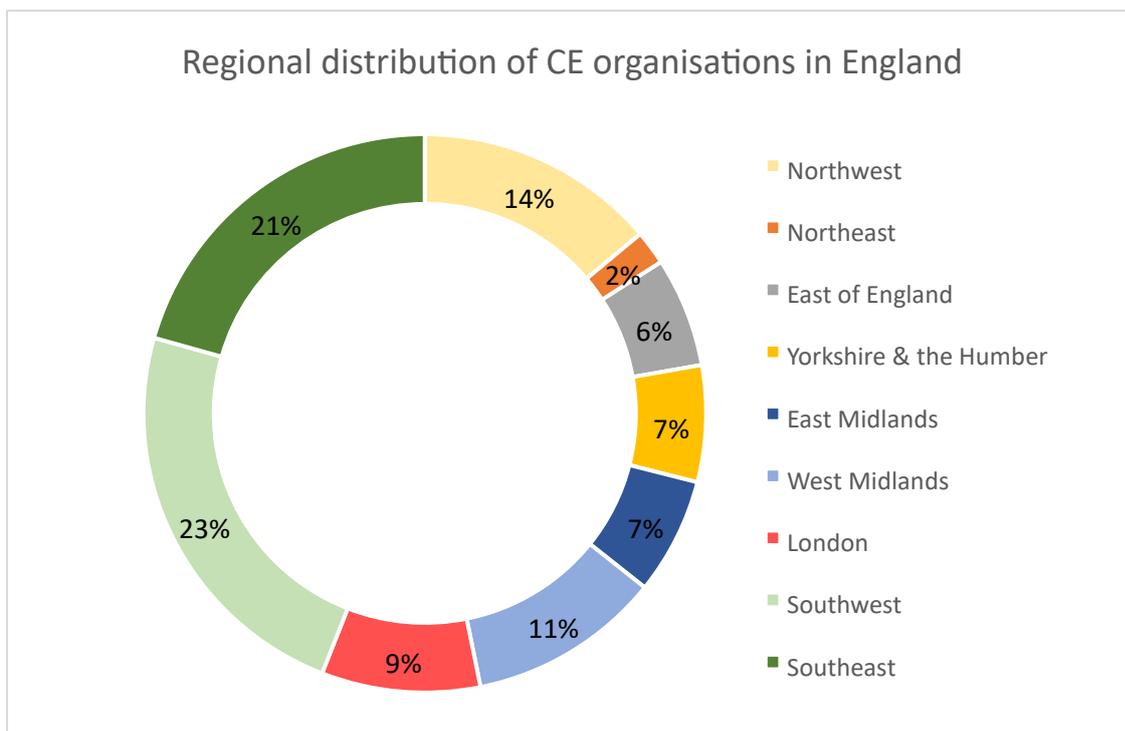


Figure 3: Distribution of established CE organisations, split across nine geographic regions in England (Data sourced from CEE2020 anonymised database).

Figure 3 shows CE organisations' regional distribution across 9 identified geographic locations in England. Sectoral development appears uneven, with the majority (53%) of

these initiatives in Southern regions¹¹. Other regions where CE has gained a minor foothold include the Northwest (14%) and the West Midlands (11%). Overall, CE representation is considered to be low in non-Southern regions (Hempshall et al., 2021; Scene Connect, 2019), with the lowest concentration in the Eastern regions such as the Northeast (2%), East of England (6%), East Midlands (7%) and Yorkshire & the Humber (7%).

Whilst the reasons behind uneven CE development may be unclear, socioeconomic differences between these regions in CE are considered due to the high capital prerequisites often needed to acquire generation assets. For example, when comparing the regional gross household disposable income [GHD] of the nine regions through data obtained from the Office for National Statistics [ONS] for 2018, the three Southern regions, in addition to the East of England, showed the highest disposable incomes with an average GHD of £24,198 between the four regions, in comparison to an average GHD of £17,904 between Northern regions, the Midlands and Yorkshire (Office of National Statistics [ONS], 2021). This suggests a relatively large divide between GHD of approximately £6,294 which may have significant implications on the ability of communities to engage in CE initiatives that mostly depend on the relatively high start-up costs, especially those seeking to acquire RE generation assets (CEE, 2020; Hempshall et al., 2021).

Comparing this with the average demographics of individuals known to engage in the wider CE sector, as Radtke (2014) explained, it is then expected that 'richer' localities would indeed have the experiences, resources and especially the time to engage in CE.

Other sectoral reports suggest a higher CE presence in certain regions than the findings captured by the CEE report. For example, a report by the Centre for Sustainable Energy [CSE] identified 25 currently active CE organisations throughout the Northeast of England, noting that 75 organisations and individuals were interested in CE (Hempshall et al., 2021). This gap between the CEE and CSE reports may suggest a disconnect between CE organisations and the national-level representative of the sector in certain regions.

2.3.2 Organisation structure in the CE context

The structure of an organisation allows it to fulfil its function within its environment (Gibson & Gibbs, 2006). CE organisations are skewed towards organic structures (Burns & Stalker, 1961), which display three shared qualities: Horizontal communication lines, a

¹¹ Southern regions represent the Southeast, Southwest and London.

generalised approach to operations and decentralised decision-making processes (Luenenburg, 2012).

CE organisations adopt various structures to suit their requirements (Radtke, 2014).

Different legal forms can operationalise and prioritise different social values depending on the unique vision and requirements of the respective communities (Becker et al., 2017).

Hybrid models also exist with more established organisations incorporating multiple legal structures to specialise in certain activities. For instance, the Low Carbon Hub¹² [LCH], which has a CE presence in Oxfordshire, comprises two organisations working together. An Industrial Provident Society [IPS] is responsible for acquiring capital and ownership of energy generation. Surplus income from the IPS flows into a Community Interest Company [CIC] to further support communities in energy-related activities and develop new organisations (LCH, 2017a).

Cooperatives have traditionally been the dominant structure (Berka, 2017). However, incidents of rejections to register by the Financial Conduct Authority in 2014 have since led to CBS becoming the dominant structure for CE approaches (CEE, 2018). The anonymised CEE dataset showed that 48% of 250 respondents in England adopted a Community Benefit Society [CBS] model, 16% Cooperatives, 9% CIC, 7% Charity, and 20% adopted hybrid or other structures. Furthermore, 27 informal (Seyfang et al., 2013) organisations are reported to have no legal structure due to being unincorporated (CEE, 2020). Structures adopted by CE approaches emphasise democratic decision-making (Veelen, 2018; Walker, 2011) and incorporates elements of a broader social entrepreneurial ethos (Becker et al., 2017). A ‘one member = one vote’ approach is often seen as a critical feature of these organisations (Bauwens et al., 2022).

Parties and individuals are motivated by different incentives (Bauwens, 2016; Doci & Vasileiadou, 2015; Hicks & Ison, 2018), and as a result, conflicts and misunderstandings tend to arise (Fell et al., 2020). Disputes are often resolved as CE organisations involve a small number of members and stakeholders (Wirth, 2014). Therefore, solutions are simple (Alvial-Palavicino et al., 2011). If unresolved, they may lead to other serious issues, such as

¹² Founded in 2011, the LCH is a SE whose main aim is to accelerate the low-carbon, and later zero-carbon, transition to RE through CE development in Oxfordshire (LCH, 2016). In its short life, the LCH has become one of the UK’s leading examples of the potential and benefits of CE through their proactive approach to sharing resources and knowledge throughout their regional boundaries.

deep-rooted mistrust between the stakeholders (Kydd,2010) or even slowing down development.

This tends to occur when local communities are not involved in the decision-making process of developing projects in their localities¹³ (Devine-Wright, 2004). For private commercial developments, including the host community in the decision-making process is essential. The successful implementation of these initiatives depends on the degree of local participation and community involvement (Alvial-Palavicino et al., 2011). Walker & Cass (2007) find that communities prefer to be part of such initiatives than to oppose them. The degree to which local participation is involved at all project stages depends on other parties. Devine-Wright (2004) reports that individuals who own shares are more likely to support projects. To ensure a project gains lifetime sustainability, trust must exist between the individuals in the community and between communities and developers (Hoffman & High-Pippert, 2010; Lehtonen & de Carlo, 2019).

However, this does not imply that disagreements will be eliminated once a project displays a certain degree of community involvement or ownership (Walker & Devine-Wright, 2008). As these organisations continuously evolve, some may expand and grow through issuing new shares and greater involvement due to higher levels of members (Fell et al., 2020). Clashes may still arise regarding technology (Devine-Wright, 2004), amongst other concerns regarding the decision-making process, vision and interaction with other organisational bodies (Raven et al., 2008).

As an organisation develops, its motivations are expected to shift (Holstenkamp & Kahla, 2016; Raven et al., 2008). As a result, more rigid structures are expected to form as the need to become more organised and specialised increases. Evidence of this can be found when exploring Baywind Cooperative, which founded a Private Limited Company [PLC] to manage energy generation assets on behalf of its growing cooperatives (Baywind Energy Co-operative, 2019; E4A, 2021).

2.3.3 Individuals involved in CE organisations

Bottom-up enterprises rely on a predominantly voluntary workforce (Chapman et al., 2020). Participation in voluntary organisations is virtually universal. In the UK, the National

¹³ This is the Not in my backyard [NIMBY] approach and is commonly associated with communities rejecting projects in which both process and outcome dimensions do not include the local community (Devine-Wright, 2004)

Council for Voluntary Organisations [NCVO] 2021 data tables¹⁴ indicate that the voluntary sector exceeds 140,000 different organisations. When considering activities, although the dominant form of volunteering remains in the provision of social services, environmental activities are represented by over 6,000 organisations accounting for over £3.8bn in income—placing them as the 12th most prominent form of volunteering.

Volunteering is the primary driving force that ensures CE remains operational (Hielscher et al., 2011). In their State of the Sector report, CEE notes that the English CE organisations had the lowest average number of FTE representation in the UK (CEE, 2021a). In 2021, CEE identified over 1,800 volunteers and 308 FTE roles within the sector (CEE, 2021a). Whilst the data shows that the sector remains heavily reliant on volunteers, a comparison with historical reports of annually created FTE roles¹⁵ indicates a shift towards job creation, albeit at a minimal level. In terms of their distribution, Southwest accounted for 29% of the total FTE roles, and London represented the highest concentration of FTE role creation with approximately 2 FTE roles per organisation (CEE,2020).

CE stakeholders can be classified into at least one of these categorisations: (1) Board/senior members, (2) Employees/FTE, (3) Voluntary members, and (4) Shareholder/investor. Individuals may fit into multiple categories within a single organisation and have cross-organisational roles in numerous initiatives.

CE organisations tend to be smaller in membership size than other groups, such as public institutions and incumbent organisations within the energy sector and the RE subsector. Their small size might render them exclusive by nature to outsiders, and this may lead to further conflicts between such initiatives and respective community members (Walker et al., 2010), highlighting the importance of conveying information and having a clear long-

¹⁴ NCVO Database: Section A1 for total voluntary organisations. A6 for assets, income and other relevant values (NCVO, 2021).

¹⁵ Table below: Total number of identified full-time equivalent roles and volunteers in England in all CEE State of the Sector reports (2017-2021).

Year	Volunteers	FTE
2017	1,700	85
2018	1,800	166
2019	No data	263
2020	1,521	207
2021	1,887	308

term vision (Raven et al., 2008). This is further accentuated in English organisations because they have fewer volunteers per organisation on average compared with Scottish and Welsh representation (CEE, 2021a). 64% of the organisations responding to the 2020 State of the Sector report having less than ten volunteers, whilst 20% indicated 10 to 29 volunteers (CEE,2020).

Small groups lack internal capacity and expertise (Gray, 2006). Often, members are responsible for multiple roles within these organisations and operating voluntarily. Motivating voluntary workers is considered a limitation of CE organisations (CEE,2018; CEE et al., 2022) due to low financial rewards and difficulty balancing volunteering activities and other responsibilities where time is a crucial inhibitor (Hempshall et al., 2021). Traditionally, the relationship established by such initiatives with their volunteers negatively impacts their ability to adopt innovative solutions and processes (Hull & Lio, 2006). An essential task here is to convey such information in a manner that is easily visualised. In the CE sector, volunteers have a crucial role in sharing information. The main difference is that volunteers operating are multi-rolled (Radtke, 2014). For example, volunteers may also be founding members or senior members within the locality, which all contribute to an increased commitment and dive towards the fundamental causes and missions of the organisation.

Whilst reports and secondary sources may understate representation. The results put the conditions in which the CE sector operates into perspective. Recognising that CE volunteers also have other priorities concerning their full-time jobs and private lives and will have to find a balance between sustenance and growth.

In terms of their demographics, Anderson (2022) reports that most of the individuals involved in the CE sector in England fall within the 50-69 age bracket and report a personal annual income between £25,000- £49,000¹⁶. The second most represented age group fell to individuals above 70 years old and incomes between £10,000-£24,999. The data showed that CE involvement was heavily skewed towards older individuals with relatively high annual incomes, suggesting that these were experienced individuals with the financial means and time to contribute to CE development (Anderson, 2022; Radtke, 2014).

¹⁶ **Age group:** 50% of a total of 755 respondents, **Income level:** 37% of 616 respondents.

2.3.4 Ownership

Small-scale zero-carbon initiatives are privately or commercially owned (Walker & Cass, 2007; Walker et al., 2007). Ownership models often dictate the nature of these developments and are often influenced by their adopted legal structures (Fell et al., 2020). Organisations may be wholly owned by their host communities, in partnership with local authorities and other public bodies, or split between community and commercial ownership in a partnership-based model (Fell et al., 2020; Goedkoop & Devine-Wright, 2016; MHCLG, 2021).

In a study exploring the motivations behind the uptake of microgeneration projects, Balcombe et al. (2014) find that self-sufficiency, saving money and protection against future energy costs as primary drivers of ownership of microgeneration projects. Whilst environmental concerns are reported as a key driver, it is a secondary facet to the motivations, suggesting that economic gain is a more critical factor to consider.

Extending these views to the community level presents similarities, such as a primary financial drive and secondary environmental motivation (Bauwens, 2016; Doci & Vasileiadou, 2015; Hicks & Ison, 2018; Holstenkamp & Kahla, 2016). Hoffman & High-Pippert (2005) suggest further motivations, such as material benefits and gratification arising from ownership of a CE approach which may not be obtained to the same degree as individual household projects.

Ownership of CE tends to be through the issue of shares (Fell et al., 2020; Goedkoop & Devine-Wright, 2016). Hicks & Ison (2018) find that local ownership and the inclusion of the community in the overall decision-making process were among the core motivations and benefits of engaging in community-driven low-carbon activities. This is supported by Hoffman & High-Pippert (2010), who find that local ownership enhances community cohesion and thus leads to an overall positive impact on the project's success.

Localised ownership ensures that the project's economic benefits, such as dividend payments, remain within the community (Berka & Creamer, 2018; Hillman et al., 2018). Although CE organisations emphasise 'local' ownership, it is difficult to ascertain the degree to which the term 'local' is upheld (Bauwens et al., 2022; Goedkoop & Devine-Wright, 2016). In their impact report on behalf of CEE, Anderson (2022) reports a 70% ownership rate in localised CE projects from individuals within the communities. Most organisations do not disclose the geographical distribution of their investor shareholders.

Others suggest that many invest from outside the local community (Fell et al., 2020). For example, Saddleworth Hydro, a relatively small-scale and localised CE organisation, reports that a third of its shareholders come from outside their locality (Saddleworth Hydro, 2021). Other organisations report that over 85% of their investor members are geographically within the locality (Morecambe Bay Community Renewables [MORE], 2021). The local communities may be initially prioritised during share issues (Walker & Devine-Wright, 2008), but ultimately, funds are prioritised instead of the degree of ownership locality.

Ownership dynamics have grown in importance when considering the evolving nature of hybrid business models (Fell et al., 2020) that have begun to develop as an attempt to offset policy changes. Shared ownership models involving CE organisations, public bodies (Bourdin & Nadou, 2020; Goedkoop & Devine-Wright, 2016; Hamilton et al., 2014) and commercial businesses (CEE, 2021a; Regen, 2019) are becoming increasingly popular (Braunholtz-Speight et al., 2018; Seyfang et al., 2013).

An interesting business model involves outsourcing the organisation's management to specialist organisations operating within the sector. Two organisations have been identified in England; their main objective is to provide asset management solutions to less experienced CE organisations. Bright Renewables and Energy for All [E4A] both engage in activities involving operations management, financing and accounting of projects and organisations, supporting board members with organisational decisions, providing recordkeeping services and procurement of various power purchase agreements and energy generation assets on behalf of these organisations (Bright Renewables, 2020; E4A, 2021).

These organisations may provide expertise in areas that the CE may not necessarily possess due to the self-selecting nature of these approaches and may further benefit from the knowledge gained from centralising numerous CE organisations, of which many individual projects exist. These organisations may also limit the localism involved in the project due to outsourcing energy management and obtaining the majority of the capital investments from outside the immediate community itself, thus potentially reducing these CE organisations to ethical investments in small-scale renewables hosted by communities.

It remains unclear what the effects of these organisations concern participation. However, considering the dynamics of who the project is for and whom it is proposed to (Walker & Devine-Wright, 2008), it is worth considering if contractor agreements with external

organisations can replace services from within the community and if the receiving CE organisation pays for these agreements. The spillovers of the revenue benefits of these initiatives are indeed leaving these communities whilst the number of individuals and potential skillsets required for these initiatives is dramatically decreased from within the community. Therefore, rendering the projects for external parties and by external parties (Goedkoop & Devine-Wright, 2016).

2.3.5 Types of CE activities

As previously explained, the DECC classifies CE energy partly through their ownership but mainly through its activities. Therefore, although it is recognised that some CE organisations may be engaged in wider non-energy-related activities, these are not included in this section. The focus here will remain on the energy-related activities distinguishing CE organisations from community organisations.

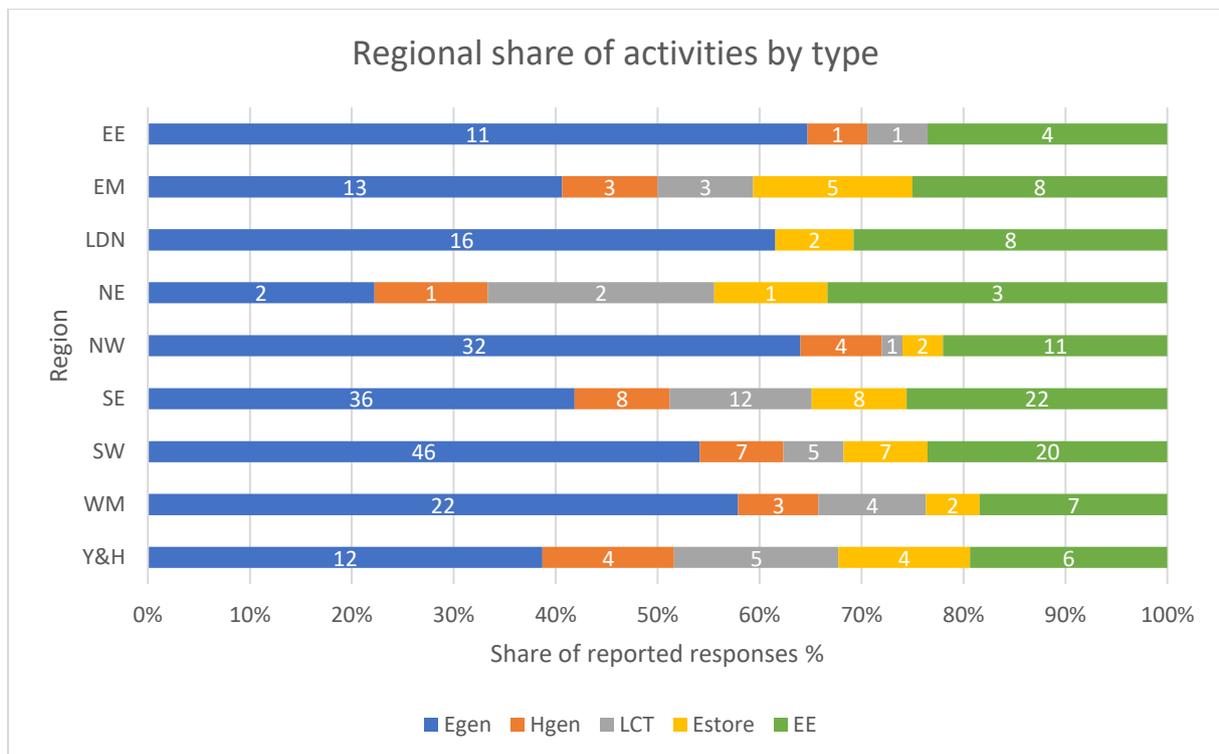


Figure 4: Regional share of CE energy-related activities by type, data obtained from CEE 2020 Anonymised database. **Abbreviations:** Egen=Electricity Generation, Hgen= Heat Generation, LCT= Low Carbon Transport, Estore= Energy Storage, EE= Energy Efficiency. **Regions:** EE= East of England, EM= East Midlands, LDN= London, NE= Northeast, NW= Northwest, SE= Southeast, SW= Southwest, WM= West Midlands, Y&H= Yorkshire and the Humber. Individualised responses (N=(x)) are denoted in white inside each bar.

Figure 4 shows the regional distribution of reported activities. The 2020 CEE database reports that 190 of 252 responses indicated electricity generation as their primary focus

(CEE,2020). There appears to be an even distribution of the activities across the regions, with electricity generation dominating all regions. As a secondary activity, 89 organisations adopted various energy efficiency measures (CEE, 2020). These often see a combination of multiple activities targeting the same objective. Other activities include Heat generation (31), Energy storage (31) and Low Carbon Transport (33).

Current CE approaches mainly focus on generating electricity through renewable assets, predominantly solar PV (CEE, 2020). The business model involving generation to sustain other, cheaper activities has thus far been the primary method of guaranteeing long-term revenues by the CE sector (Nolden et al., 2020).

Other activities involving energy efficiency measures have been gaining prominence over the past few years due to relatively low costs of implementation followed by immediate results for consumers regarding lowered consumption that may lead to cheaper energy bills and lower carbon footprint (CEE, 2021a). One concern, however, regarding energy efficiency activities is its high human capital requirements that necessitate home visits and the physical installation of improvements (Mayne & Hamilton, 2014).

Energy storage remains minimal due to the relatively high cost of integrating battery storage into broader generation systems and the limited knowledge bases, necessitating external parties to install and maintain these systems (CEE, 2020).

2.3.6 Community benefits

In addition to energy-related activities, CE creates meaningful local impact through various community benefit activities (Atkins, 2018; Walton, 2012; Hoffman & High-Pippert, 2010). Addressing issues of climate change is only a secondary goal of these organisations. The primary contribution of CE is a source of wealth creation and economic activity within their respective communities (Becker et al., 2017). Social impact activities from CE appear to target multiple facets (Rogers et al., 2012), such as energy-related market failures, broader community-related issues and deeper-rooted forms of socioeconomic inequalities (Braunholtz-Speight et al., 2021).

Five social benefits that CE can provide include efforts to alleviate fuel poverty (CEE, 2016; Mayne & Hamilton, 2014), educational opportunities, group funding of different CE projects through benefit funds, increasing local economic resilience through socioeconomic rejuvenation and the facilitation of greater degrees of community cohesion

through collective action and inclusion (Atkins, 2018; Berka & Dreyfus, 2021; Walton, 2012).

In their review of the different socio-economic benefits of CE, Berka & Creamer (2018) classified various literature exploring positive social outcomes, resulting in 8 articles reporting specifically on these types of outcomes. They find that the highest degree of charitable organisations is involved in large-scale community development projects (92%), benefiting from electricity export revenue streams. These initiatives also display the highest degrees of shared ownership. Their study concludes that although CE organisations claim to deliver social impacts, these revolve around community empowerment through ownership and socio-economic regeneration, which may be observed in the long term. Rogers et al. (2012) reiterate these findings and report educational benefits and empowerment as key social values resulting from a CE approach. They also note that these initiatives can increase public acceptance of adopting these projects within their localities.

Although it can be difficult to quantify social value and impact (Rogers et al., 2012), CE organisations have attempted to assign specific values to these activities by producing various social impact reports, explaining the key community benefit activities they are undertaking. For instance, Repowering London and the LCH conduct specific social benefit activities, such as providing free household-level energy audits and helpdesk services regarding household energy management (LCH 2016:2017b:2021; Repowering London, 2019b). Although neither reports a specific quantified economic value of these activities, their impact reports provide detailed guidelines about time spent, households benefitted, and the number of people engaged through these services. Repowering London also furthers these by offering free training to young individuals to provide them with necessary energy-related skills as well as create an access point for them for entry into the energy sector (Repowering London, 2019b).

2.3.7 Partnerships and wider relationships

A growing CE sector has seen a sharp increase in external relationships with numerous stakeholders (CEE, 2020; Goedkoop & Devine-Wright, 2016). Whilst only representative of a small fraction of partnerships throughout England, Figure 5, derived using data from the anonymised CEE 2020 database, represents reported partnership-based models categorised through geographical distribution and by the type of partners involved in these arrangements.

Geographically, although the SE and SW regions show disproportionate partnership agreements compared to other areas, this reflects the strong connections developed throughout their localities. Similarly, the high CE-commercial partnerships observed in the SW (17) reflect the strong industry links developed throughout the region.

Most partnership agreements are shared between CE organisations (Hamilton et al., 2014). This was closely followed by localised partnerships with other community organisations that do not necessarily operate in the energy sector. Following these, partnership arrangements between CE organisations and local authorities are reported as the third most prominent partnership type (CEE, 2020), it is expected that developments here, as well as those gained from a closer relationship between CE organisations and their respective local authorities, also support the development of similar arrangements with other public bodies such as healthcare institutions and schools.

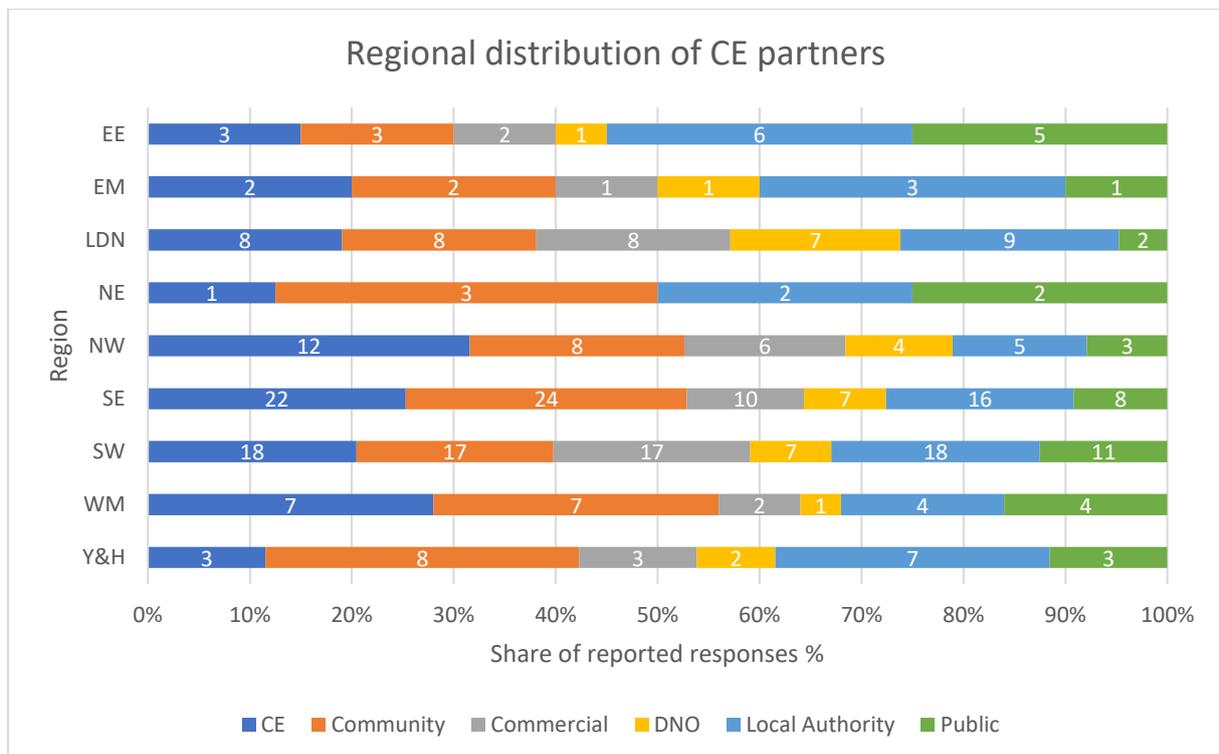


Figure 5: Regional distribution of CE partners, data obtained from CEE 2020 anonymised database. **Abbreviations:** CE= Community Energy, DNO = District Network Operator. **Regions:** EE= East of England, EM= East Midlands, LDN= London, NE= Northeast, NW= Northwest, SE= Southeast, SW= Southwest, WM= West Midlands, Y&H= Yorkshire and the Humber. Individualised responses (N=(x)) are denoted in white inside each bar.

Due to their central role in the energy sector, CE-District Network Operator [DNO] arrangements are also gaining prominence (Braunholtz-Speight et al., 2018; CEE, 2020; Electricity Northwest, 2021). Reasons for this may be attributed to the necessity of the

DNO to take a more proactive approach towards new market entrants and decentralised players so that they can better adapt capabilities to fit within a transitioning sector (Giles & Hoare, 2019; Energy Networks Association [ENA] & Regen, 2017; Scottish & Southern Electricity Networks [SSEN], 2020).

Whilst multiple partnership structures exist, larger joint initiatives consisting of several partners within a single arrangement have begun to develop. One example from the Southwest of England is Riding Sunbeams, a CE organisation specialising in rail decarbonisation (Riding Sunbeams, 2021).

Their joint establishment through Possible (Formerly 10:10 Climate Action), a charity focusing on climate change (HM Government, 2023), and Community Energy South [CES], a CE regional network (CES, 2022), marks an innovative approach to CE initiatives, linking the sector with a new, and unexpected, partner, Network Rail (Pendered, 2021).

Collaborations create small networks that provide their partners with commercial opportunities to diversify their revenue streams and knowledge to inform current and future activities (Argote et al., 2000; Wenger, 1998). This is especially the case for smaller players in these arrangements, where the benefits of the involvement of a single CE organisation may spill over beyond the immediate actors involved.

One benefit of partnership models between external stakeholders and the CE sector is their ability to integrate characteristics CE organisations value, such as incorporating local ownership, recirculating profits and focusing on socially impactful activities (Hillman et al., 2018). Although it is suggested that shared long-term goals and targets are a key motivator for collaboration (Cremona et al., 2014), the diverging and often contradicting targets of the numerous players involved in these relationships suggest that although partnerships and joint collaborative development between CE organisations and their extension to involve non-CE actors should be welcomed as a potential avenue for business model diversification. They should be treated cautiously to ensure that the values are upheld, and the impact created by CE is not reduced to a form of corporate social responsibility.

2.4 Development of classification profile for CE organisations

Section 2.3 provided an overview of England's CE sector, highlighting the diversity between CE organisations (Raven et al., 2008) observed throughout the sector. Differences were

observed from an organisational perspective through their structure, the scale of operations, technology, participation and community benefit activities. Although a definition of CE was previously put forward, its further exploration concerning the key characteristics of these organisations will contribute to creating a classification profile to allow for individual CE organisations to be identified and mapped. Ultimately, this will allow for a method to compare different CE organisations in addition to understanding how these organisations shift over time.

Given this diversity, multiple definitions have risen for what CE should constitute. However, there seems to be no universal definition (Hicks & Ison, 2018; Seyfang et al., 2013; Walker & Devine-Wright, 2008). Variations, especially by the funding bodies, have led to a broad interpretation of CE (Bauwens et al., 2022). This has also led to opportunism as cases have been reported where the CE label has been incorrectly adopted for personal or mutual gain, not involving the local community (Hoffman & High-Pippert, 2010).

For example, with profits as a key source of motivation (Balcombe et al., 2014; Holstenkamp & Kahla, 2016), the CE label has been applied to individuals fitting their homes with solar PV as well as landowners lending land for commercial development of RE projects all of whom adopt the community label (Hoffman & High-Pippert, 2010). Walker et al. (2010) mentioned an incident between community members and stakeholders involved in a ‘community’ wind farm within the locality. Most of the financial benefits derived from the project were concentrated around rewarding the stakeholders within the wind farm as opposed to the community itself, even though the initiative adopted the CE label. The concentrated flow of benefits reflects a private enterprise and should not be allowed to adopt the CE label and its associated advantages. Collections of individuals that engage in these RE initiatives have been traditionally adopting the CE label as a means by which their ideas may be achieved through the community avenue as opposed to the embodiment of the meaning to sustain and create impact and change (Hoffman & High-Pippert, 2005; Walker et al., 2007; Walker et al., 2010). Ofgem, the UK energy regulator, is currently attempting to respond and identify unfair adoptions of the term and other fraudulent practices within the sector through its counter-fraud programme (Ofgem, 2017).

Whilst the loose definition may lead to the unjust adoption of the term, it has fostered opportunities for its legitimate uptake, which far outweigh its shortcomings—creating a space for opportunity, diversity and widespread adoption (Hicks & Ison, 2018). A restrictive definition can negatively impact innovation and sectoral development (Veelen, 2018). The

open space has been a critical component in fostering the development of multiple models and forms of partnership (Goedkoop & Devine-Wright, 2016). These initiatives are tailored to a specific community's individualised needs and requirements. These practices have been of strategic value to the broader development of the CE sector as a small but effective solution to the energy transition (Walker & Devine-Wright, 2008).

Through its community guidance page, the UK government defined CE as a form of bottom-up collective action involved across four main facets of the energy market, which include the aim to reduce, purchase, manage and generate energy (DECC, 2014a). CEE defines the term as a group of individuals brought together through a shared collective identity to deliver projects that generate electricity and/or heat, energy efficiency, demand reduction and energy supply (CEE, 2018; DECC, 2015). Thus far, a consensus on the most agreed-upon definition was put forward by Walker & Devine-Wright (2008), who distinguish across process and outcome dimensions in determining whether a specific initiative should fall under the community label. They suggest that the key determining factors in the classification process are who a project is for and who it is by. If answers to both questions incorporate the community to a degree, these approaches may fall under the CE umbrella.

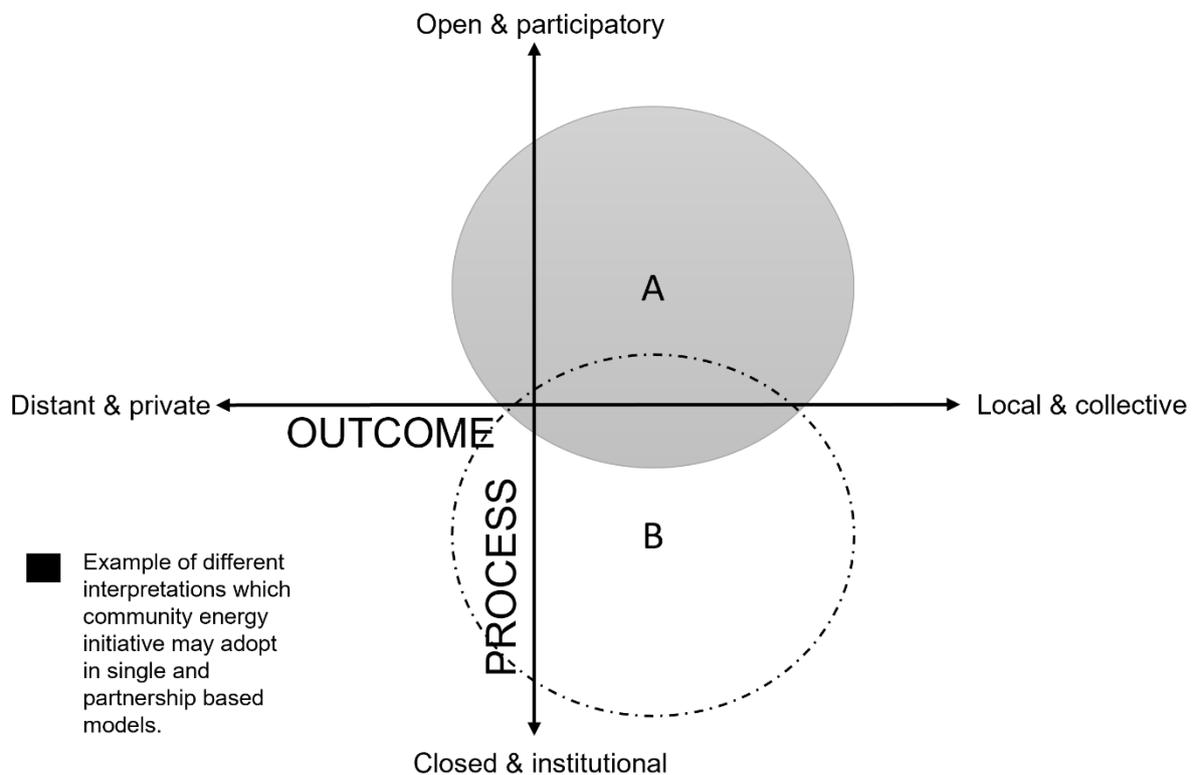


Figure 6: *Simplified characterisation of organisations fitting into CE classification profile within a single and partnership-based setting. Adopted and combined from (Goedkoop & Devine-Wright, 2016; Walker & Devine-Wright, 2008).*

Figure 6 illustrates different interpretations and adoptions of the CE term, conceptualised by Walker & Devine-Wright (2008) and later extended by Goedkoop & Devine-Wright (2016) to adjust and incorporate partnership-based definitions into the figure. CE organisations were argued to fall under the label correctly if their process and outcome dimensions fell within the (+, +) quadrant in Figure 6. Those within category (A) have a high degree of openness and participation and uphold values that reflect the locality and collective action. Walker & Devine-Wright (2008) accept any combination of these traits as long as they fall within (+, +) quadrants. There needs to be more focus and concern on the CE label as well as more concern about the viability and longevity of the organisation. The extended incorporation of a (B) category that does not fit into any traditional defining parameters suggests that CE organisations may be local and collective but also closed and institutional simultaneously, reflecting partnership-based models (Goedkoop & Devine-Wright, 2016), which often sees the community element reduced to a secondary feature coming after all other interests have been satisfied as opposed to the main focal point.

It is essential to easily visualise how a potential organisation may place itself against the criteria to quickly determine its status as qualified to adopt the community term. The extension of the model and the acceptance that CE may fall outside the pre-set dimensions causes a degree of confusion regarding what exactly is meant by the term 'community element', which was previously put forward to support the incorporation of a (B) category (Goedkoop & Devine-Wright, 2016).

A recent study by Bauwens et al. (2022) attempted to readdress the issues surrounding the meaning of CE through an extensive review of 183 previously put forward conceptualisations and definitions of the CE term. They conclude that although the term has been extensively adopted, resulting in a multiplicity of concepts around CE. Two main directions of emphasis were identified. The first came through the conceptualisation of the CE term as a place, emphasising the social aspects identified as a prominent aspect of CE. In direct contradiction, emphasis on the process aspects of CE, as previously conceptualised by Walker & Devine-Wright (2008), focused primarily on the energy aspects of CE. It focused on its growth as a sector instead of its social and localised impacts from its revenues. Overall, it was concluded that reflections from the explored definitions

suggested a deeper shift in the underlying characteristics of CE, moving from one predominantly focused on social impact to one now focused on economic sustainability (Bauwens et al., 2022).

This study argues against this simplified classification and generalised visualisation of how the CE term is interpreted. A model must consider the evolving nature of CE models and partnerships (Creamer et al., 2018) whilst maintaining the unique element that still renders them a community initiative. Rather than allowing for different quadrants within a simple diagram, several distinct categories and aspects should be placed with the organisation suggesting the value placed on each of these traits. An alternative model is proposed; this allows for further classifying CE organisations based on seven defining characteristics from the literature. These characteristics include (1) the degree of advocacy by the organisation, (2) the level of engagement with the community, (3) emphasis on democratic governance, (4) commitment to education, (5) emphasis on environmental impact, (6) value placed on shareholder reward and (7) degree of social impact.

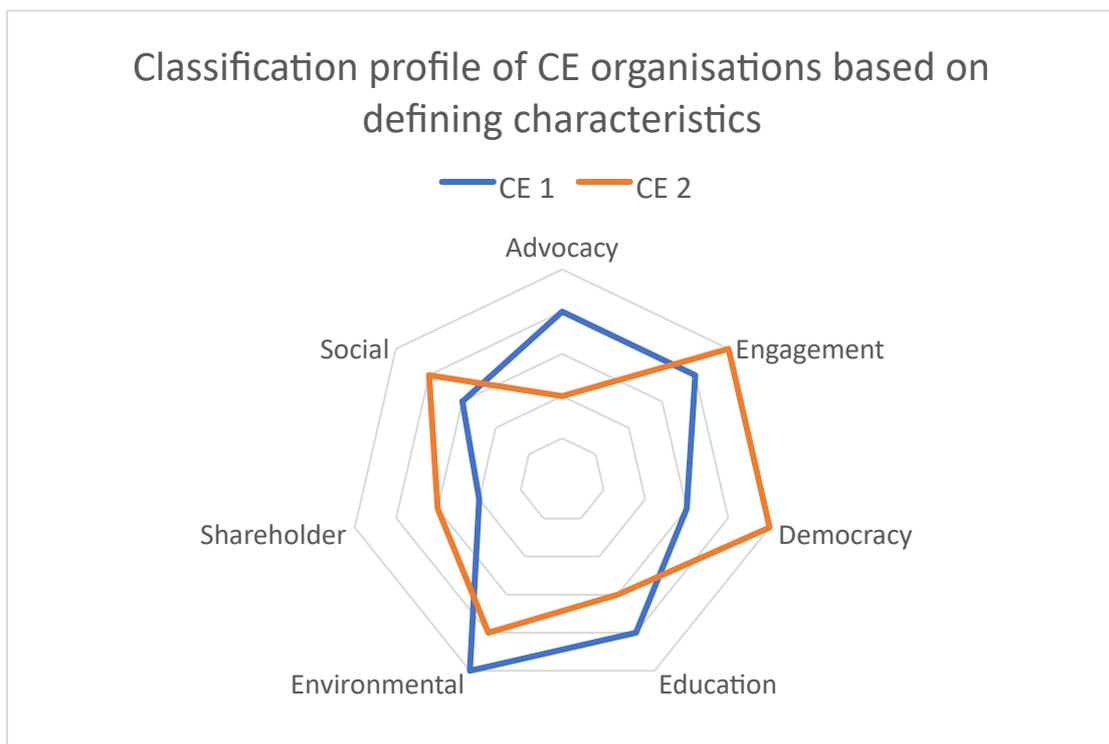


Figure 7: Classification profile for individual CE organisations based on defining characteristics, self-created.

Figure 7 attempts to expand on and contribute to previous diagrams capturing CE's defining values. Placing seven classification categories in the format shown is expected to

help to visualise differences between the organisations. They provide insight into their degree of prioritisation of specific values and the relationships between the characteristics. For example, organisations with higher degrees of social drive may display higher participation and locality in exchange for commercial gains and vice versa. Similarly, those with a higher focus on education and engagement should be expected to learn more than their counterparts due to the combination of a focus on education, both its provision as well as an openness by the organisation itself to search for knowledge as well as its ability to benefit from cooperation.

The extension of the previous model allows for greater variability between different organisations to be highlighted. When comparing figures 6 and 7, figure 6 shows that the definition of CE previously put forward disregarded organisations which appear to be closed & institutional as well as distant & private (Walker & Devine-Wright, 2008). In their definition revision, Goedkoop & Devine-Wright's (2016) CE classifications were extended to include the previously disregarded criteria. The (B) category in Figure 6 seems to be a forced classification to accept the increasing partnership-based model without changing the once-put-forward diagram. However, this would lead to several misclassifications between the actual benefits of the organisations towards their shareholders and owners. It assumes that organisations not functioning as charities are not classified as CE, going against their purpose.

Although CE organisations display openness and encouragement towards participating individuals, they benefit from several hours of unpaid, voluntary work by specific individuals. As these individuals are returning members who are believed to engage with these routines daily and the organisation itself does not expand its activity base to include more routines, there will come the point in the organisation's lifespan where it can appear to be distant and private about its ability to receive participation from other community members. Therefore, it is important to recognise that an organisation may display all these characteristics to varying degrees. It is then important to understand the different values these organisations assign to distinct categories to determine whether they truly reflect the definition of CE.

2.5 Organisational Learning Theory

2.5.1 Learning within an organisation 'Intraorganisational learning.'

The concept of learning first emerged in organisational studies in the seminal works of Cyert & March (1963), 'A Behavioural Theory of the Firm', challenging the neoclassical view of organisations put forward by Coase (1937). This publication shifted the focus of organisational studies moved from market forces to an internal examination of the organisation itself. Concentrating on the impacts of structure and operational practices on decision-making, performance and goal achievement (Cyert & March, 1963).

Historic development of the concepts put forward in OL theory have been shaped by numerous contributions by multiple scholars and converging theoretical ideas. Whilst some of the main concepts that have helped shape OL theory will be listed and discussed in the upcoming section, it is worth noting that there remains to be an all-encompassing theory of learning in the organisational setting (Easterby-Smith & Lyles, 2012) and that the ideas that have deepened our collective understanding of how organisations learn and are able to utilise these lessons for themselves and others continue to evolve and develop overtime (Argote et al., 2020).

One area of disagreement in OL involves the dimension (Botnis et al., 2002) constituting learning. Several articles view learning as an outcome based on inputs (Argote & Epple, 1990; Argote et al., 2003; Lapre & Nembhard, 2010). Others believe these inputs shape capabilities (Huber, 1991), contributing to learning processes (Argote & Miron-Spektor, 2011; Templeton et al., 2002; Tippins & Sohi, 2003). Different views target various levels of learning (Crossan et al., 1999; Holmqvist, 2003a); whilst some frame OL as a whole, others focus on the role of the individual agent as a mediator and instigator of this process (Easterby-Smith & Lyles, 2012). Similarly, authors have also explored learning processes across and between levels adding an interrelated dimension to its conceptualisation (Castaneda & Rios, 2007).

This study adopts a process-based view of OL. Learning is assumed to be achieved by efficient methods of conveying information across individuals, groups and organisations with recognition of higher levels such as the interorganisational and network. To become an organisation with learning capabilities, information acquisition, distribution, integration, and creation must be efficient at all organisational levels (Argyris, 1999). OL and knowledge

management are complementary. While OL is a process, knowledge management is its content (Holmqvist, 2003a:2004; Easterby-Smith & Lyles, 2012).

Table 1: Compilation of relevant definitions of OL. Self-created, adapted from multiple sources.

Article	Conceptualisation of OL	Definition	Recognised levels of analysis	Link between cognition and behaviour
(Argyris & Schon, 1978)	Perception/ Expectation	It occurs when an individual's feedback, based on expectations, evaluates the organisation's current model.	Individual	Cognition leads to behavioural change
(Fiol & Lyles, 1985)	Evaluation & change	A process where actions are improved because of newly acquired knowledge and understanding.	Individual & organisation	Cognition, coupled with knowledge leads to behavioural change within the organisation
(Levitt & March, 1988)	Routines	Evaluation of past routines to create new ones.	Individual, group & organisation	Cognition is highlighted as an instrumental feature of OL
(Huber, 1991)	Change	Process of identifying beneficial information resulting in changing behaviours throughout the organisation.	Individual, group, organisation & external acquisition (Insinuating interorganisational learning)	Cognition impacts behaviour within the organisation
(March, 1991)	Tension in strategic renewal	OL occurs when the knowledge gained is utilised to benefit individuals and the organisation.	Individual & organisation, but arguments in this article focus more on the direction of learning.	Bi-directional relationship between cognition and behavioural change
(Bain, 1998)	Growth	Involves the growth and expansion of the "Organisational container".	Organisation	Cognition impacts behaviour within the organisation
(Hurley & Hult, 1998)	Amendments	Process of gathering targeted information from the market to improve practices and products.	Individual, group & external	Firm based view of OL that is guided and achieved through externalised knowledge

(March & Olsen, 1998)	Experience	Process of past evaluation to influence and predict a future outcome based on changed action.	Individual, group & organisation	Cognition leads to behavioural change
(Argyris, 1999)	Single and double loop	Achieved through evaluating past actions and correcting errors.	Individual	Cognition leads to behavioural change
(Crossan et al., 1999)	Tacit/explicit knowledge	Transforming tacit knowledge to explicit knowledge through balancing strategic renewal across multiple levels.	Individual, group & organisation	Bi-directional relationship between cognition and behavioural change
(Bapuji & Crossan, 2004)	Experience	It involves evaluating past actions, measuring their effectiveness and deciding future actions.	Individual, group, organisation, interorganisational & network	Bi-directional relationship between cognition and behavioural change
(Dutta & Crossan, 2005)	Cognitive/ Situated	Enables organisational growth from the knowledge acquired at the individual level to create new opportunities for successful business ventures.	Individual, group & organisation	Bi-directional relationship between cognition and behavioural change
(Castaneda & Rios, 2007)	Acquisition and transformation of knowledge	Process-based on individual learning through creating and acquiring knowledge to influence the organisation	Individual, group & organisation	Focuses on knowledge as the primary driver of behavioural change and OL
(Schilling & Kluge, 2009)	Barriers to OL	The self-reinforcing collective process of individual and group learning improves the organisation.	Individual, group & organisation	Relationship between cognition and behavioural change is implied, but not explicitly stated.
(Argote & Miron-Spektor, 2011)	Literature Review	A change in an organisation's knowledge occurs as a function of experience.	Individual, group, organisation & interorganisational	Cognition impacts behavioural change, mediated through increased knowledge at the organisational level
(Easterby-Smith & Lyles, 2012)	Extended review of theoretical development of OL	No definition is provided; however, the book recognises OL as a theoretical construct that follows a process dimension with knowledge management as its content.	Individual, group, organisation, interorganisational & network	N/A as their book combines and provides information on many conflicting OL perspectives and theoretical advancements

(Argote et al., 2020)	Creating Knowledge	Experience gained through functions performed by individuals is converted into transferred knowledge which affects the organisation's overall performance in the future.	Individual, group & organisation	Cognition impacts behavioural change, mediated through increased knowledge at all levels within the organisation.
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From Table 1, early definitions emphasise individual reflections relating to previous actions and experiences as the core process of OL, this suggests that any theory targeting OL must incorporate both a cognitive function to realise areas where change may be implemented as well as a behavioural dimension to ensure that the change itself is implemented and maintained (Easterby-Smith & Lyles, 2012). Whilst reflections and the overall idea of feedback remain strong, OL is extended to include multiple levels within the organisation and recognises external search as an avenue for learning from other organisations (Argote & Miron-Spektor, 2011; Huber, 1991).

Behaviours relating to learning processes were linked to the routines contained within organisational systems (Cyert & March, 1963; Levitt & March, 1988). Routines are suggested to observe an ongoing process of change, and when they become encoded into the organisation, they become independent of human agents (Levitt & March, 1998). Routines stem from past interpretations of outcomes and are continuously amended to adapt through feedback, incrementally improving their effectiveness over time (Argote & Miron-Spektor, 2011).

Building on the concepts put forward by Cyert & March, numerous approaches have since continued to develop OL to further expand our understanding of the OL concept. Some of the major advancements in the theoretical development of OL included the contributions of Argyris & Schon's (1978) single and double-loop learning model which conceptualised the learning approach through the detection and correction of perceived errors. This approach focuses on the role of reflection and organisational inquiry that challenged established underlying norms that are embedded in an organisations culture, routines and structure, ultimately resulting in learning within an organisation (Argyris & Schon, 1978; Argyris, 1999).

In the coming decade, the article by Fiol & Lyles (1985) sought to further our understanding of OL theory by clarifying its parameters and further differentiating its considerations away from organisational adaptation and change. They suggested that an organisation's culture,

overall strategy, structure and both their internal and external environment may act as contextual factors, affecting the effectiveness of OL within the organisation that may be conceptualised to comprise behavioural and cognitive developments depending on their self-created levels of learning (Easterby-Smith et al., 2008). Fiol & Lyles (1985) classify lower-level learning through repetition and routines and higher-level learning through the ability of an organisation to generate new insights leading to 'Out-of-the-box' solutions for the organisation itself.

Following this, numerous approaches (Easterby-Smith et al., 2008) to the concept of OL (Huber, 1991), exploratory and explicit knowledge (March, 1991), the learning organisation (Senge, 1994) and knowledge (Nonaka & Takeuchi, 1995) were conceived as attempts to create and contribute towards a unified theory of OL by providing combinations of previously conceived ideas and concepts that incrementally contribute to OL theory development. These mainly came through frameworks, such as the knowledge spiral model, SECI, conceived by Nonaka & Takeuchi (1995) that attempted to conceptualise the processes in which knowledge is transformed from its basic, tacit form into an explicit form that may be widely disseminated for learning purposes. Hence, the transformation of organisations into learning organisations through a systems approach guided by mastery, mental models, team learning and systems thinking by Senge (1994) and the bridging together of multiple concepts to understand and recognise the numerous task-oriented directions of the theory by Huber (1991).

Lessons drawn through personal experience inform the feedback process (Argyris & Schon, 1978; Argote & Miron-Spektor, 2011; Bapuji & Crossan, 2004; March & Olsen, 1998; Levitt & March, 1988). By reflecting on experiences, various aspects of the organisation, such as its routines and structure, may be amended (Argote et al., 2000; Holmqvist, 2004; Ingram & Simons, 1991). As they are embedded in the organisations' systems (Bain, 1998), they become independent of any human actors operating within the organisation (Levitt & March, 1988) and remain unimpacted irrespective of labour-based movements.

Experience is recognised as a key source of learning (Castaneda & Rios, 2007; Crossan et al., 1999), and the ability of individuals to transform these experiences into meaningful lessons to gain a competitive advantage. Although some articles suggest OL is used to aid individuals and groups within the organisation, and others suggest individual and group learning aids the organisation (Schilling & Kluge, 2009), the consensus follows a bidirectional relationship between the levels previously identified by March (1991).

Learning from individuals may benefit their groups and organisations and vice versa. Experience in itself is then considered of little value. The definitions in table 1 suggests that experiences must be absorbed, transformed and transferred to indicate that learning processes are unfolding (Dutta & Crossan, 2005; Easterby-Smith & Lyles, 2012; Schilling & Kulge, 2009). They must interpret experiences into meaningful learning outcomes that their organisations can utilise and further share between them (Mozzato & Bitencourt, 2014; Levitt & March, 1998). Interpretation of experiences depends on the events themselves (Dutta & Crossan, 2005), in addition to the overall competency of the human agent to decipher these experiences and extract something meaningful (Sandler-Smith, 2008). Similarly, organisational capabilities to facilitate these processes are also considered (Kogut & Zander, 1992; Szulanski, 1996; Zander & Kogut, 1995; Zietsma et al., 2002).

The organisational capacity to absorb knowledge and its transfer into experience is an essential aspect of the overall OL process (Cohen & Levinthal, 1990). However, this is not explicitly mentioned in the definitions put forward. Concepts of knowledge absorption have been linked to formal qualifications (Muscio, 2007), experience (Vinding, 2006) and expertise at the individual level (Zahra & George, 2002) and with larger research & development investments at the organisational level (Cohen & Levinthal, 1990). Literature around these concepts has since grown into a separate strand due to the variations in how these capacities may be displayed and influenced (Flatten et al., 2011; Gray, 2006; Lane & Lubatkin, 1998).

Although learning is linked with improvements (Fiol & Lyles, 1985), this does not imply that learning must lead to immediate performance gains that translate into improved efficiency (Argote et al., 2003), increased production or decreased costs by the organisation (Knight, 2002; Knight & Pye, 2005). Instead, OL may be linked with incremental but continuous improvements in the form of amended routines (Cyert & March, 1963; March & Olsen, 1998), changes in organisational structure (Argote et al., 2020) or learning what not to do (March & Olsen, 1976).

2.5.2 Learning between organisations ‘Interorganisational learning’ and through networks

Whilst the intraorganisational view of learning allowed for significant developments in the literature (Argote et al., 2020), leading to the creation of models (Crossan et al., 1999; Huber, 1991; Nonaka & Takeuchi, 1995) and methods for measuring and managing this

process (Botnis et al., 2002; Templeton et al., 2002; Tippins & Sohi, 2003). Argyris & Schon (1978) suggest that this perspective is restricted to learning within organisations and that a narrow view of the theory simplifies an inherently complex world. Although intraorganisational learning provides comprehensive insights, its key drawback and critique is its restricted unit of analysis that needs to be more reflective of how modern organisations learn (Holmqvist, 2003b). In this case, extending the unit of analysis to incorporate learning between organisations is considered the next step in developing the OL theory (Dyer & Nobeoka, 2000).

Interorganisational learning involves organisational cooperation processes (Mozzato & Bitencourt, 2014). This combines the prerequisites from intraorganisational learning processes and explores the unique behaviours from their application in a collaborative setting (Dyer & Singh, 1998; Lane & Lubatkin, 1998; Larsson et al., 1998; Powell et al., 1996). Learning between organisations and learning within network settings has been gaining prominence within OL theory due to a growing consensus that organisations are increasingly becoming more interdependent (Easterby-Smith et al., 2008; Easterby-Smith & Lyles, 2012; Wenger, 1998).

Modern-day organisations are highly specialised (Child, 1972), and therefore collaborations (Le Pennec & Raufflet, 2018), alliances (Capaldo, 2014; Gulati, 1999) and partnerships (Hamel, 1991) are a common occurrence (Larsson et al., 1998). By engaging in interorganisational collaborations, organisations aim to harness the benefits associated with knowledge transfer (Jensen & Szulanski, 2007) instead of understanding the learning process and its associated dynamics (Knight, 2002).

Interorganisational learning can be seen as processes in which collaborating organisations can learn from experience by producing and reproducing dominant routines and practices (Holmqvist, 2003a). These routines create behavioural characteristics shared by these organisations, leading to homogeneity or isomorphism (DiMaggio & Powell, 1983) as individuals come to behave the same. Although homogeneity is taken in a negative light in organisational studies, it is encouraged within the CE sector due to notions that replicability and the broader adoption of dominant designs lead to a significant reduction of costs associated with having to achieve various outcomes alone (Radtke, 2014).

Organisations engaging in network-related activities often perceive this as an avenue to remain competitive (Knight, 2002). Recognising that collectively sharing resources may be

more beneficial than individualised approaches (Gibb et al., 2017). Literature has used the terms interorganisational learning and network learning interchangeably (Holmqvist, 2003a), whilst others combine informal and formal networks (Mozzato & Bitencourt, 2014). This study suggests that a clear distinction should be made when applying each term, as while there may be similarities; they are fundamentally different. While interorganisational learning focuses on learning between organisations, network learning considers the network itself the entity (Dyer & Nobeoka, 2000). In this view, learning between organisations constitutes a part of network learning; however, the difference is in the entity, which is the learner. In network learning, knowledge would first reach the network, which an organisation generally facilitates coordination within the network setting (Gibb et al., 2017). Similarly, whilst formal and informal networks foster cooperation (Mozzato & Bitencourt, 2014), the additional benefits derived from their formalisation are recognised (Dyer & Nobeoka, 2000; Knight & Pye, 2005).

Dyer & Nobeoka (2000 p. 364) define network learning as *'Knowledge that is developed or resides within the network that is discovered and documented by a network level knowledge storage mechanism'*. Keywords such as knowledge and storage are highlighted and learning in this context is considered a mechanism by which knowledge is transferred and embedded into the network. Another definition put forward by Knight (2002 pp 428–429.) views network learning as *'Learning by a group of organisations as a group. If through their interaction, a group of firms changes the group behaviour or cognitive structure, then it is the group of organisations that have learned, not just the individual organisations within the group.'* Highlighting the importance of collective learning instead of individual or dyadic approaches (Larsson et al., 1998). Network learning is believed to be more than an amalgamation of learning at a different unit of analysis. It is a process that results in structural changes and collective practices at the network level (Gibb et al., 2017).

Networks have also been associated with limiting opportunism between organisations by converting single transactions into long-term cooperation and fostering trust (Dyer & Nobeoka, 2000; Powell et al., 1996; Teece, 1992). Networks have been conceived as knowledge-sharing vehicles where member firms use their network to transfer knowledge and avoid the many costs associated with acquiring, transforming and disseminating meaningful forms of knowledge into episodes of learning (Argote, 1999; Ingram & Baum, 1997; Reagans & Mc Evily, 2003). Capaldo (2014) argues that networks can provide firms

with knowledge resources that can enhance a firm's ability to compete, but the process of network governance needs to be carefully managed. Kogut (2000) states that if a network is to be effective at facilitating exchanges and sustaining learning episodes, it must create principles that support coordination among its members. This is supported by Dyer & Nobeoka (2000), who suggest governing principles formulate the first stage indicating that the network is moving from its commencement towards maturity. Influencing these dynamics, the prominent position of a dominant firm can set and manage the coordination mechanisms of network-level learning towards performance goals (Dyer & Hatch, 2006), potentially leading to unfair benefits towards a single or group of organisations rather than equal benefits split across all members (Dyer & Nobeoka, 2000).

Understanding the stages in network development provides an important lens for investigating its underlying mechanisms (Dyer & Nobeoka, 2000) that enable and support effective learning processes and disseminating this knowledge into the network memory (Templeton et al., 2002; Reagans & Mc Evily, 2003). In their study of a knowledge-sharing network in the automobile industry, Dyer & Nobeoka (2000) provide a simplified framework showing how a network develops overtime. They explain the processes and benchmarks for progression as well as the difficulties that these networks must overcome to reach a stage of maturity. For a network to mature, it must address three barriers essential to its development.

Governance is an important antecedent of the overall cohesion of activities and the management and facilitation of interorganisational relationships within the network (Dyer & Singh, 1998). A network must ensure its members agree to share all forms of knowledge. In a competitive setting, knowledge is a crucial factor for organisations gaining a competitive advantage (Senge, 1994); it is considered that the most important forms of knowledge are also the most valuable, and as such, an organisation may wish to conceal these lessons from the network (Dyer & Nobeoka, 2000). The coordinator must have conditions for participating members to ensure honest and collaborative practices regardless of the value of learning within its domains. Not all learning episodes are equal and do not necessarily transmit a tangible improved performance for the recipient organisations (Knight, 2002; Knight & Pye, 2005). An ethos of collaboration and freedom of dissemination of knowledge within network settings overtrumps the value of the specific form of knowledge within the learning process at any given time. Achieving robust processes and creating a learning culture that delivers long-term benefits to its members

(Lucas & Mayne, 2013; Senge, 2006). As organisations enter network-based settings with an overarching collaborative ethos in the CE sector, they are eager to share solutions and find replicable forms of knowledge (Nolden, 2013). This is therefore expected to be less of an issue in the CE case.

As the coordinating hub engages several organisations in collaborative efforts, it can redistribute resources and utilise the learning processes to disseminate the most valuable forms of knowledge by creating public goods in the form of physical assets, digital resources as well as tacit knowledge for its dispersion and spillovers (Bramoulle & Kranton, 2007; Wai Ko & Liu, 2015). Whilst some organisations enter as resource providers, others enter these settings as recipients to learn (Argote et al., 2000; Argote & Ingram, 2000; Nochta & Skelcher, 2020).

This poses the issue of free riding, as suggested by Dyer & Nobeoka (2000), a problem that the coordinator must address to avoid risking the credibility of its members. Although it is beneficial to CE organisations to engage in network collaborations as a substitute for knowledge gaps within their internal capabilities, knowledge acquired for 'free' is encouraged.

The network must ensure that once its members gain experience regarding their activities and potential barriers faced by various scenarios, these experiences will be disseminated before their distribution throughout the network. As the CE sector is experiencing a fundamental shift, acquired experiences must be treated as novel forms of learning (Braunholtz-Speight et al., 2020).

It is then important for the coordinating hub organisation to ensure that knowledge flow from the network to its member organisations remains efficient whilst also ensuring that the members themselves also contribute knowledge to the network setting to avoid any knowledge-based competitive advantages that may arise (Dyer & Nobeoka, 2000). In this domain, it is important for the network and its members to have a clear idea of the intentions (Gulati, 1999) of other members and a recognition that network participation must be conducted in a cooperative spirit to ensure that all members benefit equally.

The hub is responsible for ensuring efficiency by providing and creating learning capabilities (Gulati, 1999) within the network (Dyer & Nobeoka, 2000). As these interorganisational collaborations can provide competitive advantages at an exponential rate compared to individualised approaches (Dyer & Singh, 1998), the complexities

associated with coordinative efforts are also exemplified (Knight, 2002). A hub organisation must be aware of the individual factors influencing and motivating (Le Pennec & Raufflet, 2018) its members to determine the requirements at a specific time to maximise learning efficiency. As its member organisations are expected to grow individually, in addition to the attraction of the network to new members, requirements on the hub organisation for providing these capabilities is an ongoing and dynamic process (Dyer & Nobeoka, 2000).

When a network is in its initial stage, weak ties are displayed between its members, whilst strong ties are shown with the hub. The primary focus involves building three foundation blocks for achieving the long-term vision of the network. These include the attraction of new members, building a network identity and the creation of sub-networks.

(1) Attraction of new members (Dyer & Nobeoka, 2000), which in the case of CE comprises mainly CE organisations, private entities such as consultancy, distribution, development-based organisations and public sector departments such as local authorities (CEE, 2021b; Hodson et al., 2013; Parag et al., 2013).

(2) Building a network identity (Dyer & Nobeoka, 2000) is argued to be an essential element to ensure progression into maturity as an identity helps to exemplify the pre-existing learning-driven culture and collaborative ethos. Identity for identification by those externally searching for knowledge is also crucial when acting as a sector representative to non-CE stakeholders.

(3) Creation of sub-networks helps members navigate and organise different forms of knowledge into sub-categories (Dyer & Nobeoka, 2000), further easing access and contributing to the overall efficiency of exchanges within this setting (Kogut, 2000).

Once the network has realised these targets, it is assumed to be mature (Dyer & Nobeoka, 2000). In maturity, independent ties are formed between the members, and activities exist independent of the network coordinator (Dyer & Nobeoka, 2000). At this stage, elements of structure (Kogut, 2000; Reagans & Mc Evily, 2003) and its members' centrality (Tsai, 2001) become relevant to place them in a strategic position, maximising access to information from other members. During maturity, interorganisational learning is expected to increase as opposed to when the network is in its initial stages (Gibb et al., 2017).

Relationships may develop into long-term partnerships (Hamel, 1991; Hamilton et al., 2014), which may deliver more significant benefits to the organisations participating in these exchanges than those of the network. Network development may be an essential

facet of sectoral growth and its sustenance. It is a strategic entity that may be replaced when better-serving alternatives appear (Gulati, 1999).

2.5.3 Alternative perspectives and rationale for adopting the 4I learning framework:

Although there are several alternative theoretical perspectives that may be adopted as a theoretical lens to explore the OL phenomenon within and between CE organisations, the 4I learning framework was selected due to its perceived superiority as an investigative lens over other alternatives.

One of the well-known theories on OL is Argyris & Schon's (1978) theory of action. They posit that learning loops and feedback processes which emphasise individual level learning can be regarded as the basis of how OL occurs. This perspective has strong applicability in CE research due to the overdependence on individuals throughout the CE sector. There is strong evidence in OL literature that shows interactions between individuals could lead to positive learning-based organisational outcomes (Argyris, 1999; Botnis et al., 2002; Templeton et al., 2002).

Whilst Argyris & Schon's model is strong in its conceptualisation and theoretical contributions, an organisation would seldom satisfy the parameters put forward in the framework due to the reality that OL, in reality, often incorporates multiple learning processes simultaneously (Argote et al., 2000) as opposed to the binary processes that depict learning as either single loop or double loop. Additionally, several barriers and drivers to learning exist within organisational settings which are not recognised by the theory (Castaneda & Rios, 2007), such as those that focus on organisational culture and the external environment which plays a major role in shaping and affecting the organisations' propensity and effectiveness to learn.

It is also important to consider the organisational structures that are in place which either mitigate or enable learning-based interactions to occur. These will have further effects on the learning outcomes and will dictate how easy or otherwise it is to disseminate OL and acquired knowledge at a sectoral scale, such as those in place by the CE networks (CEE, 2020).

Another perspective worth considering, is the Communities of Practice [CoP] approach proposed by Lave & Wenger (1991). A CoP may be defined as a group of people with a common set of values, interests or concerns that come together in common pursuit of

their shared goals and targets (Wenger, 1998). In a revised approach however, Wenger & Snyder (2000) propose that these groups are '*Informally bound together by shared expertise*' (pp. 139). The principles of the CoP perspective are underpinned by its (1) domain that constitutes the identity of a CoP, the (2) community itself, consisting the individuals involved and the (3) practice, representing the specific body of knowledge and boundary objects that must come together in synchronization to allow for a CoP to fulfil its intended purpose (Wenger et al., 2002)

The CoP perspective, and its derivatives¹⁷ have certainly gained popularity in CE research (Bauwens et al., 2016; Berka & Creamer, 2018) in helping researchers to identify the meanings and diversity around the CE term (Walker & Devine-Wright, 2008), as well as to understand how informal relationships and tacit knowledge may influence and ultimately contribute to meaningful long term engagement between individuals operating within CE organisations as well as between CE organisations (Walker et al., 2022).

A CoP perspective offers multiple merits when applied to the CE context due to its ability to provide insights into how the multiple CoPs simultaneously interact within the CE sector (Wenger et al., 2002). This perspective demonstrates how CE organisations are able to individually foster OL within their individual organisations and also collectively contribute to network learning throughout the CE sector (Walker et al., 2022). Additionally, a CoP approach allows for an investigation to better understand the development stages in CE organisations and their networks that allow for learning processes to further develop (Wenger & Snyder, 2000), an aspect which numerous alternative approaches to OL are yet to consider (Dyer & Nobeoka, 2000). Some of these approaches include Argyris & Schon's (1978) theory of action, Nonaka & Takeuchi's (1995) knowledge spiral framework and March's (1991) strategic renewal model.

Although there are clear merits in considering a CoP for this study, the concept of CoPs suffers from numerous limitations that ultimately render it unsuitable due to the specific aims of this study. Firstly, there appears to be a greater focus from the CoP perspective on tacit knowledge as a by-product of informal learning episodes (Wenger et al., 2002). Whilst informal learning constitutes a large element of OL in the CE sector, emphasis on informal learning neglects another crucial element simultaneously occurring within the sector such as formalised training, technical knowledge and educational forms of learning (Seyfang et al., 2013). Secondly, the CoP perspective does not consider the volatile environments in

¹⁷ Communities of place and Communities of interest (Walker et al., 2022).

which CE organisations currently find themselves in. Certain contextual factors that may either encourage or impede OL processes as well as the CoP's development themselves are not considered.

Furthermore, CoP's emphasis on collective learning through the creation and maintenance of learning communities (Wenger & Snyder, 2000) neglects the focus on the individual as the main agent for learning-based interactions. This is in direct contradiction to Argyris & Schon (1978), Lave & Wenger (1991) focus on group and organisational level learning processes and outcomes. These respective approaches, with their emphasis on either individual or organisational learning are deemed insufficient for this study due to the important role of the individual in the CE context. Namely the contributions and influence of the individuals on all other levels of learning, both within as well as between CE organisations. This is further accentuated in CE networks due to the overdependence of the CE sector on its individuals (CEE, 2020) as these members often have multiple responsibilities and roles within their organisations that drive the bulk of interorganisational and network-level interactions. Therefore, any study attempting to investigate learning in the CE sector must consider simultaneously the individual and organisational levels of learning to be the basis in which OL occurs.

Therefore, taking into consideration the advantages and disadvantages of two potentially worthwhile alternative perspectives outlined above for this study, the 4I learning framework approach by Crossan et al. (1999) is argued to be a theoretically superior because it bridges together multiple concepts of learning, with clear influences from the aforementioned discussion to create a comprehensive framework to allow for a clearer understanding of how learning processes unfold throughout organisational settings. Examples of this include the incorporation of the direction of learning, proposed by March (1991) that specifies whether new knowledge is being explored or whether acquired knowledge is being exploited. This is presented as a more advantageous approach than several alternative theories, such as the CoP perspective, where these processes are depicted in a non-structured way. Secondly, the 4I learning framework also differentiates between the different types of knowledge, following the framework put forward by Nonaka & Takeuchi (1995) that specifies whether the knowledge and preceding learning process is tacit or explicit. Lastly, following Hubber's (1991) proposal, the 4I learning framework also recognises multiple levels of learning, where each level contains different conditions and prerequisites to allow for learning processes to unfold within them as well

as the recognition that inter-level interactions between these levels of learning (such as from the individual to the group level) are also important to achieving OL.

Whilst no perspective is objectively better or worse, the 4I learning framework presents a more detailed and nuanced perspective, in line with the aims and objectives of this study. This is further underpinned by the fact that the 4I learning framework incorporates additional considerations and adoption of multiple other theoretical strands of OL (Huber, 1991; March, 1991) resulting in a more structured and quantifiable approach that allows researchers to examine the differentiation between the multiple levels of learning, inter-level dynamics and considerations of organisational adaptations that were briefly presented in Chapter 1 (Section 1.3) and will be explained in more details in the following section (2.6).

2.6 Conceptualising OL through the 4I learning framework.

This section presents the 4I framework (Crossan et al., 1999) and its network-level extension (Mozzato & Bitencourt, 2014) (figure 8). As noted in Chapter 1 and section 2.5, there have been multiple attempts at classifying and theorising concepts put forward in OL and bridging them together in search of a unifying theory (Crossan et al., 2011; Easterby-Smith et al., 2008; Fiol & Lyles, 1985). Whilst there is yet to be a unified theory, the '4I' learning framework is arguably a step in the right direction due to its ability to bring together multiple established points of consensus and further linking these to other facets contained in OL literature (Jenkin, 2013).

The proposed framework envisions OL as a series of interrelated and self-reinforcing dynamic processes that unfold across organisational levels (Crossan et al., 1999). Within the initial framework, these processes and their corresponding levels are:

Processes:

- (1) Intuition
- (2) Interpretation
- (3) Integration
- (4) Institutionalisation

Levels:

- (1) Individual
- (2) Group
- (3) Organisation

The 4I framework is guided through four fundamental premises (Botnis et al., 2002; Crossan et al.,

1999); these premises are crucial yet often neglected. The first premise is informed by the works of March (1991), accepting that the acquisition of knowledge and the content by which learning is achieved can be obtained by either the exploration of new knowledge (Feed-forward) or the exploitation of previously acquired knowledge (Feedback) (March, 1991). The first premise suggests that an organisation must balance the tension of these competing facets, dubbed strategic renewal [Premise 1] (Crossan et al., 1999).

Organisations must contend with limited resource bases between the two during the natural process of finding this balance. This may be more so the case within the CE sector due to the larger resource limitations based on learning. CE organisations must make consistent decisions on adopting existing, proven models, routines and practices or creating novel and innovative approaches.

Sectoral initiatives targeting different forms of strategic renewal for organisations are also seen throughout the sector (DECC, 2014b: 2015). Initiatives targeting both sides of strategic renewal to advance the sector can also be seen in the form of The Next Generation Innovation Fund, which aims to explore new business models, methods of social impact and technological innovation to provide potential CE organisations with exploitative, replicable solutions to their approaches (CSE, 2018).

A current example of this phenomenon unfolding in the CE sector includes decisions about the adoption of current, established business models for new organisations or creating new business models (Saintier, 2019) to reflect better a changing landscape and unique community requirements which may influence these models of structure, management and ownership. Whilst some organisations have opted for exploitation (E4A, 2021), others have found innovative solutions (Riding Sunbeams, 2021).

The second theoretical premise recognises that learning processes unfold across and between multiple levels. In their initial proposal of the 4I framework, Crossan et al. (1999) identified the individual, group and organisational levels. This has since been extended in recognition that these processes may also unfold between organisations and within networks [Premise 2] (Mozzato & Bitencourt, 2014).

Thirdly, the 4I learning framework recognises that the processes influence each other [Premise 3]. Chapter 1 specified that they are both interactive and self-reinforcing (Botnis et al., 2002), suggesting an emphasis on fine-tuning the processes to encourage OL.

The final premise suggests that individuals' cognitive functions, including mental processes and views, may influence their actions and decision-making. In turn, these actions further affect future mental processes and shape personal views [Premise 4] (Crossan et al., 1999; Jenkin, 2013).

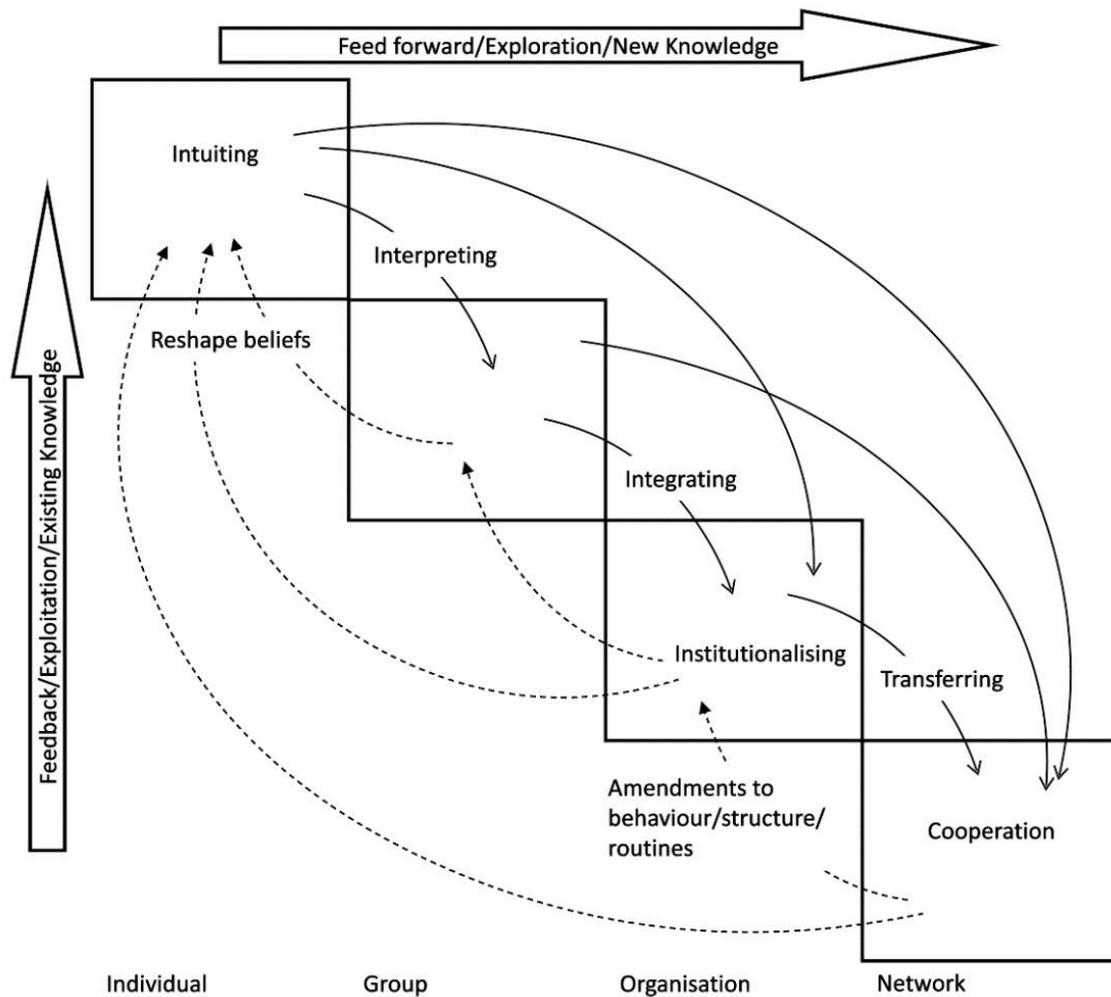


Figure 8: 4I learning framework with additional network level and cooperation process. Adopted and amended by the researcher from Crossan et al. (1999) and Mozzato & Bitencourt (2014) for network level and cooperation process.

Although the 4I framework explicitly differentiates between organisational levels, it is recognised that it has stemmed from and is mainly applied to 'Mechanistic' organisations as opposed to those with more 'Organic' structures (Burns & Stalker, 1961; Holmqvist, 2003a). The decentralised and often limited capacities of CE organisations (CEE, 2020) render it inherently difficult to establish precise organisational levels. Whilst a rough structure may exist, it is difficult to generalise due to organisational discrepancies. CEE finds that most CE respondents to their State of the Sector report having under ten

members involved in day-to-day operations within their organisation. Furthermore, these are primarily voluntary roles with an average of under 1 FTE per organisation (CEE,2020).

Therefore, roles may be expected to cross over within CE organisations with other crossovers of personnel between multiple CE approaches. Individuals within an organisation may be affiliated with multiple internal groups focusing on different activities. Multiple groups often comprise the same individuals, constituting the entire organisation. Due to their limited size as a sector, frequently, these same individuals have responsibilities over numerous organisations, suggesting loose organisational boundaries and a high degree of interorganisational crossovers.

Four levels of learning are linked through five processes, which unfold at certain levels as described by the '4I' learning framework. Initially, four learning processes were recognised (Crossan et al., 1999); however, the incorporation of an additional level of learning (Network) constitutes an additional learning process (Cooperation) to be included (Mozzato & Bitencourt, 2014). Within these processes, it is recognised that overlaps may occur. Each process is unique in its applicability and requirements to unfold both on the organisation and the individuals involved (Crossan et al., 1999).

The individual level constitutes the lowest unit of analysis within the framework. They form the basis from which learning is incepted and to which it is ultimately delivered (Castaneda & Rios, 2007). Individuals refer to key members involved in the day-to-day activities of the CE organisation. These individuals may be volunteers or FTE. Furthermore, they may also be acting members of the board of directors, founding members or shareholders.

Individuals have a vital role in fostering the readiness of others to engage in learning-related activities in addition to the promotion of interorganisational learning through experiential development. They carry this role onto the higher levels of learning as single actors representing the processes themselves (Argote & Miron-Spektor, 2011; Dutta & Crossan, 2005; Gray, 2006; Huggins & Thompson, 2015).

Learning at the individual level is observed through intuition as its first process. Intuitive processes exclusively unfold at the individual level (Behling & Eckel, 1991); it is inherently a cognitive function (Sandler-Smith, 2008; Sandler-Smith & Sparrow, 2009) that is internalised and occurs within the mind (Jenkin, 2013). Intuition is influenced by three main inputs, individual capabilities, motivation and focus (Sandler-Smith & Sparrow, 2009). Collectively, these inputs affect the ability of an individual to develop new insights given a

set of circumstances (Botnis et al., 2002). The experience gained allows an individual to recognise common patterns and respond accordingly.

The capabilities that allow for intuitive processes to unfold and for individuals to generate new and meaningful insights present no value unless they are transformed from an inherently tacit form of knowledge into an explicit format, as Nonaka & Takeuchi (1995) explained.

Whilst the 4I framework does not specify an otherwise obvious point, intuitive behaviours cannot be furthered into meaningful and tangible lessons for the organisation without acting on behalf of the intuiting individual. OL literature has previously described this as an exploration process linked to generating new insights (March, 1991), which has been adopted into the 4I learning framework and dubbed feed-forward knowledge flows (Crossan et al., 1999). An extension of the 4I learning framework by Zietsma et al. (2002) proposes the addition of 'attending' as a process alongside intuition. Their proposal for its extension attempts to emphasise active learning (Castaneda & Rios, 2007) instead of accepting its passive state. The initially conceived intuitive process recognised that intuition might appear in more than one form (Crossan et al., 1999), suggesting that it either appeared as 'Expert intuition', informed through pattern recognition or 'Entrepreneurial intuition', informed through creative capacities (Dutta & Crossan, 2005). Through active search, an individual may increase their expertise to allow them to engage in expert-based learning.

Acting as an important link between the individual and group levels of learning, interpretation is classified as the second learning process. Interpretation constitutes the ability of an individual to deliver an initially conceived concept to a broader audience. In essence, interpretation is the process of transforming tacit intuition into an explicit form, moving it from an internalised individual gain to an externalised piece of information (Jenkin, 2013) for multiple individuals and various units within an organisation to reflect on through dialogue (Hilden & Tikkiamakki, 2013).

The group level constitutes the second learning level and the second analysis unit within an organisation. This level aggregates the multiple interpretive processes co-occurring with individuals within the organisation. Learning at the group level entails sharing multiple individual interpretations in a collaborative setting to develop shared visions between group members (Botnis et al., 2002).

The third process, integration, links the group and the organisational levels. Integration involves extending the aforementioned shared visions and developing a shared understanding between the individuals, concluding the foundations laid by the interpretive processes preceding it (Orlikowski, 2002). Those with a deeper history of collaboration are expected to understand each other's visions better and are even argued to develop a similar shared vision over the long term, thus increasing their collective propensity to learn (Orlikowski, 2002). The dynamics mainly concern dialogue and interaction between individuals within a common organisational setting (Castaneda & Rios, 2007). Integration is assumed to be achieved by acknowledging that the lessons are helpful and taking coordinated action (Crossan et al., 1999).

In their study of intermediaries in CE, Parag & Janda (2014) distinguish between middle actors and intermediaries, suggesting that the important contribution of middle actors mediating these interactions is often neglected. Although linked, the role of middle actors is perceived as that of established individuals and organisations with ample experience and expertise while simultaneously having established trust and reputation within the sector. A drawback of the study by Parag & Janda (2014) was its ambiguity in determining the success and failure factors of the conceptualised middle actors. It was described that these entities might either succeed in their influence or fail, in addition to their ability to promote positive actions and values as well as unintended consequences of their actions. A step forward in this domain is the consideration of the different forms of intermediation that may be delivered by actors at different levels of learning (Hodson et al., 2013; Kanda et al., 2020).

Occurring exclusively at the organisational level, the final internal process constitutes institutionalisation. Institutionalisation acts as an externalised piece of evidence showing that the preceding processes have occurred and with success, the lessons acquired are indeed helpful and warrant an amendment in current organisational routines (Dutta & Crossan, 2005; Crossan et al., 2011). Institutionalisation constitutes the embedment of knowledge into the organisations' memory through changes in organisational routines. In line with the framework, OL represents embedding individual and group learning into the organisation's memory. However, learning by individuals or groups alone does not entail OL has been achieved (Huber, 1991). The organisational level and its preceding institutionalisation process mark the final aspects proposed by Crossan et al. (1999) in their initial conceptualisation of the 4I framework.

Several extensions of the 4I framework have expanded the reach of the initially proposed theory. Iterations at its extension have sought to either deepen our understanding of the theory by integrating aspects such as power (Lawrence et al., 2005), opportunity (Dutta & Crossan, 2005) and reflection (Hilden & Tikkiamakki, 2013) into the theoretical constructs and their considerations relating to each of the proposed processes. Other articles suggest that the theory lacks sufficiency and propose several extensions involving processes, such as the inclusion of 'attending' and 'experimenting' (Zietsma et al., 2002) and 'information foraging' (Jenkin, 2013) as additional processes. Lastly, a branch of literature attempts to bring the 4I framework more in line with modern-day, interdependent organisations, recognising that interactions between organisations are common and their integration of additional levels of learning deemed essential. These focus on the interorganisational (Jones & Macpherson, 2006) and network levels (Mozzato & Bitencourt, 2014).

Interorganisational learning involves interactions between organisations. As organisations do not interact, these unfold through the individuals and groups representing their organisations. In their article that explores learning between SMEs in the context of the 4I framework, Jones & Macpherson (2006) propose a process of 'intertwining' as linking the organisational and interorganisational levels. They suggest that it is informed mainly through external agents, and its ultimate goal is to create internal mechanisms for learning. The points proposed, however, are too broad and do not capture the complexities associated with an extension into the external environment. Their proposal disregards the development of ongoing relationships between the actors and their respective organisations, transforming interactions into lasting relationships. In an alternative proposal, Mozzato & Bitencourt (2014) recognise these dynamics, suggesting that developed networks may be formal or informal, each with specific considerations. Similar to the initial proposal by Crossan et al. (1999), the model by Mozzato & Bitencourt (2014) combines all these external interactions as networks being the fourth level with cooperation as its process. Cooperation is coordinated action in pursuing shared goals or contributing to a relationship (Holmqvist, 2003a).

Episodes of cooperative learning unfold at the interorganisational and network levels, respectively. They can be seen as processes where collaborating organisations collectively learn through the production and embedment of routines in their structures (Holmqvist, 2003a). A primary example of interorganisational learning within the CE sector can be found in the numerous mentoring programmes which have greatly benefitted sectoral

development (Centre for Social Action [CSA], 2015; NextGeneration, 2021). These programmes can link experienced CE organisations alongside inexperienced and newly established counterparts to create an environment of collaboration and ongoing learning between the knowledge provider and its recipient.

In their study of intermediation in the UK based on interviews with 15 participants, Hargreaves et al. (2013) note that the most important lessons learned by CE organisations are those of community-based support involving upskilling activities. Finding that skill deficits represented 24% of the lessons learned by organisations collaborating through networks. Relating to this, the Community Energy Peer Mentoring Fund [CEPMF] report noted that as a result of £500,000 of distributed grant funding to 12 CE organisations, they were able to support 35 different CE organisations that directly led to approximately 1,500 volunteers to gain necessary skills and experience to create deeper social impact within their respective communities (CSA, 2015).

Networks constitute formalised structures, bringing organisations together to advance their common cause (Easterby-Smith et al., 2008). Achieving effective interorganisational learning is a crucial driver for organisations to enter and engage in broader network arrangements (Jensen & Szulanski, 2007). This is especially important for CE organisations as they must contend with limited resources that may restrict their network engagement. It is then suggested that networks must ensure that they incorporate certain elements that allow for effective information flows with the ability to influence their members (Lucas & Mayne, 2013).

Network affiliation is also believed to be influenced by the network's resources and its members for organisations deciding to join these settings (Gulati, 1999). Within the cooperative process and the network level, several conditions relating to network development set out by Dyer & Nobeoka (2000) specify that as a network develops, interorganisational exchanges occurring within these settings will grow as a result of the formulation of stronger ties between the members themselves as well as the increased ability of its coordinating organisation to sustain channels and mechanisms that ensure the useful and consistent delivery of information (Gibb et al., 2017; Reagans & Mc Evily, 2003).

Organisations must recognise that membership without engagement will only ensure minimal network benefits. Members must identify sources of information and key players

within these networks that may provide lessons and position themselves strategically to allow for the maximum flow of information (Tsai, 2001).

2.7 Identifying Networks in the CE Sector in England

A growing body of literature focuses on networks, and their functions, within the CE sector. Studies within this strand have explored the roles of intermediaries as network coordinators (Bird & Barnes, 2014; Hargreaves et al., 2013; Hodson et al., 2013; Kanda et al., 2020; Warbroek et al., 2019) as well as conceptualised different forms of intermediaries such as DNOs (Electricity Northwest, 2021; Regen, 2019; Simonds & Hall, 2013; Western Power Distribution [WPD], 2020), local authorities (Bourdin & Nadou, 2020; Fudge et al., 2016; Tingey & Webb, 2020) as well as to capture interactions between CE organisations within networks (Berkhout & Westerhoff, 2013; Brauholtz-Speight et al., 2021; Hamilton et al., 2014; Nochta & Skelcher, 2020; Parag et al., 2013).

Berkhout & Westerhoff (2013) attempted to identify key actors within a CE network through a SNA of 22 organisations in British Columbia. They note the existence of a cluster of main actors responsible for most of the identified interactions within the network. However, a drawback of the study was its inability to capture the directional flow of the exchanges between the organisation. Whilst their study provides meaningful insights into the interorganisational connections within a network setting and the type of relationships between the organisations, it is unclear who the leading players are and if the lessons shared across the network stem from all participating members or are restricted to a few.

Parag et al. (2013) shared these findings. They applied a similar analysis to a network of 57 organisations in Oxfordshire in England. They also find clusters of organisations dominating exchange, suggesting that specific inner distribution channels exist. Parag et al. (2013) find that, on average, organisations received more knowledge than they provided, suggesting the role of the intermediary and the network itself as an additional contributing body.

Although Parag et al. (2013) specify the directional flow in addition to differentiating between financial, knowledge and informal exchanges, they fail to capture the dynamics of the exchanges. Interestingly, whilst Berkhout & Westerhoff (2013) was unable to specify the direction of the exchanges, Parag et al. (2013) found significant discrepancies between those providing knowledge and those receiving it, suggesting that some organisations may be engaged passively in the networks to provide knowledge but were quick to disseminate what has been shared by others into their organisational systems.

Both studies found that newer organisations engaged in more exchanges than older ones, showing that new entrants are expected to enter these settings in their external search for knowledge through cooperation (Easterby-Smith & Lyles, 2012; Mozzato & Bitencourt, 2014). Once joining these settings, the organisations are expected to have a relatively low degree of centrality (Tsai, 2001), which would increase as they focus on establishing themselves and maximising the benefits of joining these networks (Capaldo, 2014; Stroink et al., 2022).

An increase in the knowledge base of the CE sector and wider deliverability of RE solutions saw a much larger focus on the role of networks and their ability to absorb and coordinate the dissemination of valuable lessons throughout their respective regions (Seyfang et al., 2013).

An online search identified five different network types within the CE sector in England; these are **(1)** National level, **(2)** Regional, **(3)** Government, **(4)** Knowledge sharing **(5)** Project development/management. A table of individual networks alongside relevant descriptive information relating to their objective, size and location of operations can be found in Appendix A. It is worth noting, however, that many more networks are believed to exist (Hargreaves et al., 2013), especially those operating on an informal basis, acting as informal intermediaries (Kanda et al., 2020).

Each network is involved with the continued development of CE as a sector in England (Hargreaves et al., 2013). Whilst other networks, such as CE Scotland [CESCOT] and CE Wales/ *Ynni Cymunedol Cymru* [CEW/YCC], were identified in Chapter 1, they have not been included in Appendix A due to the geographic scope of this study. It is recognised that the organisations above, along with others throughout mainland Europe, such as REScoop, also interact with the English CE sector, predominantly through interactions with English intermediaries, public bodies and exemplary CE organisations. Cross-border interaction may be considered an external learning-related influencer of organisations in England (Kerres et al., 2020; Perez-Nordtvedt et al., 2008). Similarly, some organisations within the sector, such as Scene Connect,¹⁸ are known to foster cross-border interorganisational

¹⁸ Founded in 2011, Scene Connect is a SE focusing on sectoral research, development of Information & Communications Technologies and consultations with other CE organisations. Founded in Edinburgh, Scotland, its growth has seen them expand its operations to include Liverpool and London (Scene Connect, 2021).

relationships with other CE approaches to share best practices and explore potential opportunities together (Kerres et al., 2020; Stroink et al., 2022).

Although the overall goal of all the networks and their respective intermediary organisations is to broadly further the sector, intermediary organisations in Appendix A are unique in their methods of establishment, purpose and specialised niches in which they operate. The variability may be criticised as indicative of disorganisation, reflecting competing agencies and uncoordinated third-party stakeholders. It is more indicative of the ability of parties with diverging interests to self-organise multiple channels for delivery. For instance, it is evident that networks with storage channels of knowledge, such as CEE, have a different role than financial networks, such as Pure Leapfrog [PLF], where one is knowledge-driven, the latter is financially driven.

Specific networks were directly involved in the CE sector as its main area of expertise, whilst others focused on broader causes of which the CE approach fit into this classification. For example, Cooperatives UK is driven by wider third-sector activities by organisations that fit into their classification of cooperatives, usually involving a legally adopted organisational structure. As an organisation encompassing one of the largest networks across the UK, Cooperatives UK (Cooperatives UK, 2021) is concerned with the overall contributions of cooperatives within their communities. A significant facet of the CE sector in the UK is affiliated with the cooperative's more comprehensive network as part of a small energy strand with several specialised resources available to them, in addition to different funding opportunities wherever available. Importantly, Cooperatives UK also administers the Community Shares Fund, an important investment vehicle sustaining share offers within the CE sector (Nolden et al., 2020).

These networks have developed over three main phases associated with different timescales and different priorities during those times. Firstly, a series of networks had evolved before the turn of the century. These networks aim to deliver broader sectoral and societal change, such as Cooperatives UK, which can trace its roots to the wider cooperative movement in the Northwest of England and acts as a unified platform for the independent cooperative organisation throughout the UK (Cooperatives UK, 2021). With over 100 years of growth and experience, it has extended its reach to all cooperative-based movements and sectors within the UK. Other networks which engage in broader activities include the CSE, PLF and Regen, which share similar goals in providing resources for the development and innovation of the broader energy sector.

Networks exist at various stages of their life throughout the different regions in England, delivering different targets to their respective regions (Hargreaves et al., 2013). Common themes include creating a space for interaction between organisations within their regions (Bird & Barnes, 2014) and acting as a unified representative body on behalf of its member organisations when interacting with local authorities (Fudge et al., 2016; Tingey & Webb, 2020; Webb et al., 2016), DNOs (Becker et al., 2017; Simonds & Hall, 2013) and other non-CE organisations and finally acting as a hub of information (Creamer et al., 2018; Hargreaves et al., 2013; Kanda et al., 2020), coordinating knowledge sharing activities (Hargreaves et al., 2013) by providing both explicit knowledge which is digitised within their online systems, most of which is freely available to its members as well as other interested parties as well as the creation and coordination of several different effects focusing on providing information, sharing lessons learned and formalised training seminars for their member organisations (Berkhout & Westerhoff, 2013).

Local authorities are increasing their responsibilities as key actors due to commitments around zero carbon targets and climate emergencies within their constituencies (Creamer et al., 2018). Local-level policies incorporate energy awareness and measures to reduce carbon footprints (Bourdin & Nadou, 2020). Local authorities may fill the role of intermediaries themselves due to their broader development goals (Bourdin & Nadou, 2020; Fudge et al., 2016) as well as statutory powers over land use and planning permissions (Tingey & Webb, 2020). Their potential access to public sites (Armstrong, 2015) creates incentives and partnership-based models for CE organisations with expertise (Roby & Dibb, 2019). In a study of over 350 local authorities, Tingey & Webb (2020) note that despite an appetite, most councils have just begun engaging in energy-related activities. 18% note they are yet to participate in or undertake any energy-related activity.

Interestingly, in a similar study, Webb et al. (2016) suggest that although multiple local authorities remain relatively unequipped to take a proactive approach to CE development, they pointed to multiple examples involving some of the most successful CE-led initiatives, such as the Low Carbon Hub, directly referencing their local governments as being instrumental players through general forms of support including access to resources and ongoing dialogue and joint involvement in their environmentally driven initiatives (Creamer et al., 2018).

The national strategy from the government toward CE is regionalised through the LEP energy hubs (Tingey & Webb, 2020). Each of the five LEP energy hubs acts in a self-

determined role allowing for regional autonomy concerning pathways that CE development will follow (GSENZEH, 2021). This is advantageous as it accounts for variability and allows for regional diversity. The LEP energy hubs are founded with a top-down approach, are centralised and can benefit from high degrees of expertise in addition to public sector connections and resources. They are also responsible for observing and continuously learning from their experiences with the CE sector and disseminating this information into transferable and replicable forms of knowledge to allow other potential groups to benefit from these lessons. The LEP energy hubs must ensure their strategies continue the sector's development and can deliver on broader national-level targets (Tingey & Webb, 2020). To their advantage, they can utilise their position to amalgamate local government knowledge, foster public-community partnerships, which have seen the creation of several opportunities (CEE, 2020) and the potential for lessons to be replicated in other domains through regional knowledge sharing between the LEP energy hubs. A comparable study by Kivimaa (2014) explored a similar phenomenon using two government-affiliated organisations in Finland. Whilst national differences in energy policy between Finland and England are important points to consider, Kivimaa notes that these organisations were essential players in policy decision-making due to their ability to remain impartial and interact across multiple tiers.

2.8 Summary and conclusion

Chapter 2 explored the main literature relating to this study. The chapter introduced organisational literature, showing how the literature has evolved to incorporate bottom-up and socially driven organisations, which CE organisations have been argued to encompass (Baumol, 1993).

This was followed by an exploration of CE in England, beginning with the policy landscape concerning CE development and later showing the regional distribution and main characteristics (Hillman et al., 2018; Hoffman & High-Pippert, 2010; Seyfang et al., 2013) of CE. Addressing the first objective, this section was concluded through the creation of a classification profile in an attempt to provide a systematic and robust method for comparing, distinguishing, and identifying CE organisations to the previously put forward model by Walker & Devine-Wright (2008) and extended by Goedkoop & Devine-Wright (2016).

OL was later defined to constitute the “*Process of improving actions through better knowledge and understanding*” (Fiol & Lyles, 1985 p. 803), its relevant literature critically reviewed, discussing its developments, prerequisites and considerations of influence in the organisational (Easterby-Smith et al., 2008; Easterby-Smith & Lyles, 2012) and CE contexts. The 4I framework (Crossan et al., 1999) and its network-level extension (Mozzato & Bitencourt, 2014) were introduced and discussed. With literature around network development (Dyer & Nobeoka, 2000), network benefits (Capaldo, 2014) and interorganisational interactions within these settings being discussed (Berkhout & Westerhoff, 2013; Jones & Macpherson, 2006).

The chapter concludes by presenting relevant CE network literature and exploring networks operating within the CE sector in England (Bird & Barnes, 2014; CEE, 2020; Hargreaves et al., 2013; Parag et al., 2013). The CE sector has shown a discrepancy between regional CE development; whilst no single reason may be attributed to this, a multitude of factors was found to influence CE development, such as the socioeconomic status of its community members, its localised skill sets, availability and willingness of individuals to come together (primarily in a voluntary capacity) to establish and sustain the organisation and its operations and broader considerations of local authority and other non-CE entities for support, access to finance and funding opportunities and finally the presence of channels for assistance.

From the literature, it was explained that each CE organisation is comprised of a mixture of the points mentioned above. Differences between the individuals affiliated with each organisation and the specific circumstances, communities and external environments render CE organisations unique entities, which may also influence their ability to learn and allow for the OL processes identified by the 4I learning framework to unfold efficiently. These are further emphasised through differences in the network settings regarding their degree of maturity and emphasis on knowledge sharing.

In adopting the extended 4I learning framework, learning is recognised as a process-based phenomenon whose outcome is knowledge, confirming to the initial definition of OL put forward by Fiol & Lyles (1985). Each process is specified alongside its requirements and predefined level where it is expected to occur and is achieved through incremental improvements of organisational routines and actions through increased knowledge and understanding, predominantly through experience and meaningful exchanges.

Due to CE organisations not following traditional hierarchical structures and governance models, these processes are expected to unfold irregularly to its initial proposal that has not yet tested the applicability of the 4I framework on organisations lacking rigidity in their structure.

Regarding CE networks, secondary sources showed several networks (Appendix A) involved in the sector. Variations between these networks in terms of their role and deliverability of benefits suggest that they may be complementary. However, for the most part, their collective dependence on external sources of finance to sustain their activities provides cause for competition in competing for limited resources.

Chapter 3 – Research Design

3.1 Introduction

The following chapter will develop the research approach. The chapter begins by setting the overriding research paradigm to inform the design and adopted methods. The chapter will then present and justify the research design. A mixed methods approach comprising semi-structured interviews followed by a survey instrument is proposed as the primary data collection strategy as it would be best suited for a study of this nature. The aims and objectives are presented, followed by the development of the methods which will aid the study in achieving its intended aims and objectives. An interview script and a survey instrument are developed, and subsequent analysis methods are discussed. These methods involve a thematic analysis through NVIVO of the interview data followed by a principal component analysis [PCA] through SPSS of the developed scales in the survey and SNA through Gephi to map and examine the exchanges between the organisations. To conclude, the study proposes approaching key senior members from the CE sector to reinforce the main findings to add further validity and give more context to the results.

3.2 Research design

OL studies have previously adopted a positivist stance involving heavy reliance on numerical data, which treats learning as a function of different quantifiable inputs such as production and costs, suggesting that improvements in organisational routines have a causal relationship with learning (Dutton & Thomas, 1984; Easterby-Smith & Lyles, 2012; Lapre & Nembhard, 2010). More recently, studies investigating behavioural aspects of learning through human interaction have adopted an interpretivist view (Prange, 1999) due to their recognition of how multiple learning-related processes are socially constructed in their nature (Crossan et al., 1999; Cyert & March, 1963; Levitt & March, 1988). Any attempt to investigate a phenomenon where human interaction is central, such as learning, must consider its subjective, socially constructed and distributed nature (Levitt & March, 1988). Holmqvist (2003) suggests that these underlying differences indicate that multiple diverging strands have informed OL.

Whilst each of these perspectives and corresponding methods possess certain advantages over each other, their power is dictated by the nature of the study (Queiros et al., 2017).

Alternatively, a pragmatic paradigm can be adopted that focuses on the problem. A pragmatic view is concerned with a problem-driven approach through action (Cherryholmes, 1992; Thayer & Rosenthal, 2017), accepting that an objective world exists and is further complemented by one that is socially constructed (Kaushik & Walsh, 2019).

The adopted paradigm must satisfy two conditions in the context of this study. Firstly, it must be able to capture the interplay between learning processes and socially constructed interactions between human agents and the role of their unique organisations (Raven et al., 2008) in these processes to allow for a meaningful interpretation. Secondly, these must be supported by objective and replicable findings through established measurement tools (Botnis et al., 2002; Chiva et al., 2007; Templeton et al., 2002; Tippins & Sohi, 2003).

To investigate learning within the CE sector, one must consider the main stakeholders' perceptions, experiences and meanings to capture objective measures relating to the intensity of exchanges and their nature within network settings. Similarly, to provide insight into the interorganisational interactions, the networks' characteristics must be understood (Lucas & Mayne, 2013).

Considering the points mentioned above relating how the perceptions of learning in addition to assumptions underpinning the adopted '4I' framework and previous CE studies discussed in Chapter 2. A pragmatic approach is adopted as it is deemed the most appropriate concerning the specific objectives of this study. This recognises that although multiple aspects of learning within the CE sector are socially constructed, an independent and objective reality continues to influence the sector's development.

3.3 Aims and objectives of the study – A recap.

This study is primarily interested in furthering our understanding of how CE organisations in England learn collaboratively. Three principal pillars are identified as the primary influencers of learning: Organisational characteristics, internal learning capacity and network dynamics. From this, two aims were derived. These are:

1. To understand how learning processes across multiple levels unfold within and between CE organisations.
2. To investigate how CE networks contribute to these learning processes.

Four objectives are listed as follows:

- To review CE literature to identify the main characteristics of CE organisations and how variations in the displayed characteristics between the individual organisations in England may impact their learning.
- To operationalise a measure of OL by adapting and refining quantitative scales for measuring OL within and between CE organisations in England.
- To develop further conceptual constructs of OL in the CE sector.
- To capture network-level exchanges by mapping financial and knowledge exchanges of CE organisations within a network setting in England.

Due to the unorthodox nature of a volunteer-led and socially driven approach to energy management (Hillman et al., 2018), the CE sector offers an interesting avenue for exploration. Whilst gaining prominence, this research area remains relatively infant (Braunholtz-Speight et al., 2021). The majority of the studies within this domain are of an inductive and exploratory nature. In contrast, several iterations of adopting the '4I' learning framework (Botnis et al., 2002; Tippins & Sohi, 2003) and wider adoptions of other theoretical learning-based lenses (Chiva et al., 2007; Templeton et al., 2002) exist. In this domain, the studies are deductive as they do not seek to further OL theory. Instead, they attempt to operationalise its concepts and examine their application to different organisation types operating in different sectors. This study adopts previously established concepts concerning the characterisation of CE organisations (Bauwens et al., 2022; Goedkoop & Devine-Wright, 2016; Seyfang et al., 2013; Walker & Devine-Wright, 2008) as well as concepts introduced in the '4I' learning framework (Botnis et al., 2002; Crossan et al., 1999; Mozzato & Bitencourt, 2014), it then follows a deductive approach. Whilst this study is deductive in nature, due to its adoption of previously established methods, scales and tools for data collection, processing and analysis, its combination onto the CE sector may still yield unexpected results and generate new insights.

An emerging concept proposed by this study is to explore learning processes, both within the organisation and between them, termed intraorganisational and interorganisational learning, respectively (Holmqvist, 2003). Furthermore, the integration of the network level through a learning lens emphasises the important role that these networks play in CE development, which has long been recognised (Berkhout & Westerhoff, 2013; Geels & Deuten, 2006; Hargreaves et al., 2013; Nochta & Skelcher, 2020; Parag & Janda, 2014; Parag et al., 2013; Seyfang et al., 2014). As previously explained, the abovementioned

articles are mostly inductive, adopting different theoretical perspectives to explore the sector's development. To the best of the knowledge of the author, no study explicitly attempts to examine the specific interplay between learning processes and network dynamics, integrating concepts such as centrality (Tsai, 2001), maturity (Dyer & Nobeoka, 2000) and learning (Argote, 1999; Argyris, 1999; Easterby-Smith et al., 2008) to the CE sector. This is deemed an essential avenue for research due to the current shifting landscape impeding CE development in England. Reliance and interdependencies between these initiatives have grown in response to a tightening financial landscape, creating an environment where cooperation is vital for adaptation (Fischer & Jasny, 2017) and continued development.

3.4 Empirical considerations from previous studies

Previous studies exploring CE networks have opted for interpretive methodologies with interviews as their primary method for data collection (Bird & Barnes, 2014; Hamilton et al., 2014; Ruggiero et al., 2018; Parag & Janda, 2014). Other adopted methods include case studies (Berkhout & Westerhoff, 2013), survey data (Radtke, 2014; Seyfang et al., 2013) and network mapping (Parag et al., 2013). Although these studies incorporate elements of objectivity, they are mainly subjective, resulting in ambiguous and contradicting conclusions.

Whilst studies in the broader field of OL also adopt multiple methods informed by different worldviews (Easterby-Smith & Lyles, 2012), indicating that knowledge may be examined through both qualitative and quantitative approaches through both an interpretive or objective worldview (Bryman, 2016; Creswell, 2003; Morgan, 2007). Articles seeking to operationalise the '4I' framework to examine learning processes (Botnis et al., 2002; Tippins & Sohi, 2003) rely on a combination of interviews in addition to a quantitative method such as a survey, which indicates a favourability toward a pragmatic and mixed methods approach. Crossan et al. (1999) and Huber (1991) adopt conceptual constructs and recognise learning as a dynamic and multi-levelled process. Item measures from the developed surveys are adopted to create an instrument suited to the CE case and the network level.

To inform the research design, chapter 2 identified key characteristics associated with CE organisations, an overview of the policy-based landscape and the changes faced by the sector, key learning processes within and between organisations, network dynamics

influencing learning and the role of the intermediary/ hub organisation in facilitating these processes. The review identified seven key characteristics to shape these organisations through a CE classification profile. Regarding learning, specific prerequisites such as formal qualifications and experiences might influence these processes (Cohen & Levinthal, 1990; Muscio, 2007; Vinding, 2006; Zahra & George, 2002). The conceptualisation of these elements through the '4I' learning framework and its adoption revealed interplay between four levels¹⁹ and five processes,²⁰ respectively.

Incorporating the network level into the analysis, as per the objectives of this study, must also recognise three elements associated with the networks themselves. These are (1) the role of the intermediary/hub organisation (Bird & Barnes, 2014; Bourdin & Nadou, 2020; Hargreaves et al., 2013; Kanda et al., 2020; Kivimaa, 2014; Nochta & Skelcher, 2020; Warbroek et al., 2019), (2) the maturity of the network (Dyer & Nobeoka, 2000; Knight & Pye, 2005) and (3) the centrality of the organisations relative to each other within the network (Tsai, 2001). Whilst these articles incorporate varying methods, relevant items such as centrality measures and threshold points for determining maturity are also adopted to inform the research design.

3.5 Proposed methods

In consideration of the research designs adopted by previous studies and what this study intends to achieve, a mixed methods approach is adopted as the preferred methodology. This recognises the inherent disadvantages of any one method and allows for a problem-driven approach (Creswell, 2003; Johnson & Onwuegbuzie, 2004). Collecting multiple forms of data also allows for their triangulation and presentation in a complementary manner (Bryman, 2016; Creswell & Clark, 2011).

The intended sequential mixed methods design comprises an initial review of relevant literature, sectoral reports and policy documents. A qualitative approach follows this in a semi-structured interview to explore perceptions from the sector, drawing key themes in the manifestation of the community label, learning-related processes and network dynamics.

¹⁹ Levels of learning: (1) Individual, (2) Group, (3) Organisation and (4) Network

²⁰ Processes of learning: (1) Intuition, (2) Interpretation, (3) Integration, (4) Institutionalisation and (5) Cooperation

Adopting this method ensures flexibility by emphasising the participants' personal accounts, experiences, reflections and anecdotal stories (Bryman, 2016; Creswell, 2003) whilst maintaining an overall direction of the topic, questions and subsequent probes (Berg, 2009).

Results from this approach are used in conjunction with previously developed survey instruments (Botnis et al., 2002; Dyer & Nobeoka, 2000; Parag et al., 2013; Tippins & Sohi, 2003; Tsai, 2001) to develop an appropriate instrument for the CE sector to be operationalised in this study. Since CE organisations are relatively non-conventional, the items must be reworded to ensure their applicability within the sector. A survey is selected as the appropriate approach due to its ability to reach many respondents (Wright, 2005), thus providing generalisable findings in addition to the increased validity of the item due to its replicable nature (Creswell & Creswell, 2018).

In addition to developing scales to capture learning processes, the survey instrument includes items for categorising the organisations through their characteristics and capturing exchanges and their nature within the sector. These three pieces of information are used to gain insight into learning within the CE sector and achieve the set-forth objectives of this study. As a final step, the results are presented and discussed with key members from CE networks to gain additional insights and provide them with further validity.

3.6 Semi-structured interviews

3.6.1 Development of interview schedule

As no previous study explicitly addresses learning in the CE sector, these questions must be adopted in a manner that enables the translation of practical experiences into relevant theoretical concepts. It is essential to approach these experiences at their source, through the participants, to capture a firsthand account of the lessons learned and suggestions relating to this domain. This is to understand the key driving factors and inhibitors that ultimately shape their organisational propensity to learn. It is important to recognise that although these interviews are conducted with individuals, the questions target the organisational level of analysis.

The developed script comprises a 10-question format divided into three sections focusing on individuals, organisations and networks. Furthermore, a series of prompts were

designed alongside the questions allowing for follow-ups and deeper details in the participants' responses (Berg, 2009; Creswell & Creswell, 2018; Patton, 2002). The developed script underwent three occasions of piloting over four weeks with PhD colleagues and a member of a CE group to test its relevance, the total length of the interview and the nature of the prompts to maximise its outcome (Bryman, 2016; Creswell & Clark, 2011).

The script begins (Q1) by asking the participants about their organisation. How it was founded, and its current operations. This question creates a relaxed environment due to the familiarity with the topic (Berg & Lune, 2009) as well as capturing valuable insights into how local contexts have shaped the organisation (Raven et al., 2010), their financial and organisational structures (Nolden et al., 2020) and the value placed on their defining characteristics (Bauwens et al., 2022; Goedkoop & Devine-Wright, 2016).

Following this, participants are asked (Q2) about the contributions of their colleagues to their respective organisations and how they contribute to day-to-day activities (Muscio, 2007; Vinding, 2006; Zahra & George, 2002). This attempts to gain an insight into how the experiences and expertise of their members influence their associated processes at appropriate organisational levels within the organisation (Crossan et al., 1999; Huber, 1991; Nonaka & Takeuchi, 1995). Probes for this question include expanding on previous work affiliations, motivations for CE involvement and inputs into organisational routines (Cyert & March, 1963).

Afterwards, participants are asked to describe the impacts of the Covid-19 pandemic on their organisation. Including question 3 relating to the pandemic seemed appropriate given the nature of adaptation with the perceived cooperation and learning-related activities it entails (Bacq & Lumpkin, 2021; Busch & Hansen, 2021; CSE, 2020). Probes here focus on nudging participants into discussing their experiences with community engagement, digital switching and how potential projects were impacted and adapted.

Regarding interorganisational considerations, question 4 asks participants to describe their relationships with other CE organisations. This is motivated by the collaborative and alliance-based view that shapes these cooperative settings, acting as a driver of network development (Capaldo, 2014; Dyer & Nobeoka, 2000; Gulati, 1999; Larsson et al., 1998). Probes here focus on geographic ties at the local and regional levels and purpose-based ties based on activity, resource sharing, knowledge and technology.

To gain an individualised account, question 5 asks participants to describe a learning-based example where they provided or received knowledge. This question aims to gain specific context into a learning episode instead of participants simply stating their organisations learned all the time. The probes attempt to identify how the knowledge was deemed relevant, its process and the exchange frequency (Argote, 1999; Templeton et al., 2002).

Moving to the networks, question 6 asks participants whether their organisations are members of any wider CE network(s), as well as their general perceptions relating to the respective network(s) and their contribution(s) to the organisation.

Question 7 asks how the organisations have contributed to the wider network. Accounting that not all organisations will be knowledge providers or receivers, the probes are amended accordingly depending on which network the participants refer to and any wider contributions their organisations may have shared, even if they are minimal.

Question 8 explicitly targets the benefits of the network to the organisations probing the participants into discussions around the development of new initiatives through network-based partnerships, the financial rewards to their shareholders and the overall attractiveness of the organisation to the wider public.

Derived from concepts put forward by Dyer & Nobeoka (2000). Question 9 asks participants to describe the role of the coordinator. However, the probes target all the theoretically derived aspects, such as the established norms, sub-networks and capabilities of the network, all of which play a role in ascertaining the actual function of the coordinators in addition to the degree of maturity of the networks.

The last question (Q10) asks participants their opinion on what they perceive to be the most significant barriers impeding this process. This question is self-developed as it seemed a logical way to gain an insight into the sector-specific barriers perceived by its stakeholders. A question of this nature would allow the participants to expand on these perceptions and to provide insights into why there was a knowledge deficit within specific organisations whilst their counterparts benefitted from it as a primary source of support. The full interview transcript is included in Appendix B.

3.6.2 Interview analysis

Thematic analysis is proposed as the preferred method to analyse semi-structured interviews due to its strength in capturing common and shared meanings through the

reported experiences of the participants (Creswell & Clark, 2011; Roberts et al., 2019). An initial set of five themes alongside initial codes were adopted from the literature, and their further development and reorganisation will follow to achieve saturation (Bryman, 2016; Creswell, 2003; Walsh, 2003). The themes represent overarching concepts discussed in the interviews, which are listed as follows: (1) Knowledge, (2) Learning, (3) External environment, (4) CE, and (5) Covid-19.

The first theme, knowledge, comprises three subcategories representing its barriers, creation and transfer. Knowledge creation is further categorised between tacit and explicit, where explicit knowledge is divided into six categories denoting various sources of its creation. Knowledge transfer was coded and represented through their associated learning processes derived from the 4I learning framework (see objective 2). Learning is represented by its direction and respective level. This includes codes for feedback and feedforward in addition to individual, group, organisation, interorganisational and network (see objective 3).

The external environment (see objectives 3 & 4) comprises different financial mechanisms, such as grants and subsidies, and interactions with councils, DNOs and government agencies. Non-CE actors were included to capture relationships differentiated by locality or technology. These were perceived as the central bodies with which these organisations interact outside their primary areas of operation.

A theme for CE (see objective 1) focuses on the organisational aspects of its activities, embeddedness, ownership and participation. Furthermore, to avoid including extra and unnecessary themes, local contexts of the organisations captured instances of localised impact and specific examples behind certain actions and decisions.

The final theme constituting Covid 19 has been divided into six categories representing engagement, delivery, financial, members, routines and a final code “other”, which only recorded one instance of coding, showing that the selected codes were sufficient at capturing the effects of the pandemic on the organisations. A full-item list representing the expanded themes and their subsequent codes can be found in Appendix P.

3.7 Survey instrument

3.7.1 Survey item development

A survey is developed to operationalise the extended '4I' learning framework in the context of CE in addition to the integration of previously mentioned additional objectives such as the characterisation CE classification profile as well as network mapping strategies. The initial survey comprised 43 questions. After a piloting period of approximately three weeks with PhD colleagues and previous participants who agreed to the interviews²¹, this was first shortened to a 21-question format and further shortened to 17 before its distribution. This was mainly a result of eliminating repetitive questions, which showed very high inter-item correlations, from previously adopted scales, mainly those targeting the same constructs and those which focus on elements beyond the scope of this study, such as the amount of grant funding they received and grant providers and a social desirability index due to it targeting the individual unit of analysis as opposed to the organisational level. Unless otherwise stated, all survey items are presented through a five-point Likert scale.

The first three questions in the survey comprise descriptive information relating to the organisations and their members, allowing for inference of the respondents (Wright, 2005). Question 1 asks the respondents to provide general information about their organisation, such as its name for coding purposes, establishment year, member distribution and legal structure. Further, desk-top research may also reveal several relevant details of the organisation without prolonging the survey, such as its region and type of technology. Other pieces of information, such as when it was founded and its distribution of key members, also provides insight into the maturity and general ability to learn of these organisations as they are commonly targeted proxies of its measurement (Muscio, 2007; Vinding, 2006; Zahra & George, 2002). The age of the organisation may act as a proxy for the total accumulation of knowledge, and its size indicates the labour capabilities (Muscio, 2007). Recognising that the sector is highly dependent on volunteers, the distribution of

²¹ In total, 3 participants from the semi-structured interviews kindly agreed to participate in piloting the survey instrument and provided important feedback on its structure, questions and delivery method. Thank you to these participants for their cooperation and valuable input. The piloting period of the survey instrument was promising, and the survey satisfied initial preliminary tests of reliability and suitability. However, there were concerns that the small response rate to the piloting period may be misleading when a larger dataset is integrated and therefore the preliminary tests of reliability and suitability will be rerun in the final dataset.

FTE and volunteers is included in the instrument, as its inclusion may generate new insights into these overarching factors.

Both questions 2 and 3 relate to organisational activities. Whilst question 2 focuses on the main activity, question 3 attempts to further this by adopting 12²² activities from the CEE2020 State of the Sector survey (CEE, 2020). To gain further clarity, four classifications are presented alongside the activities. Participants may indicate they participate in these activities (1) actively, (2) sometimes, (3) in the past and (4) never.

Question 4 relates to the previous experience of the key members within the organisation (i.e., FTE and volunteers). Recognising the importance of expertise and experiences as strong proxies for learning capabilities within organisations has entailed the adoption of this question. Traditional measures such as research and development investments [R&D] (Lane & Lubatkin, 1998; Tsai, 2001), as well as objective measures for human capital (i.e., formal qualification and the number of years of experience) (Muscio, 2007; Vinding, 2006; Zahra & George, 2002), cannot be captured due to differences in the level of analysis of the survey. It is impractical to ask respondents to list their members' years of experience and formal qualifications, especially when considering the demographics of CE members, which renders formal qualifications irrelevant compared to decades of experience²³ (Radtke, 2014). In adapting these concepts to the survey, it was decided to list five relevant backgrounds and ask participants to categorise their applicability regarding their key members. A reverse scoring scale, with 1 being the highest and 5 the lowest responses, is proposed in question 5 to ensure the respondents remain engaged and do not hastily provide agreeable answers as recommended in the survey design (Bryman, 2014; Creswell & Clark, 2011; Wright, 2005).

Question 5 operationalises objectives 1 and 2 by asking participants how important each of the seven previously identified organisational traits (Hoffman & High-Pippert, 2005;

²² The 12 activities adopted from the CEE State of the Sector report include: (1) Educational events, (2) Electricity generation, (3) Energy audits, (4) Energy performance services, (5) Energy switching, (6) Fuel poverty reduction, (7) Funding and project financing, (8) Heat generation, (9) Insulation, (10), Lighting efficiency, (11) Low carbon transport [LCT] and (12) Training and workshops.

²³ In his study relating to motivations for citizen participation in energy initiatives, Radtke (2014) reports that 54% of the respondents are aged between 45-64 years old. Furthermore, he reports that 57% have obtained a higher education university degree and finally 49% of the respondents have a monthly income above €3,500 based on a survey of 2826 respondents. This indicates that individuals associated with CE are middle-aged, well-educated and have a comfortable income.

Seyfang et al., 2013; Walker & Devine-Wright, 2008)²⁴ are to their respective organisations through a five-point Likert scale. Results are then used to create individualised diagrams in the CE classification profile to compare how the differences and similarities between the responding organisations can influence their wider propensities around cooperation and collective learning.

The following five questions focus on perceptions of learning within the organisation and the directional flow of knowledge associated with the learning processes. These questions have been adopted from previous studies (Botnis et al., 2002; Chiva et al., 2007; Templeton et al., 2002; Tippins & Sohi, 2003) and amended in their language to suit the CE sector. The scales represented in the following questions are collectively analysed to satisfy objective 5.

Question 6 focuses on learning at the individual level, targeting concepts involving competence, capabilities and motivation which revolve around intuition as the key learning process. The main item constructs adopted involve insight, pride, suitability of role to the individual and awareness to measure key intuition-based processes of learning (Botnis et al., 2002).

Question 7 extends focus to the group level categorised through interpretation and integration learning processes. Here an attempt is made to understand group dynamics and how developing a shared vision influences the respective learning processes. The main item constructs included in question 7 are around conflict resolution, diverse views, reevaluation of decisions and adaptability.

Question 8 targets the organisational level with the interplay between integrative and institutional learning processes. The scale is represented by 5 items which are; Long term vision, strategy, work structure, routines and memory to explores how the broader interactions between human and non-human actors lead to the effective transfer of knowledge and how, through the structure and strategy of the organisation itself, this knowledge is embedded into the organisation's routines.

Both questions 9 and 10 focus on the directional flow of knowledge. These are termed feedforward and feedback processes, respectively. Question 9 examines if and how the processes of intuition at the individual level advance through the organisational channels

²⁴ The 7 identified traits from chapter 2 are (1) Advocacy, (2) Community engagement, (3) Democratic decision making, (4) Education, (5) Environmental drive, (6) Financial reward and (7) Social impact.

to influence the incumbent culture and routines of the organisation. Items from question 9 focus on the power of the individual within the broader organisational setting and intraorganisational communication effectiveness. In contrast, question 10 focuses on how lessons embedded at the organisational level influence individual and group-level learning-related processes. Items here focus on organisational capabilities and the effectiveness of policies concerning the lower levels within an organisation.

Moving to cooperation and extending the focus to interorganisational relationships, question 11 explores the nature of the support of the organisations within CE networks, asking participants whether they were contributors or recipients of either financial or knowledge-based resources.

Chapter 2 identified two primary forms of exchanges occurring within these settings. These are (1)

Financial and (2) knowledge-based (Bird & Barnes, 2014; Hargreaves et al., 2013; Parag et al., 2013). Furthermore, in his study exploring centrality and performance within networks, Tsai (2001) notes a distinction between resource providers and recipients and that further differences between these may provide additional insights into how network dynamics influence interorganisational learning within its settings.

In addition to insights from the semi-structured interviews, the piloting period showed that CE organisations generally have multiple affiliations, which may not seem evident from secondary research. Furthermore, these affiliations may be at different levels²⁵ and with non-CE members. Question 12 asks respondents to name networks they are affiliated with at the regional and national levels and include a noteworthy non-CE network. Short answer sections are provided in recognition of the diversity of affiliations by CE organisations. This is followed up by question 13, which asks respondents to rank the networks regarding their value to the respective organisation.

Focusing on the networks themselves, question 14 assesses perceptions of network maturity using items derived from Dyer & Nobeoka's (2000) stages of network development. Additional items include perceptions of the hub organisation and network-

²⁵ Three such levels were identified, these are (1) Local, (2) Regional and (3) National. However, during the pilot stage, it was shown that most network affiliations at the local level were with non-CE bodies. Therefore, the local level was omitted from the final survey item with the inclusion of a noteworthy non-CE network.

based capabilities. These are derived and amended from the IT-oriented focus of both Templeton et al. (2002) and Tippins & Sohi (2003).

To conclude the scale-based items used in the primary analysis, question 15 explores perceptions of network benefits to the organisations. Whilst challenging to derive objective measures for performance given the nature of CE approaches, these perceptive measures may act as a reasonable substitute as they are indicative of traditional financial performance indicators (Botnis et al., 2002; Lyles & Salk, 2007). Items developed for this scale were amended from Botnis et al. (2002), focusing on perceptive indicators of success.

Including a section of short answer questions was deemed important to allow respondents to provide accounts and individualistic perceptions. This was considered a superior alternative to a multiple-choice approach previously adopted in the CEE2020 State of the Sector report. Question 16 asks respondents to provide short answers about the most important aspect of CE networks, their future role and the most significant perceived barrier inhibiting interorganisational learning.

Finally, question 17 operationalises the final objective involving mapping the exchanges between CE organisations within network settings. Following previous network mapping approaches (Berkhout & Westerhoff, 2013; Parag et al., 2013; Nochta & Skelcher, 2020), the survey lists network members alongside six possible categories of interaction. (1) Provision of knowledge, (2) Provision of finance, (3) Recipient of knowledge, (4) Recipient of finance, (5) Informal relationship and (6) No interaction.

A full breakdown of the items and their respective scales can be found in Appendix Q. Although it will be discussed in more detail in Chapter 4, two mailing lists were created due to limited responses from CE networks to partake in the survey. Mailing list one comprises regional network members, whilst mailing list two comprises a more general approach targeting members of CEE. As a result, Q17 in the survey has been amended to reflect the mailing lists. Whilst the first (regional) mailing list lists other network members, the second (general) list lists identified CE intermediaries. A full copy of the questionnaire, with two sections representing Q17 has been included in Appendix D.

3.7.2 Survey analysis

In line with the mixed-methods approach, the survey allowed for collecting multiple forms of data, which require different analysis methods. Questions 1-4 and 12 provide descriptive

information relating to the organisation, which may be used as a basis for further secondary research, categorisation, and coding, and to give more context (Wright, 2005) relating to the organisations themselves in a complementary manner to the interviews and remainder of the survey.

Question 5 provides context into the dominating characteristics of the organisations. Correlations are first calculated for these characteristics (Appendix F, F1-F4) to examine their interrelationships before individualised classification profiles (Appendix G, G1 & G2) are created to visualise and compare the observed features. These can compare groups operating within similar geographic regions and between organisations with different network affiliations. The classification profiles are created through the five levels of importance that the respondents could assign to each of the characteristics from 0= not important to 4= very important.

Following recommendations by Bryman (2016) to include short questions to gain individualised accounts instead of standardised responses, question 16 results in qualitative data, which may complement the findings from the aforementioned thematic analysis in 3.5.2.

The dominating aspect of the survey instrument is the adapted scales utilised to operationalise the 4I learning framework and measure learning within the organisations. These will be analysed quantitatively using SPSS through a PCA (Watkins, 2018), which entails initial reliability tests (Cronbach, 1951; Griethuijsen et al., 2015; Ursachi et al., 2015) followed by suitability tests (Osborne & Costello, 2004; Williams et al., 2010) to ensure that the data is fit for purpose.

Finally, from question 17, the data about the network-based exchanges between the organisations will be coded and mapped through Gephi to visualise the relationships and their nature. This will be analysed through SNA methods (Scott, 1988; Wasserman & Faust, 1994) to explore relationship structures, network dynamics and further categorisation of core and peripheral members within these network settings (Lucas & Mayne, 2013).

To achieve this, sociograms will be produced (Berkhout & Westerhoff, 2013; Nochta & Skelcher, 2020; Parag et al., 2013), capturing the respondents' financial, knowledge and informal exchanges. Basic network statistics include network position (Tsai, 2001), network size (Nochta & Skelcher, 2020) and network density through the total number of members and their connections. In a previous article exploring the relevance of SNA to the CE sector,

Lucas & Mayne (2013) further imply that incorporating SNA also allows for observation of the deeper forms of support that CE networks may provide its members that extend beyond immediate learning outcomes.

3.8 Corroborative discussion

It is recognised that CE settings may be unique irrespective of behavioural patterns (Raven et al., 2008). These settings result from a divergence of multiple dynamics in addition to further demands and ideological influencers which ultimately shape these organisations and their purpose. Therefore, whilst this study predominantly focuses on learning, the reasons for differences in their propensity to learn may be influenced by deeper-rooted causes unaware to the researcher. Hence, it was decided that the main findings should be corroborated through a discussion with independent validators within the CE sector.

Although multiple individuals were approached, the study could only secure one participant. The results from the discussion are used to confirm findings and provide further detail into the local context (Bryman, 2016) in which the organisations and their networks interacted. The participant will be provided with a synopsis of the findings alongside the main generated outputs such as figures and tables to summarise the findings, providing them with a clear picture of the insights revealed in this study.

It is important to note that this discussion is not aimed at correcting prior findings. Its purpose is to provide further validity for the collected data (Creswell & Creswell, 2018) because it is represented by a relatively small sample size and to ensure that the findings may be generalisable to the wider CE sector.

3.9 Summary of research design

To summarise, this study is grounded in a pragmatic worldview and intends to adopt a mixed methods design to achieve its objectives. A three-part design begins with a 10-question semi-structured interview script developed from the literature review and will be thematically analysed through NVIVO. This is followed by creating a survey instrument adopted from previous learning-oriented studies and being further informed from the interviews. The survey comprises 17 questions which provide four forms of data for analysis. Firstly, descriptive information is used for broader coding purposes and to inform secondary research. Finally, correlations and radar charts are created wherever relevant to complement the aforementioned thematic analysis. Secondly, learning scale items from

the survey will be processed through a PCA to identify factors in addition to the strength and nature of their inter-relationships. Thirdly, short questions allow open-ended answers to inform the qualitative analysis. Finally, social network analysis is conducted via Gephi to examine the broader interactions between CE organisations between each other within wider network settings.

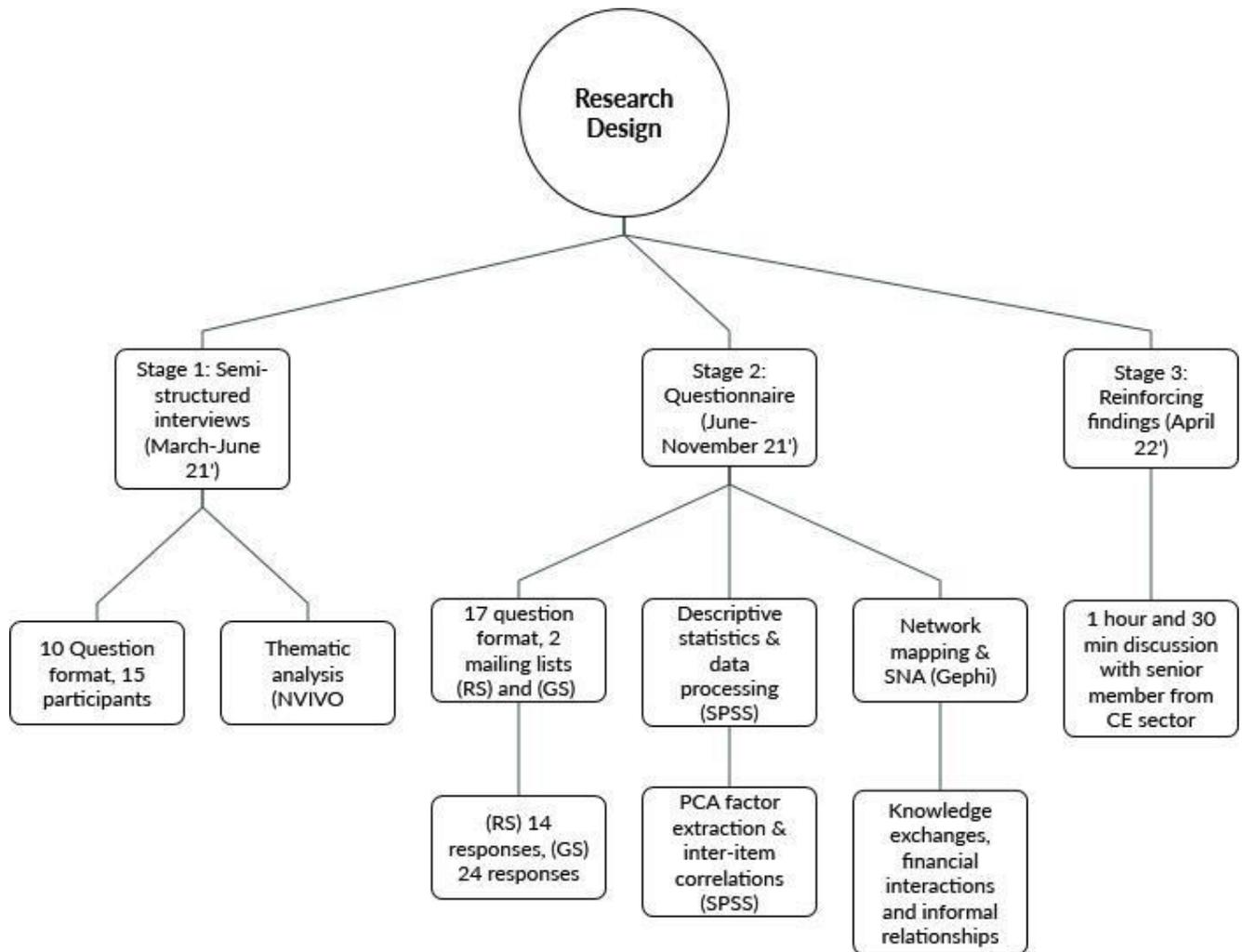


Figure 9: – Visual representation of the main steps in the research design, the number of questions, the type of analysis which will be carried out, and software use.

Chapter 4 – Data Collection and Processing

4.1 Introduction

The following chapter describes the sample selection process, data collection and the limitations encountered during this period. After an initial scoping period, it is explained that purposeful sampling techniques are utilised to identify relevant organisations and participants in the semi-structured interviews. A total of 15 interviews (and an additional discussion-type interview post-data collection and analysis) were secured and conducted between March and June 21'. The interviews themselves, the participants and their respective organisations are described in addition to the processes of transcription through Otter.ai and input into NVIVO. Similarly, the steps to compose survey mailing lists and their distribution at the regional and national levels between June and November 21' are also described alongside their input and coding into SPSS. Lastly, the chapter concludes by stating the limitations that impeded the data collection process, mainly due to the effects of the Covid-19 pandemic.

4.2 Sample selection

Literature around CE in the UK suggests that the current scale of CE initiatives totals over 5000 approaches (DECC, 2014a). However, limited online presence and varying degrees of community involvement in energy-related projects distort these findings, suggesting that the true scale of CE is unknown (Seyfang et al., 2013). The CEE2020 anonymised database has identified 252²⁶ CE organisations in England (CEE, 2020) split across nine regions throughout England. It is noted that the results may only capture a small proportion of the sector targeting those already possessing internet-based capabilities.

²⁶ More recently, CEE have introduced a national map providing information relating to different projects, regional political affiliations and the geographic regional, DNO and local authority boundaries (CEE, 2022).

Considering the selected sample's overall representativeness (Bryman, 2016) to accurately reflect the wider CE population, this study will classify six different geographic regions based on previous DBEIS regional boundary net zero categorisation represented through the LEP energy hubs (GSEZHZ, 2021).

Although five such regions²⁷ are described in the LEP energy hubs, London is split from the Greater Southeast region to account for the unique dynamics and strong CE presence (Hodson, 2013; Mawhood & Adcock, 2021) within London as a capital city in comparison to other localities represented within the region.

In line with the mixed methods approach, the study also adopts a mixed sampling technique (Bryman, 2016) to obtain the best possible sample for each method (Creswell & Creswell, 2018). The research design comprises qualitative and quantitative methods, so each approach's ideal sample sizes differ. Qualitative approaches favour restricted sample sizes to allow for an in-depth approach and richness in data collection, whilst larger sample sizes are preferred for the latter to allow for population-level generalisations to be drawn (Bryman, 2016; Patton, 2002; Winter et al., 2016).

Initially, the CE England (CEE, 2021b) and Co-operatives UK energy membership pages (Cooperatives UK, 2021) were taken as the basis for the sample selection scoping period as they both operate on a national basis. Each page provided lists of over 200 potential organisations to be approached. Following this, several other membership pages of previously identified networks were also examined to determine other organisations for interviewing participants and creating mailing lists to distribute the survey.

4.2.1 Identifying individuals for interview participation

For the qualitative aspect of the study, purposeful sampling techniques are adopted to identify key participants. This method is preferred to select individuals deemed the most knowledgeable and relevant to specific issues (Patton, 2002; Suri, 2011). This strategy is expected to maximise the possibility of gathering meaningful and rich forms of data (Bryman, 2016). The targeted individuals would be senior members within their organisation, having an active role in interorganisational interactions and broader, network-level engagement on behalf of their organisations.

²⁷ These include (1) Greater Southeast, (2) Midlands, (3) Northeast and Yorkshire, (4) Northwest and (5) Southwest.

As the individuals representing their organisations meet and interact within network settings, often with members affiliated with the intermediary organisations, participants will also be selected from the network level. Participants representing these organisations are recognised to have the important task of disseminating valuable forms of knowledge and embedding these lessons into the network's memory. This interplay between organisational, interorganisational and network learning can be viewed from the bottom-up and the top-down. Capturing these different perspectives is necessary to obtain a well-rounded and unbiased view of learning episodes unfolding within these settings.

Approaching the organisations was conducted over multiple stages between January to March 2021, based on geographic regions due to the notion that regional differences would allow for a deeper understanding of the local contexts whilst embracing different technologies and organisational structures. The unique nature of CE approaches and insight into how these common local contexts result in different interpretations and differences in learning processes unfolding.

A total of 58 organisations were approached. These were identified as the best organisations based on the information revealed through secondary sources. Each organisation was scoped to identify potential candidates to participate in the interviews on behalf of their organisation. The identified individuals were contacted via email, introducing the research topic and kindly requesting their participation in a semi-structured interview. The email clarified that they would be anonymised to protect the integrity of the study. A total of 15 participants²⁸ agreed, 13 of whom represented CE organisations, a representative of one of the LEP energy hubs, and a representative of a national-level intermediary.

After their agreement, in-depth scoping of their respective organisations was undertaken. This involved gaining as much information as possible from secondary sources relating to their activities, establishment and members, in addition to broader research involving their localities and general issues faced by their communities. Other documents such as annual reports, meeting minutes and soft forms of information such as blogs and newsletters were also reviewed. This proved a vital resource to gain as much information as possible to help provide context to the information being discussed.

²⁸ This constitutes a 26% response rate in the survey participation based on the selected sample pool, slightly higher than the 20% minimum acceptable threshold (Bryman, 2016).

4.2.2 Identifying networks for survey distribution

As this study is interested in understanding network interactions, the type of interaction and their intensity through a learning spectrum, it is essential to select networks that may result in responses of cross-interaction between the members. Furthermore, there must be participation from several members of the specific network, which creates a necessity to approach the intermediary organisation acting as the primary coordinator to ask permission to distribute the questionnaire to increase response rates.

Following CEE and Cooperatives UK mentioned in section 4.1, Regen and E4A membership pages were also examined. Although credited with strong knowledge-sharing capabilities, the Electricity Storage Network (ESN) coordinated by REGEN does not differentiate between community and noncommunity stakeholders, leading to difficulties in categorising its members (REGEN, 2021). On the other hand, E4A was identified as a co-developer and management organisation of CE initiatives (E4A, 2021). As a result of their client-driven role in the form of an independent service provider to the sector, they were omitted from the sample selection process.

At the regional level, CE London [CEL], CE South [CES], Bristol Energy Network [BEN], Devon CE Network [DCEN], Low Carbon Hub [LCH] and Zero Carbon Yorkshire [ZCY] were all examined as part of the sample selection process. CEL, CES and LCH were deemed appropriate candidates to approach from the aforementioned intermediary organisations due to their comparable roles, members and geographic focus.

BEN, which was deemed mature and had a strong presence within its locality, does not include a membership page on its website, which creates difficulties in identifying its member organisations (BEN, 2021). Similarly, DECEN may also be considered a mature network due to its significant membership page and evidence of coordination of events and knowledge-sharing capabilities (DECEN, 2021). However, its members are predominantly non-CE organisations engaging with a limited number of CE organisations within the locality. Of 32²⁹ members, only ten fell under the community umbrella. Finally, ZCY was deemed to be at its infancy stage in terms of the maturity of the network. As a result, its footprint remains relatively small; a membership page still needs to be created for its members.

²⁹ DECEN membership is comprised of 10 CE organisations, 11 sustainability groups, 10 local authority groups and a renewable energy specialist (REGEN) (DECEN, 2021).

After inspecting the networks mentioned above and their respective intermediary organisations, it was decided that BEN, DCEN and ZCY be omitted from consideration due to the barriers to access their members, a limited number of members and the infancy of the network itself. This leaves CEL, CES, and LCH to be specifically targeted in the survey instrument.

Approaching the intermediary organisations during the lockdown period of the pandemic proved unfruitful. Only one intermediary [CES] agreed for the mailing list to be compiled from its members and distributed throughout its network.

Two mailing lists were created for the distribution of the survey. The first mailing list consisted of 34 members affiliated with CES³⁰, whilst the second list was developed from CE organisations of the CEE membership page (CEE, 2021b). Filtering the initial 210 members to target those fitting within the geographical parameters of the study, in addition to satisfying the community umbrella, resulted in a list comprising 130 organisations representing the sector throughout England. Disappointingly, the combined mailing list only resulted in 38 responses. Fourteen of these came from the regional list targeting CES members, whilst 24 replies came from the national-level survey item.

Adapting to these changes, question 17 in the survey was amended in the national distribution mailing list to include 21 previously identified intermediaries³¹ responsible for coordinating network activities instead of network members in the original regional list. For the regional mailing list, CEE and Regen were included in addition to CES due to their collaborative relationship with CES and their members. Whilst this change will result in two survey datasets, all the scales operationalising the 4I framework targeting learning processes remain consistent. The only difference would be through the SNA, where one dataset would show interorganisational exchanges through a network setting, and the other would offer organisational exchanges with intermediaries. However, these should act complementary to see how interactions between organisations affiliated with multiple intermediaries and how these exchanges are taking shape.

³⁰ These represent the CE members within CES of a total of 45 members as of 2021 (CES, 2021).

³¹ The intermediary organisations represented coordinators of CE networks in addition to their DNO, LEP energy hub and local authority.

4.3 Data collection

4.3.1 Conducting the interviews and post-interview process

Phase 1 of the data collection took place between March to June 2021. All interviews were conducted online via platforms such as MS Teams or Zoom. One participant opted for a phone call. Participants were reintroduced to the research topic and re-read the ethical considerations (Appendix C) of the study, explaining their rights regarding their participation. The length of the interviews varied from half an hour to an hour and fifteen minutes. A pre-developed script (3.5.1, Appendix B) and a series of prompts pertaining to the topics guided the interviews.

The post-interview process began as soon as each interview ended. This involved composing reflective notes relating to the overall impressions of the experiences, opinions expressed, and other points deemed important for its analysis. Audio files were digitally recorded and collected as the interviews were held online. Folders were created for each participant, including audio files, ethical consent forms and classification sheets with descriptive information (Berg, 2009; Hammersley, 2010; Poland, 1995). These pieces of information represent the raw data of the semi-structured interviews.

Interviews were transcribed using the aid of Otter.ai. Emphasising that the transcription should accurately reflect the audio tape (Poland, 1995), the transcription process took longer than anticipated, with each minute of interview time accounting for around 15 minutes of transcription. This was due to considerations of data fragmentation that may result in a loss of context (Bryman, 2016). Therefore, several non-verbal indicators, such as phonetic details, are included in signalling laughter, pauses and other behavioural gestures (Hammersley, 2010). These were later individually reviewed to ensure they were 100% reflective of the audio files.

Using the initially identified themes from the literature review relating to (1) knowledge, (2) learning, (3) external environment, (4) CE, and the integrated (5) Covid 19, the transcripts were inputted into NVIVO and coded. The emerging themes, the overall direction of the interview and the excerpts are all provided in Chapter 5.

4.3.2 Interview participant and organisation descriptive information

Descriptive information relating to the participants and their respective organisations has been compiled and presented from the interviews and secondary research. These are

presented in Tables 2 and 3 below. Unique classifiers for participants read as follows: P(x) represents the unique participant number; this is followed by a * to denote if the individual is a founding member of their respective organisation. The type of organisation and regional locators follow this and lastly the employment status of the individual is provided to differentiate between FTE and volunteers.

Table 2 – Interview participants’ descriptive information.

I.D* (Org type, locator, employment status).	Gender	Involved Since (*Founding member)	Role (Employment Status)	Notes:
P1* (CE, NW, FTE)	F	2014*	Communications (Employee)	Current role consists of creating and maintaining external relationships, with a keen interest in sharing experiences and publicity for the organisation. Strong previous CE involvement in one particular organisation but with multiple affiliations and other networking ties.
P2*(CE, NW, VOL)	F	2011*	Director (Voluntary)	Previous involvement in the local authority as well as environmental counselling. Currently director of 3 other sustainability-driven organisations. As part of her other organisations, there is strong previous involvement with CE. Secondary research showed that this participant is indeed highly regarded throughout the sector by her peers.
P3 (CE, NW, VOL)	M	2013*	Director (Voluntary)	Mobilised CE within their locality, previous local authority involvement at a senior level and current active participation in the village community centre. No previous CE experience however the participant and other members of the CE organisation have relatively close ties and were previously involved in numerous community activities throughout their locality.

P4 (CE, SE, FTE)	M	2015	Communications (Employee)	<p>Unrelated previous experience in the financial sector. His current role involves external communications, online platform development and coordination of events. Additionally, he is actively engaged in social work with local charities in addition to free consultations and providing energy advice.</p> <p>No previous CE involvement whatsoever.</p>
P5 (CE, LDN, FTE)	F	2019	Community development (Employee)	<p>Previous corporate experience affiliated with a RE supplier. Her current role involves active community engagement to encourage project involvement and investment.</p> <p>Involvement in CE appears to stem from previous volunteering activities combined with exposure to the energy sector through RE affiliate.</p>
P6* (CE, SW, VOL)	M	2016*	Company Secretary (Voluntary)	<p>Long-term engineering background with multiple senior roles. Currently involved in zero-carbon energy projects and broader sustainability initiatives.</p>
P7 (LEPEH, SE, FTE)	M	2017	Project management (Employee)	<p>A decade-long involvement within the broader field of sustainability. Previous advisory role in the local authority focusing on rural community projects. His current role involves project management and the promotion of funding opportunities. Independent affiliations with other CE initiatives voluntarily.</p>
P8 (INT, NAT, FTE)	M	2014	Communications (Employee)	<p>Ongoing active volunteering in multiple CE and environmental initiatives. Events and wider network coordinator in a national-level intermediary hub in addition to affiliation with a regional hub.</p>
P9 (INT, SE, FTE)	F	2016	Communications (Employee)	<p>Previously engaged in the public sector in addition to not-for-profit organisations. Her current role involves supporting member organisations and</p>

				managing an extensive regional partnership programme and communications.
P10* (CE, SE, VOL)	F	2011*	Director (Voluntary)	Ongoing consultation role in a non-community and non-energy sector. Active involvement in founding regional CE hub intermediary in addition to current directory role.
P11* (CE, NW, VOL)	F	2016*	Director (Voluntary)	Prolonged involvement in the public sector in a relevant, broader sustainability role and a previous role as representative of DNO. Involved in advocacy and fundraising on behalf of the CE organisation.
P12* (CE, NW, VOL)	M	2011*	Director (Voluntary)	Senior research role in a university with multiple affiliations with societies and broader sustainability organisations. Additionally, strong community advocate representing the sector to the government (at a local and national level).
P13 (CONS, SE, FTE)	M	2014	Research (Employee)	With previous energy-based experience and project management roles, his current focus is on research within the CE sector.
P14 (CE, SE, FTE)	F	2021	Communications (Employee)	Previous roles in communications, public relations and journalism. Her current role focuses on community empowerment through communications management. No previous CE experience however the participant has been heavily involved in the RE sector and naturally developed relationships with CE organisations.
P15* (CE, NE, VOL)	F	2016*	Director (Voluntary)	Research background, previously engaged in project management at multiple levels (Community, private and public). Her current role focuses on day-to-day activities and oversees the board in their CE organisation.

Table 3 – Interview descriptive information of organisations represented by participants

I.D	Region	Establishment	Technology	Type of organisation	Notes
O1	NW (Rural)	2014	Hydro	CE	<p>Objective: Provision of zero-carbon electricity through innovative hydro technology and recirculating its profits through annual grants of up to £6000. It is funded through a grant award. Size: 6 key members, all of whom are volunteers.</p> <p>Current operations: 51 kW generation from a single hydro system.</p>
O2	NW (Rural)	2011	Solar PV	CE	<p>Objective: To reduce energy costs and emissions by increasing renewable energy generation within the locality through shares, providing social and environmental investment opportunities.</p> <p>Size: 44 current members, four elected directors.</p> <p>Current operations: Two projects totalling 99 kWp Solar PV.</p>
O3	NW (Rural)	2013	Hydro	CE	<p>Objective: Renewable energy generation to provide a revenue stream for broader community benefit activities whilst repaying shareholders. Surplus profits recirculated into local trust for distribution to broader social causes focusing on children, sports, energy efficiency and conservation of local heritage.</p> <p>Size: 6 key members, all of whom are volunteers.</p> <p>Current operations: Two hydro turbines are reported to generate over 1000 MWh of electricity annually.</p>

O4	SE (Urban)	2014	Solar PV	CE	<p>Objective: To reduce the environmental impact of buildings by providing consultancy and energy management. Funded mainly through share offers.</p> <p>Size: 13 key members involved. All staff have FTE roles; unclear whether directors are voluntary.</p> <p>Current operations: Over 55 independent Solar PV projects completed within regional boundaries, saving over 450 tonnes of CO2 annually.</p>
O5	LDN (Urban)	2011	Solar PV	CE	<p>Objective: Using clean and localised energy solutions to empower host communities. A proportion of the income is then used to operate multiple social programmes. Funded through share offers.</p> <p>Size: 8 Key FTE members (which has since increased to 13) and multiple volunteers.</p> <p>Current operations: 9 Solar PV projects generating over 500 MWh of electricity annually.</p>
O6	SW (Rural)	2016	Solar PV	CE	<p>Objective: Promoting clean energy generation and efficiency in its use through active community engagement. Additionally, project income is reinvested into other energy-related initiatives and broader forms of community benefit. Funded through share offers.</p> <p>Size: 5 key voluntary members responsible for day-to-day operations and coordination of activities.</p> <p>Current operations: A 50 kW Solar PV system atop their local school. Whilst some of their intended projects did not come to fruition, other operations involve energy saving and efficiency measures.</p>
O7	SE (N/A)	2017	None	LEP energy hub	<p>Objective: Providing consultation and further support for renewable energy project development and grant fund management and distribution. Public funding.</p> <p>Size: 14 key members, all of whom are FTE.</p> <p>Current operations: Direct involvement with the public and community sector</p>

					organisations with multiple activities through all development stages. Activities comprise sharing knowledge and financial resources. Additionally, many toolkits have been created in this respect and the coordination of networking events.
O8	NAT (N/A)	2014	None	Intermediary	<p>Objective: Support the overall growth of CE in England through advocacy, networking and resource provisions. Additionally, it produces annual sectoral reports, creates multiple available toolkits and provides a space for sectoral interorganisational interaction with the intention of knowledge sharing.</p> <p>Size: A team of 6 FTE members and a larger voluntary board comprising ten senior members within the sector.</p> <p>Current operations: Multiple activities involving advocacy, formal representation of CE, coordinating networking events, toolkit creation and provision of knowledge-based resources with the intention of network learning.</p> <p>Funding: Multiple funding sources from membership fees, sponsorships, partnerships, donations and grant rewards.</p>
O9	SE (N/A)	2012	None	Intermediary	<p>Objective: A sizeable regional intermediary comprising over 40 member organisations. Its primary aim is to accelerate zero carbon transmission through collective funding of projects, from which profits may be recirculated for further investments. Like other hub organisations, they also provide resources and grant funding to benefit the wider CE sector. Predominantly funded through share offers, with secondary funding via grant awards.</p> <p>Size: 18 members, including FTE and parttime, plus a large board of volunteers.</p> <p>Current operations: Whilst the intermediary possesses no generation capabilities, it has supported the development of over 45 projects within the region, mainly focusing on solar, with some hydro schemes</p>

					reportedly generating over 4.5 GWh of electricity.
O10	SE (Urban)	2011	Solar PV	CE	<p>Objective: Increase community renewable energy generation across the region by educating and involving local citizens through share offers.</p> <p>Size: 9 Key voluntary members, 1 FTE.</p> <p>Current operations: 9 solar PV projects totalling over 300 MWh annual generation.</p>
O11	NW (Urban)	2016	Solar PV	CE	<p>Objective: To increase community-owned renewable energy generation within the region, focusing on schools. Volunteer-based and ownership through share offers.</p> <p>Size: Strong school-based voluntary involvement and a small board of directors.</p> <p>Current operations: 9 solar PV installations are reported to have generated over 1,100 MWh over their lifespan.</p>
O12	NW (Rural)	2011	Solar PV	CE	<p>Objective: Developed as an energy strand within a larger organisation that targets multiple strands of sustainability at a community level. Generation projects are funded through grants.</p> <p>Size: Approximately 40 volunteers (at any given time) with a core group of 8 directors.</p> <p>Current operations: Targets demand reduction and zero carbon generation through 2 solar PV projects generating approximately 25 KW.</p>
O13	NW (N/A)	2011	None	Private consultation	<p>Objective: Consultancy-focused social enterprise which aims to support the development of CE by providing research-based solutions.</p> <p>Size: 13 FTE.</p> <p>Current operations: Provide consultancy to CE organisations (Both in the UK and internationally), product development in the broader field of sustainability, and sectoral research.</p>
O14	SE (Urban)	2020	Solar PV	CE	<p>Objective: Stemming from more extensive regional partnerships, the initiative integrates the CE concept and approach to other methods of public transportation.</p>

					Size: 6 Key members Current operations: Small trial solar PV installation generating approximately 40 KW.
O15	NE (Urban)	2016	Solar PV	CE	Objective: To develop CE within the locality through project installations and to raise awareness. Fundraising through share offers. Size: 8 key voluntary members with two additional FTE roles. Current operations: 6 solar PV projects totalling 200 kW of carbon-free generation.

Table 2 lists the 15 participants alongside their gender, involvement with the organisation, role and employment status. It can be seen that the participants represented an almost equal distribution between females (8) and males (7). Although participants' ages were not asked during the interviews, it was evident that the majority were middle-aged to slightly more senior individuals.

In terms of involvement, it can also be seen that most participants have been affiliated with their organisations for almost a decade except for **P14 (CE, SE, FTE)**, whose organisation was founded in 2020 and **P5 (CE, LDN, FTE)**, who became recently involved.

When further examining the founding members, it was revealed that seven founding members from 11 CE organisations participated in the interviews. This emphasises their pre-eminences within their settings and ensures meaningful insights from their experiences and opinions. Interestingly, all three younger participants **P4 (CE, SE, FTE)**, **P5 (CE, LDN, FTE)** and **P13 (CONS, NW, FTE)** were employed in their organisations. None were founding members, and none were volunteers.

Six roles were identified throughout the interview process; These are (1) director, interpreted as having multiple day-to-day tasks involving key activities of the organisation, and (2) communications, which involves interactions at the community level through engagement, collaboration at the interorganisational level and networking. (3) Company secretary, (4) Research, consisting of in-depth involvement in producing sectoral reports in addition to CE toolkits and (5) community engagement, involving field-level activities with members of the targeted community and (6) project management.

Regarding employment status, 6 FTE roles were identified in the sample selection in addition to a single independent contractor role (**P14 (CE, SE, FTE)**), leaving eight volunteers. Considering the diverse nature of responding organisations involving

intermediaries in addition to CE approaches, 4 of the FTE roles were created within these intermediaries, leaving only 2 FTE roles represented in the CE organisation sample.

A further detail deemed relevant was their multi-rolled nature through their involvement in other CE organisations and broader sustainability and social impact approaches. Most participants indicated having independent involvement to some degree with these different approaches. These involvements varied across multiple sectors, as well as strong previous voluntary participation targeting various causes. They had also been engaged in these roles at a senior level, indicating that they bring diverse skill sets.

From Table 3, 11 CE organisations represented the sample selection with three hub intermediaries, represented by a regional CE hub, a national CE hub and one of the LEP energy hubs. One other organisation primarily focused on CE research and specific sectoral development activities. Regional hubs are considered network coordinators whose areas of operation focus on a specific region or geographic area, whilst the national level represents those without a geographic barrier towards their operations or members.

In terms of representativeness, the sample comprised one national-level CE intermediary hub organisation (**O8**), a CE intermediary hub organisation in the Southeast (**O9**) and one of the five LEP energy hubs (**O7**), also in the Southeast. Only one non-CE organisation was represented (**O13**) in the Northwest. However, this organisation had a close working relationship with exclusively other CE organisations, providing them consultation services and resources wherever possible.

For CE organisations, although the sample selection was purposefully designed to be carried out regionally and through stages to achieve equal representation, there was an uneven regional distribution between the participating sample regarding their localities due to low engagement and non-response from members of other regions. Of 11 CE organisations, five were located in the Northwest, 1 in the Northeast, 1 in London, 3 in the Southeast and one in the Southwest. Comparing these results with sectoral reports and databases indicated that CE has a relatively low presence in the Northeast³² (CEE,2020). Furthermore, when indicating to a participant of this low response, he further noted that: *'The Northeast of trading for reports is a bit of a dead zone. There are a few [CE organisations] in there, but they're not very well connected.'* **P13 (CONS, NW, FTE)**. In

³² From a total of 252 CE respondents in England to the CEE2020 State of the Sector survey, only 5 organisations represented the Northeast region.

London, an organisation (O5) with a relatively large presence was approached. This organisation also encompassed several smaller, single installation-based CE organisations throughout the city and was considered adequate given the time-based constraints and situational circumstances. Representation from the Southeast (3), besides having a regional CE intermediary and a LEP energy hub within the sample, was considered adequate and presented the most insightful findings. Although a single individual/organisation only represented the Southwest, its striking similarities with participants from the Southeast provides cause to integrate them to generalise findings representing the “*Southern regions*”. There was a relatively equal distribution between the organisations in rural (5) and urban (6) settings.³³

It can be seen that the majority of the organisations were founded between 2011-2016, with only one (O14) established in 2020. This shows that the representative sample was involved at multiple essential stages in the sector’s development and has experienced a shifting policy-based landscape. Furthermore, some of the organisations were founded through grants which no longer exist, and others need to rely on subsidy mechanisms which they cannot utilise for new projects.

In terms of technological representation, solar PV systems (9) were a clear favourite as the preferred technology to adopt in most CE organisations, followed by turbines (2) generating hydro energy. Although other organisations adopting alternative technologies, such as biomass and wind, were approached to obtain a more well-rounded sample, these efforts were unsuccessful.

Democratic decision-making is often a vital aspect of CE organisations. All the participating organisations observed this through binding organisational structures such as Community Benefit Societies and Cooperatives to offer their members a one person = one vote rule. Additionally, many organisations had limits on the maximum amount of investment accepted by any shareholder to limit power dynamics associated with the degree of ownership.

Size-wise, variations exist between the samples regarding their volunteers and FTE members. It is, however, noted that select individuals or ‘key members mainly oversee the day-to-day activities of the organisations. These individuals are often supported by a wider

³³ Classifications of rural vs urban settings were largely based on general research of the area and self-classification (i.e., Cities and towns were categorised as urban whilst hamlets, villages etc. were rural).

varying number of volunteers who sometimes may be only 1 or 2 (**04**) individuals or multiple individuals in other cases.

Finally, it is noted that although several intermediaries were approached across all regions, the number of CE participants was significantly lower in regions or areas where the intermediary representatives did not participate, being London, the Southwest and those adopting wind turbines as their preferred technologies.

4.3.3 Distribution and collection of survey

Phase 2 of data collection commenced in June 2021, just after the final interview. A survey was distributed via Survey Monkey to both mailing lists, with reminders sent each fortnight. The regional survey (RS) was closed after three months (N=14), whilst the national survey (GS) was extended to five months (N=24) to November due to initial low response rates. As the regional survey focused on members of a specific intermediary, these organisations were all located in the Southeast. Responses from the national survey reflected those from the interviews, with representation mainly from London, Southeast and Northwest. Similarly, low responses from the Southwest (4), Northeast (2) and (3) Midlands were also observed.

All items within the survey fell into four main categories for coding. These included descriptive information used mainly for classification, Likert-scale items coded from 1-5, short answers, and network exchanges inputted into Microsoft Excel.

The survey instrument did not allow respondents to skip past specific questions before submitting. These questions were deemed crucial to the study and mainly involved those incorporating the Likert scale, which contained items representing the 4I learning framework. Other questions (Q11, Q12, Q15 and Q16) allowed respondents to skip, resulting in comparatively lower responses. The stark similarities of the answers provided meaningful insights into common issues, irrespective of scale and geographic distribution. Unique code identifiers were developed for each organisation using information from the descriptive section and distinguishing responses from the national (GS) and regional (RS) survey mailing lists.

4.4 Quantitative data processing and presentation

4.4.1 Descriptive statistics and total frequencies

Inspecting the raw data is essential before any statistical analysis, as the responses may present significant variations or reveal strong patterns from the responding sample. Therefore, key descriptive statistics relating to each question will be presented alongside the topics discussed to summarise, present and provide a broad insight into the initial relationships between the data.

The total frequencies of the survey items are presented, followed by key descriptive indicators such as their means, standard deviation and range, as found in Appendix E (E1&E2). Several figures and tables are presented in Chapter 5 to show these frequencies. Specifically, a combined figure relating to the establishment, legal structure, membership and size of the organisations is presented when discussing general organisational information at the beginning of Chapter 5. This is followed by frequencies relating to the main organisational activities, characteristics of CE organisations, experiential backgrounds, learning items and network-related frequencies.

From the descriptive statistics, a first step in the data processing and presentation involves the creation of individualised classification profiles from the responses to question 5 in the survey instrument. The question asks respondents to state, in their opinions, the degree of importance their organisation places on the main CE characteristics previously derived from the literature. This is split through a five-point Likert scale from not important, which is given a score of 0, to very important, which is given a score of 4. From these individualised profiles and the raw data, combined profiles representing CE organisations that have been grouped due to their communalities, such as their location, size or structure in order to examine the differences, and similarities in relation to their characteristics.

4.4.2 Inter-item correlation matrices

Presenting the frequencies and descriptive information of the raw data is followed by inter-item correlation matrices, which also help to inform the nature and strengths of the relationships captured by the survey (Acosta & Brooks, 2021).

A Spearman's two-tailed t-test correlation matrix is created to check inter-item correlations between all the related survey items by measuring their strength of association (Patrick et

al., 2018). The Spearman's coefficient is the preferred method due to its monotonic advantages³⁴ over its counterpart, the Pearson correlation (Winter et al., 2016). Combining multiple items in one large correlation matrix is deemed impractical because the survey targets multiple different aspects, each of which contains several items that are not necessarily related. Therefore, three inter-item matrices are created, which are used to separately inspect the main activities of the respondents, their key characteristics, and their learning-related dynamics in line with the 4I learning framework. Findings related to the inter-item matrices are presented in Chapter 5, and all the correlation tables can be found in Appendix F (F1-F4).

Interpreting correlation coefficients were found to be inherently subjective and dependent on the data's strength and the total response frequency. Following standard rules of thumb set out by Hinkle et al. (2003) relating to interpreting the strength of the relationships, this study will follow the following interpretations. As the scales comprise multiple items and the surveys returned relatively low response rates, resulting in a limited number of findings, a lower acceptance threshold will be adopted to reflect the slightly weaker results. Inter-item coefficients under 0.3 will be disregarded and interpreted as having no meaningful relationship. Inter-item coefficients between 0.3 and 0.5 are considered homogenous but not isomorphic and interpreted as weak relationships. Coefficients between 0.5 and 0.7 are considered moderate, and any results above 0.7 are interpreted as strong. However, it is recognised that these strong values may indicate multicollinearity or redundancy within the data itself (Piedmont, 2014).

4.4.3 Reliability and internal consistency tests

Considering the reworded nature of the individual scales included in the survey instrument, the adopted items and those developed for this study will undergo scale reliability tests to ensure that the scale items are statistically reliable for analysis through a PCA.

The main point of interest in these initial reliability tests is the inspection of the Cronbach Alpha (α) coefficient as a measurement of internal consistency throughout the scales (Cronbach, 1951). Its primary purpose is to inform on how reliable a specific scale is in

³⁴ Although the appropriate selection of the preferred method depends on the data, some clear advantages of Spearman's correlation include the recognition of non-linear relationships between the items and its ability to integrate outliers better (Winter et al., 2016).

measuring its intended variable through an inspection of internal consistency (Ursachi et al., 2015). One of the main advantages of this test is its ability to recognise multiple-item measures of scales (Tavakol & Dennick, 2011), which has been used in the development of this study's survey. Additionally, the ability of the test to provide a comprehensive assessment of all the item combinations (Griethuijsen et al., 2015) places it as the superior method.

A common rule of thumb specifies a threshold of acceptance at 0.7-0.9 for the respective Cronbach Alpha coefficient (Griethuijsen et al., 2015; Tavakol & Dennick, 2011), although this is sometimes argued to be lowered to a minimum of 0.6 for exploratory scales (Ursachi et al., 2015).

Several reliability tests are conducted for each individualised scale comprising their items.

A combined scale representing all the items is also presented to examine the relative strength of the combined instrument. This resulted in 12 tests to inspect the internal reliability of the individualised and combined scale items. The outputs for the tests, alongside their respective Cronbach α coefficients, are presented in Table 4 below. A full output of the tests can be found in appendix H (H1 for individual scales, H2 for combined scales).

Table 4: Internal reliability test output, Self-created using SPSS.

Scale (number of items)	Mean	Variance	Std. Deviation	Cronbach α	Cronbach α Based on Standardised Items.
a) Individual learning, (4)	16.71	1.887	1.374	0.342	0.346
b) Group learning (4)	15.53	4.688	2.165	0.733	0.739
c) Organisational learning (5)	18.34	7.096	2.664	0.739	0.738
d) Learning combined scale (13)	50.58	25.872	5.086	0.815	0.815
e) Learning revised scale (9)	33.87	16.063	4.008	0.774	0.779
f) Feed-forward (3)	12.47	2.202	1.484	0.745	0.748
g) Feedback (3)	11.08	3.858	1.964	0.744	0.744
h) Strategic renewal combined (6)	23.55	7.659	2.768	0.722	0.728
i) Network maturity (5)	18.29	22.319	4.724	0.896	0.901

j) Network benefit (6)	22.32	13.141	3.625	0.706	0.723
k) Combined scale (30)	114.74	99.226	9.961	0.814	0.823
l) Revised scale (After omission of IL scale) (26)	98.03	84.837	9.211	0.797	0.803

Of the 12 reliability tests, seven tests represented the individual scales comprising of (a) individual learning, (b) group learning, (c) organisational learning, (f) feed-forward, (g) feedback, (i) network maturity and (j) network benefit. A further three tests represented combinations of the scales that measure the same overarching construct; for instance, the (d) combined learning scale comprises individual, group and organisational learning. (h) Strategic renewal comprises feed-forward and feedback, and a (k) full survey scale comprising all the times. Lastly, two additional reliability tests were conducted after omitting results that did not satisfy the minimum acceptable threshold resulting in a revised (e) learning scale and a (l) revised combined scale comprising all items (All items and their scales can be found in Appendix Q).

Inspecting the Cronbach α coefficients, it can be seen that all the scales except for individual learning (Which was omitted from further analysis) presented acceptable results above the minimum acceptable threshold of 0.7 (α) (Griethuijzen et al., 2015). The scale representing (a) individual learning comprised of (Insight, pride, role and awareness) (Botnis et al., 2002) displayed a Cronbach α of only 0.346, which is far below the acceptable threshold. Referring to the correlation matrix in Appendix F3 and F4, most of the inter-item correlation coefficients were exponentially low and statistically insignificant. Comparing this with the study that the scales were adopted from, Botnis et al. (2002) report Cronbach α coefficients of 0.9 across all its items and scales in their internal reliability measures.

The newly developed scale, targeting (i) network maturity, displayed the highest α loading of 0.896 and standardised loading of 0.901, hovering around the maximum accepted threshold. This suggests that the scale may be redundant (Tavakol & Dennick, 2011), with multiple items measuring the same construct, and therefore should be considered to be shortened prior to the PCA.

After dropping the individual learning scale, two additional tests were computed for the revised combined learning and total item scales. The revised scales showed acceptable α loadings of 0.774 (e) and 0.797 (l), respectively, indicating that the items are linked to the overall instrument as either an independent scale or as items falling within other scales.

4.4.4 Suitability tests for Principal Component Analysis (PCA)

Following descriptive data, frequencies, inter-item correlations and internal consistency tests for data reliability, it is recommended that the data be further inspected for its suitability to undergo a factor analysis (Osborne & Costello, 2004; Watkins, 2018; Williams et al., 2010).

Kaiser-Meyer-Olkin [KMO] (Kaiser & Rice, 1974) alongside Bartlett's test of sphericity (Bartlett, 1950) are produced for each of the determined factors to measure and determine the suitability of the variables, and their respective scales to undergo a factor analysis. Whilst these tests mark an initial step in determining suitability of the dataset for a PCA, it has been recommended that their values are taken alongside theoretical justifications and inter-item correlations between the individual items (Watkins, 2018; Williams et al., 2010).

Therefore, alongside these tests, the inter-item correlations of all the scale items have been inspected in Appendix F3. 95 statistically significant correlations were observed, however the majority represented negligible and weak relationships between the items. Only 19 correlations displayed coefficients larger than 0.5 and only 3 were higher than 0.6.

KMO measures the sampling adequacy of the data, where a coefficient between 0 and 1 is produced (Coefficients closer to 1 indicate suitability whilst 0.5 is the minimum acceptable threshold) to represent the proportion of the total explained variance relative to the underlying factors being investigated (Kaiser & Rice, 1974), whilst Bartlett's tests of sphericity assess inter-correlations between the variables to examine if the dataset is large enough to justify the implementation of factor analysis methods (Bartlett, 1950). The emerging results from Bartlett's tests of sphericity are presented through a Chi-Squared value χ^2 , degree of freedom and statistical significance $p < 0.05$.

Table 5: KMO and Bartlett's tests of sphericity suitability testing outputs, Self-created using SPSS.

Scales:	KMO	Bartlett's		
		χ^2	Df	Sig
Group learning	0.676	41.768	6	0.000
Organisational learning	0.722	39.636	10	0.000
Learning	0.628	32.067	10	0.000

Feedforward	0.675	25.199	3	0.000
Feedback	0.690	23.615	3	0.000
Strategic renewal	0.707	52.330	15	0.000
Network maturity	0.856	104.170	10	0.000
Network benefit	0.701	49.526	15	0.000
Network dynamics	0.803	164.164	45	0.000

Table 5 presents the computed outputs from the suitability tests for all the scales. It can be seen from Table 5 that all the scales satisfied the tests concerning their KMO values and χ^2 significance. Following this, the factor analysis process indicates that communalities for each variable are processed. Communalities constitute a measurement of the proportion in which the variance of each item is explained by the extracted factor (Watkins, 2018), which can be found in Appendix I. As a result, five items³⁵ were omitted due to communalities lower than 0.5. Adjusting for these amendments and omissions saw the combined communalities of the other items increase, suggesting that the omitted items and individual learning scale were indeed impeding the other variables represented by the remaining items. The omitted items and individual learning scales are not included in further analysis.

Table 5 shows that the remaining scales and their combinations presented acceptable suitability results, further validating the dataset to undergo a factor analysis through their satisfaction with the suitability tests for a PCA.

Following compatibility and suitability testing of the raw data, a PCA is conducted to extract factors from the relevant scales that have satisfied the tests, as mentioned earlier. The rotation method applied is the Direct Oblimin method (Cureton & Mulaik, 1975) which allows for producing an oblique factor rotation translating to the possibility of the factors being correlated to each other instead of the Varimax method, which is orthogonal (Hinkle et al., 2003). An initial maximum interaction for convergence is set at 25, considering that it may be reconsidered and increased if the factors cannot be extracted.

After successfully extracting the factors, coefficients from the newly extracted factors below 0.4 will be suppressed. Further iterations of the analysis will be conducted to achieve a scenario with the least total number of variables cross-loaded across the factors

³⁵ These are: (1) Adaptable, (2) Attractiveness, (3) Long term vision, (4) Memory and (5) Adaptable group.

in the dataset. These steps will be conducted for each scale in addition to their combinations.

Different PCA tests were then conducted for each of the accepted scales, with an expectation of a 1:1 ratio between the factors and the scales. Each scale is expected to be explained by one extracted factor, as in previous articles that implemented a similar approach (Botnis et al., 2002).

Furthermore, additional PCA tests are conducted for combinations of factors representing the same overarching variable, such as combining individual, group and organisational learning scales to represent learning or combining feed-back and feed-forward scales to represent strategic renewal. These additional tests are conducted to confirm whether the number of factors across the scale is consistent. Whenever the factors did not align, and specific items dropped, additional tests were performed to reconfirm the factor loadings with the expected variables. The tables representing the explained variances (Appendix J), factor loadings (Appendix K) and component plots (Appendix L) can be found in the appendices.

A primary concern regarding implementing the factor analysis, specifically a PCA, was the relatively limited data with which the tests and analysis were conducted due to low survey responses. Literature explaining the steps towards conducting a factor analysis generally recommends relatively high sample sizes, with varying recommendations of N=100-250 (Hogarty et al., 2005; Watkins, 2018; Williams et al., 2010).

However, some literature that explores this issue has since identified several different issues that may influence the overall strength of the analysis. For example, Browne & Cudeck (1992) suggested that as the ratio of variables to factors increased (which is 1:1 in this study), there was a better representation of the factors from the emerging analysis. Similarly, in their study, Hogarty et al.

(2005) specifically examine the relationship between sample size and the resulting quality of the produced factor analysis. They found that there was no minimal sample size in which a factor analysis could be conducted but that they mainly reflected higher levels of communality, which were observed to be relatively high in the resulting dataset from the responses in this study. However, they suggest a minimum threshold of 30 including the satisfaction of preliminary tests of suitability and reliability (Browne & Cudeck, 1992).

As the scales were adopted, with only the network level developed explicitly for this study, previous studies showed that the scales were indeed appropriate and captured the intended variables (Botnis et al., 2002). Additionally, due to the data satisfying several prerequisites, such as the scales successfully undergoing reliability testing in addition to the results of both the KMO and Bartlett's tests, indicating that the data is suitable for conducting a PCA, it was deemed appropriate to continue further statistical analysis.

The group learning scale produced a single component representing 57% of the total variance explained within the factor. Three of its items were represented in the loading by examining its component matrix and score coefficient. Dropping adaptability, a second PCA was run across the remaining three items, increasing representation to 71.98%. The scale representing organisational learning also produced a single component; its total variance explained, however, was lower, representing 49% of the total variance of the factor.

Two further PCA tests were conducted for the combined learning scales to test previously omitted items and if a hidden or different factor could represent them. The tests confirm that omitting the items from the scales was correct due to its low representation through its variance and the discovery of a third, underrepresented variable. The PCA was then rerun with the omitted variables without specifying the number of variables to extract. Nonetheless, two factors were extracted representing group and organisational learning. A further comparison of the rotation plots of the PCA tests showed that including the Adaptability item distorts all other items within the scales.

Regarding strategic renewal, feedback and feed-forward were represented by a single factor, accounting for approximately 65% of the variance explained. These were also consistent with the combined scale, confirming that these scales and their items represent strategic renewal.

As a self-developed scale, network maturity was expected to present low results before reliability testing and through the PCA. However, promising results from its internal reliability and suitability tests continued throughout the PCA, where the extracted factor represented 71% of the variance explained. When examining these results alongside the inter-item correlation matrix, it can be seen that whilst the items are interrelated and are indeed explained by a single variable, there is no indication of redundancy within the items.

The only variation between the expected explained factors extracted by the PCA and the actual factors identified was in the network benefits scale. The PCA showed that two variables represented the scales, accounting for 63% of the total explained variance. Inspecting the component matrices of the extracted factors showed that development, financial, organisational and attractiveness were all represented through one factor, whilst partnerships and relationships were explained by a second. This was split into network benefits and interorganisational relationships, and PCA tests were redone to confirm their representativeness.

Table 6: Inter-item correlation matrix for extracted variables from PCA.

	GL	OL	FB	FF	NM	INTER	NB
GL	1						
OL	-.344*	1					
FB	0.161	-0.247	1				
FF	.648**	-.644**	.337*	1			
NM	-0.007	0.075	-0.146	-0.078	1		
INTER	-0.089	-0.286	0.131	0.118	0.157	1	
NB	-0.006	0.29	-0.174	-0.047	-.328*	-0.224	1

Where: * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed). **Abbreviations:** GL= Group learning, OL= Organisational learning, FB= Feedback, FF= Feedforward, NM= Network Maturity, INTER = Interorganisational relationships, NB= Network benefits.

In total, seven factors were extracted from the PCA. The individual learning scale was omitted due to its low Cronbach α coefficient, and other items from different scales due to them not satisfying acceptable thresholds related to their communalities. A correlation matrix for the extracted variables from the PCA was created in Table 6 to examine the inter-relationships between them. This is presented as part of the integrated findings in Chapter 5.

Multiple regressions were also conducted to use them as part of a larger multivariate analysis. However, after several failed attempts revealing no meaningful relationships and statistically insignificant results with significant standard errors and overall low indicators, it was decided to forgo this process (Results of the failed attempts can be seen in Appendix O. Instead, the utilisation of the findings up to this point was able to provide valuable and

insightful information concerning the processes of learning and the capabilities possessed by community energy organisations.

Furthermore, establishing a valid scale to capture these effects is also a meaningful contribution, as no instrument has been created to measure these aspects within the organisations in the CE sector. However, the unique nature of these organisations as well as the difficulty in capturing specific effects and capabilities, were highlighted in the data processing and statistical modelling within the study.

4.4.5 Social Network Analysis

The final component of the survey instrument (Q17) asked the respondents to identify if a relationship existed between their organisation and those included in a list of organisations. Adapting to the two survey mailing lists created, one targeted members of a specific CE network, whilst the other adopted a general approach, targeting CE organisations across England. The organisations included in the final question were amended to reflect the different mailing lists.

The regional mailing list included other network members in the selection, whilst the general mailing list included the network coordinating intermediary organisations identified in the literature review (Appendix A). Upon collecting the raw data, nodes were created relating to each organisation and given a unique identifier. These were coded alongside the nature of the relationship or interaction, denoted through edges. Table 7, representing identifiers and edges used in the SNA, is presented below.

Table 7: Node and edge list classifications for SNA, Self-created.

<u>Regional Survey</u>		<u>General (National) survey</u>		<u>Edge classifications</u>	
<u>Node:</u>	<u>Identifier:</u>	<u>Node:</u>	<u>Identifier:</u>	<u>Edge:</u>	<u>Identifier:</u>
Regional respondents	RS (x)	National respondents	GS (x)	Knowledge exchange ← ⑦	KE
CE members	CE (x)	Combined DNOs	DNO	Financial exchange ← ⑦	FN

Non-CE members	M (x)	Combined local authorities	LA	Informal relationship	INF
		LEP Energy Hubs	EH (x)	No relationship ³⁶	Not coded
Regional intermediaries			INT (x)	<ul style="list-style-type: none"> Regional and national intermediaries are included in both survey instruments. 	
National intermediaries			NAT (x)		

From the survey instrument, following previous recommendations (Parag et al., 2013), respondents could specify the direction of financial and knowledge interactions, as shown in Table 7. Informal interactions had no directional flow to enable further coding of unidirectional \leftarrow and bidirectional interactions $\leftarrow \rightleftarrows$. All the relationship types were given a weight of 1³⁷ when inputted into Gephi so as not to distort any results.

The extracted layout for all the figures follows the Yifan Hu graph algorithm, utilising a multilevel approach to present an optimal layout (Hu, 2006). This was then amended using the no overlap and expansion layout tools to ensure no crossovers between the nodes.

General network statistics relating to the centrality (Tsai, 2001) of the nodes within the network, their betweenness and closeness to each other are then computed to examine the overall structure and dynamics within the networks (Wasserman & Faust, 1994). These statistics and the output figures are used to identify members within these settings and better understand how financial and knowledge resources move within the network.

4.5 Difficulties in the data collection process

Several limitations impacted the data collection process, the most significant of which was the Covid19 pandemic. As a heavily volunteer-based sector, the ability of specific

³⁶ Although the survey included a section to indicate that there was no relationship between the organisations, most of the respondents did not tick any of the boxes of this relationship type.

³⁷ Informal relationships were initially given a weight of 1 to allow for figures that combine multiple relationship types to be appropriately visualised. This however severely distorted the results as some respondents indicated a financial/knowledge interaction (weight of 1) whilst having an informal relationship, bringing the total weight of the single edge to 1.5. Adjusting the relationships to all have an equal weight may provide some initial indication of the network relationships, and further dividing the figure into separate relationship types provides better context for analysis.

individuals to participate and engage with research was greatly impeded during the lockdown period. Before data collection, initial conversations were met with enthusiasm signalling a promising number of responses in addition to intermediary commitments for the survey distribution as organisations and intermediary coordinators were approached during the lockdown, several unanswered emails, in addition to others unable to commit made it evident that the total sample would be lower.

Limited responses have resulted in overrepresentation in both the Northwest and Southeastern regions in both data collection instruments. Findings cannot be generalised towards the sector due to limited representation in other regions unless they appear universally accepted and shared across regional boundaries.

An unanticipated issue was that of ensuring anonymity amongst the participants. The sector is small and organisational boundaries are loose. Individuals carry multiple roles across several organisations and may be easily identified through specific affiliations. It was essential to recognise these interrelationships and how they may lead to traceability through reports of specific findings through the interviews. It was also noted that specific organisations employing unique approaches might be easily identified for similar reasons.

Some organisations agreed to participate on the condition that they would review the post-interview transcript and be allowed to exclude certain aspects of the script before its inclusion in the analysis. These candidates were also omitted from further communication due to the consistent nature of anonymity, which will be preserved throughout the study.

4.6 Chapter summary and concluding remarks

The chapter began by describing the sample selection processes related to each of its data collection methods. As the study adopts a mixed-methods approach, different techniques relating to sampling, data collection and processing are presented separately.

Concerning the qualitative aspect of the study. It was explained that through snowball sampling, 15 interview participants were secured from an initial 58 approached organisations. Descriptive information relating to the interviewees and their respective organisations was provided to show their respective roles within their organisation and to provide some context into the organisations they represent and communities in which they are situated.

As per the quantitative aspect of the study, it was explained that two mailing lists were created to distribute the survey. A regional mailing list comprising 34 members of one CE network returned 14 responses, while a general survey targeting 210 CE members from the CEE members directory only returned 24 responses. Although this was disheartening, the data was coded and inputted into SPSS and Gephi to be processed and to undergo both a PCA and SNA.

Frequency tables and basic descriptive statistics were initially created to gain an overview of the data and explore initial patterns. Following this, inter-item correlations were computed to gain an initial insight into the relationships between the items. Each scale was tested for internal reliability, using Cronbach's alpha as the main proxy for estimation. After dropping the rejected items, a factor analysis using the PCA extraction method was implemented to examine the number of factors extracted from the scales to confirm that the variables were represented accurately and inspect for any hidden, unexplained variables. Furthermore, these were cross-checked between individual and combined scales.

Lastly, the chapter explained how the SNA was conducted for each mailing list. Inputting the data into Gephi, four different network types were created for each mailing list. These represented financial exchanges, knowledge exchanges, informal relationships and a combined figure of all relationship types. Furthermore, knowledge exchanges were further amended to highlight knowledge recipients and providers to allow a deeper comparison of these interactions and the organisations behind the exchanges. These were created for both the regional and general mailing lists. Alongside network mapping, relevant statistics, such as their centrality and closeness to the informational flow within the network, were also computed.

Chapter 5 Research Findings

5.1 Introduction

Chapter 5 presents the findings obtained from the combined mixed data collection methods. Although the data was collected sequentially, its analysis and presentation follow an integrated format to allow for the triangulation of the results and their representation in a manner that follows the themes previously discussed in the literature review. Alongside the mixed data, other figures, sociograms and tables will be created wherever relevant to illustrate interactions between individuals and organisations and to present quantitative findings.

The first section of the chapter will focus on presenting background and general information relating to interview participants and survey respondents³⁸ respective organisations. Participants and respondents are asked to provide accounts of how their organisations were established and what their overarching ethos is to understand how different sectoral stakeholders have interpreted CE. Findings related to the members of the organisation are then presented. This includes the distribution of the organisational workforce between full-time equivalent employees and volunteers, as well as their educational and experiential backgrounds.

The following section focuses on the impacts of the Covid-19 pandemic. Interviewee accounts reflected how CE organisations adapted to working from home, how engagement activities were amended, and the immediate financial implications on the CE sector. The survey instrument did not ask any Covid-19 related questions and therefore is excluded from this section. No further mentions were included in any short answer sections of the survey.

Intraorganisational learning processes are then presented following the 4I learning framework; the section is split into intuition, interpretation, integration and institutionalisation. Excerpts are presented to highlight how these processes are interrelated and how they are expressed within CE organisations.

³⁸ Throughout the chapter, the terms interviewees and participants will refer to those that partook in the semi-structured interviews whilst the term respondents are taken to reference those that answered the survey instrument.

Following intraorganisational learning and its subsequent processes, the chapter focuses on interorganisational considerations, where findings relating to relationships between CE organisations amongst each other and those with non-CE organisations are presented. It is important to note that interorganisational dynamics will explore collaboration between organisations that do not fall into network-level classifications.

A significant portion of the chapter presents network-level findings. This section focuses on interorganisational relationships between CE organisations, DNOs, network intermediaries and local authorities within a network setting. Additionally, this section will present the relevant figures relating to the SNA conducted for the survey data and the inter-item relationships between the extracted variables from the PCA, as explained in Chapter 4. In this section, perceptions of the role of the intermediary coordinators and the benefits of network engagement will be presented alongside the intensity of the relationships between the responding organisations and those included in the survey lists.

Lastly, the chapter is concluded by presenting the main excerpts relating to a discussion period that took place post the data collection and processing period with a senior representative (V1) from the CE sector.

5.2 Background information

Participants were asked to provide background information regarding their organisations' establishment, main activities, overarching ethos, and motivation for engaging in CE when commencing the interviews. The interviewees provided several individualised accounts of these probes, highlighting differences in their interpretation of CE. However, overlapping themes from the examples revolved around creating a positive environmental impact, improving the quality of life within the locality, providing community support to sustain and support activities and community assets, addressing more profound issues of socioeconomic importance, and empowering vulnerable communities.

Three participants pointed towards a specific event that initially mobilised individuals within their communities, eventually leading to the creation of a CE organisation. Whilst one interviewee mentioned a community showing of a documentary, *"There was a showing of 'An Inconvenient Truth'³⁹ film [...] that raised interest and then went through*

³⁹ An Inconvenient Truth is an Oscar-winning documentary that focuses on climate change and environmental catastrophes arising directly from human activities.

networks and local publicity to find people that were keen on it” P1 (CE, NW, FTE). A second participant explained that their organisation was founded to assist their local authority, which has recently declared a climate emergency, with achieving its environmental targets. They explained, “We set up with the remit to support LAs with their climate and ecological emergency [...] helping them produce an action plan to deliver” P6* (CE, SW, VOL). A third interviewee pointed towards a natural disaster within their locality as the main driver of climate-driven action. They explained that “There was a flood in [REDACTED] in the year 2000⁴⁰ [...] that’s what made everybody think that climate change is real [...] [REDACTED] [REDACTED] was set up, and from there [REDACTED] was set up” P10* (CE, SE, VOL). Two organisations were cited to be established due to this newly found climate change awareness. An initial group acted as a broader sustainability initiative from which a CE organisation was later founded.*

Other excerpts point towards a specific individual that was responsible for galvanising interest among members of the community. One interviewee explained that a particular individual that was well-known within the community developed a keen interest in RE projects and the CE approach and was able to extend this interest to others within the locality. *“There was a gentleman [...] he got very interested in energy [...], so we all got interested [...] I did some feasibility [...] We found some sites [...] We registered a CBS, and we did a community share offer” P15* (CE, NE, VOL). In a similar example, a second participant pointed to their founder as the key member due to their experience working in the RE sector internationally. They explained that “Our CEO and founder, [...] was looking to develop new business models to make switching to RE economically appealing to homes and businesses [...] setting up [REDACTED] as a not-for-profit CE organisation was to tackle the twin barriers that stop people taking up low carbon technologies, which are money [...] and technical complexities” P4 (CE, SE, FTE).*

The interviews suggest the existence of pre-existing relationships between individuals within a community in some capacity. Interviews found that whilst some CE organisations stemmed from an existing, more general organisation involved in broader sustainability issues, others were completely independent. One interviewee explained that pre-existing relationships, in addition to having relevant skillsets, were both essential for the establishment of their CE organisation *“People in [the area] were quite keen on it [...], and*

⁴⁰ A government report relating to the flood suggests that the total cost of the flooding was estimated to be £88 million, suggesting its impact was catastrophic on the local community.

people interact very closely between the villages [...]. We had a number of people who had retired recently and had the skills to do that sort of work” P1* (CE, NW, FTE).

5.2.1 Establishment, size and structure of respondents’ organisations

Similar to the interviews, the first question in the survey instrument also asks respondents to provide general information about their organisation. Specifically, this information includes the organisation’s name (for coding purposes), the year it was founded, the number and distribution of its workforce (between FTE and volunteers) and its adopted legal structure. A combined diagram of the relevant information is presented in Figure 10 below.

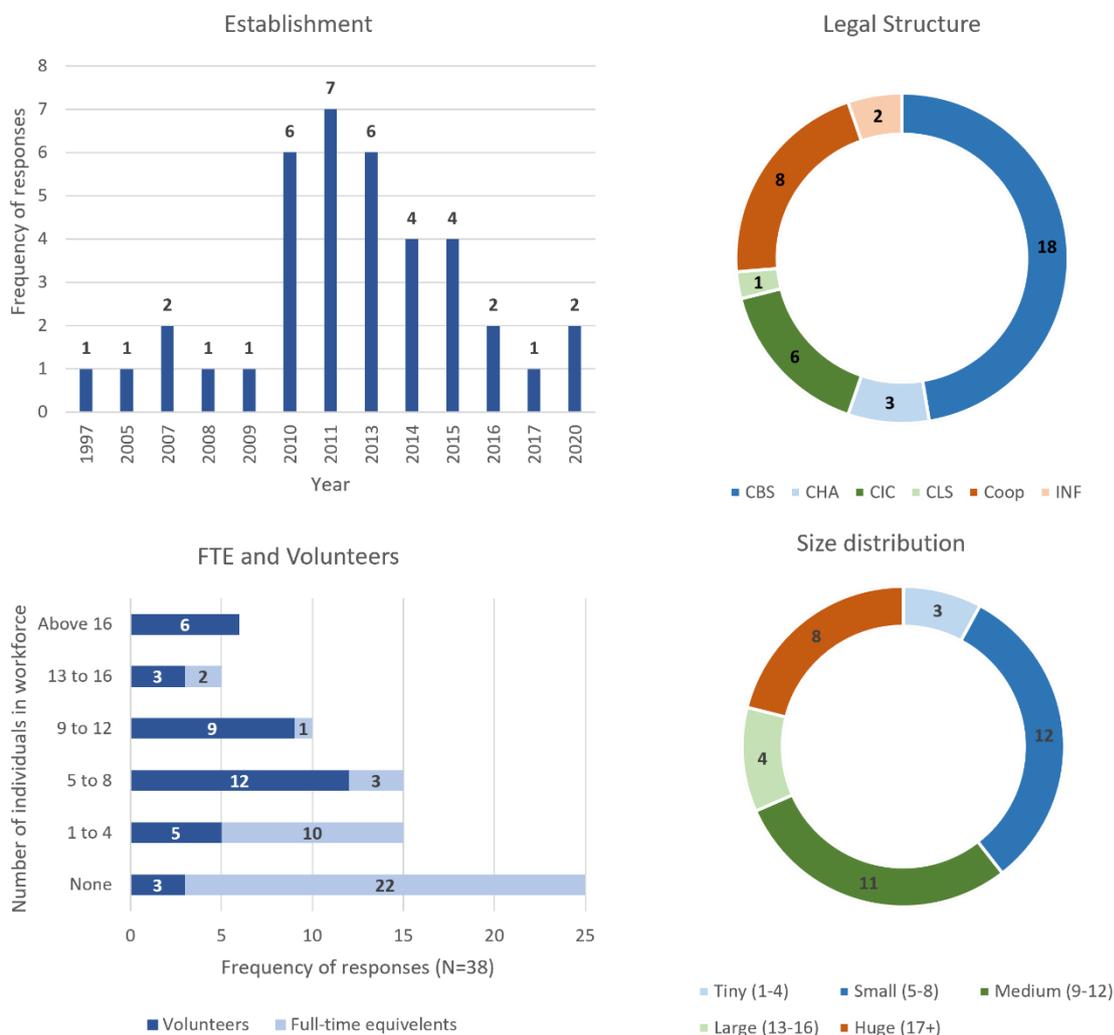


Figure 10: Frequencies of responses relating to the establishment of the organisations, their adopted legal structure, the distribution of their workforce between full-time equivalents (FTEs) and volunteers and the organisation’s size (Calculated as the sum of FTE and volunteers). Self-created using Microsoft Excel. Data were obtained from combined survey respondents (N=38).

Abbreviations: CBS= Community benefit society, CHA= Charity, CIC= Community interest company, CLS= Company limited by shares, Coop= Cooperative, INF= Informal.

The establishment of the survey respondents' organisations ranged from 1997-2020, indicating that the responding sample is representative of all periods of CE development, as previously explained in Chapter 1.

Most of the survey respondents (N=19) reported that they were founded between 2010-2013, benefitting from the favourable policy landscape that allowed many CE organisations to become established during that period, as explained by one of the interview participants whose organisation was also found in this period, the note that *"We started in 2011 [...] it was a time where the FIT was brought in [...] it was becoming feasible to do solar PV systems [...] the plan was to do lots of small-scale systems on community buildings"* **P2*(CE, NW, VOL)**. Similarly, a second participant indicated that during this time, newfound possibilities rendered many different initiatives feasible, creating space for an experimental project to come to fruition as a CE organisation. *"It was the first instalment of CE solar on social housing in the UK [...] it gained a lot of momentum [...] following that, there was appetite, and it made sense to do such projects [...] the CEOs founded ██████████ to scale this up in 2011"* **P5 (CE, LDN, FTE)**.

Other participants suggested that whilst their organisations were previously founded, the arrival of favourable policies allowed them to extend their activities to encompass an energy strand *"It grew out of and is effectively part of another organisation"* **P12* (CE, NW, VOL)**. In some cases, this was simply an extension of the current organisation. In other cases, this led to forming a sister CE organisation to specialise in generation activities. As one interviewee explained, *"It's a CBS that was established in 2013 [...] we saw an opportunity to use the power on the river [...] we began life effectively as an organisation running a community centre, it was during that process of trying to regenerate the community centre that we looked to see if there was a way of putting green energy into that building"* **P3 (CE, NW, VOL)**.

CBS structures constitute most of the adopted legal structures by the survey respondents, with a total frequency of 19. This was followed by Co-ops (8), CICs (6) and charities (3). Some organisations that did not fit commonly adopted CE structures included one that stated that they were guided through a constitution but needed to be formally registered and thus had no legal structure. This was interpreted and coded as informal. A second

consultations-based organisation reported that their organisational structure as a company limited by shares [CLS].

5.2.1.1 Full-time equivalent and volunteer members within CE organisations

Following generalised information relating to the establishment of the organisations and their adopted structure, participants and survey respondents were asked to provide details regarding their day-to-day members. Specifically, the questions attempted to gain insight into how the organisations distributed their workforce and the reasons and perceptions concerning this distribution.

Overall, the interviewees explained that their organisations depended on volunteers who often dedicated much time to CE activities. As one participant explained, *“There are huge amounts of voluntary time that’s been put into it [...] We have no employees. The whole thing is voluntary and community-based [...] the maintenance team is a dozen people [...] some of whom are shareholders [...] some just like tinkering with machinery”* **P1* (CE, NW, FTE)**. In another account, a second participant explained, *“Even though we are a community scheme, no one is taking a direct salary from this [...] We are running it as volunteers”* **P3 (CE, NW, VOL)**.

Some participants further clarified how they have had to increase their workforce capacity due to organisational growth. In one account, one interviewee explained that initially, their organisation comprised three voluntary members who were simply interested in a CE scheme. However, its unprecedented growth resulted in a need to expand. *“When this started to snowball, we realised we couldn’t run it on our own, so we called other volunteers, and lots of people said yes, we’ll come and help!”* **P12* (CE, NW, VOL)**. In a similar example, a second interviewee also reiterated these views, suggesting that it came from sustained organisational growth. They explained that *“We’re a completely voluntary organisation [...] only four or five people initially [...] now there are probably over 50 enthusiasts or community volunteers working on one form of project or another”* **P3 (CE, NW, VOL)**.

Interestingly, whilst some organisations opted to seek more volunteers to sustain these activities, other interviewee accounts suggested that their organisations could create employment positions and opt for FTE roles instead, creating a mix of volunteers supplemented by FTE. The following excerpt was selected to illustrate the decision-making process and the balance maintained within a CE organisation to create a FTE role while

maintaining the organisation's core voluntary principles. *“At one point [...] six of us put in £2000 to employ somebody through another organisation [...] we were always clear that we didn't want to be an organisation that employed people [...] they were contracted to do our admin for us and be our office” P2*(CE, NW, VOL).* In a second example, an interviewee explained how they initially became affiliated with the organisation as a volunteer, which has since evolved into an employment role. *“I volunteered for ██████ for about seven or eight months before I was thankfully offered a position as the second employee to join the organisation” P4 (CE, SE, FTE).*

Interviewees who represented larger organisations, such as a large CE organisation or intermediary network coordinator, expressed different accounts relating to this distribution. Their excerpts suggested that in contrast to their CE counterparts, they predominantly had employees as opposed to volunteers due to the nature of their operations. As one interviewee explains, *“Because of the way we're set up [...] we don't have volunteers [...] one in a while we get some people say we'd like to volunteer [...] depending on what they can do, sometimes we have some desktop research [...] Though one of the other hydros, that one of our CE organisations owns and runs [...] they have volunteers, and it works fine for them, but it's much smaller and much more local and safer installation to service” P7 (LEPEH, SE, FTE).* In a similar account, a second participant representing a large CE organisation explained that although the board was predominantly voluntary, employees constituted the organisation's workforce. *“The board is almost entirely voluntary [...] only two employed members of the board [...] We have eight paid staff members [...], and volunteers are always changing” P4 (CE, SE, FTE).*

Details relating to the distribution of FTE and volunteers that comprise the primary workforce responsible for the day-to-day operations of the CE organisations were also obtained from the survey instrument. Respondents were asked to state the number of FTE and volunteer members within their organisations in a short answer format to allow for approximations and ranges (if applicable). There was a high degree of variation in the responses, with a volunteer range of 65 and a smaller FTE range of 16. Most responding organisations (N=22) reported relying entirely on volunteers with no FTE, whilst only three reported full employment within their organisation. Similarly, ten respondents also noted that they had minimal FTE ranging from 1-4. Respondents primarily depended on volunteers, with the majority (N=12) of organisations noting that they had 5 to 8 volunteers at any time. When probing the interviewees into providing details as to why

they opted for volunteers instead of creating FTE roles, they mostly maintained that this resulted from financial restrictions. One interviewee explained, *“If you look at our turnover, we wouldn’t have the money to employ anyone”* P1* (CE, NW, FTE), whilst a second interviewee maintained that it was an economically unfeasible option. *“I don’t know, if you had to pay people to do the work for CE [...] there’s no business model for it. It does very much rely on volunteers giving a lot of their time unpaid”* P15* (CE, NE, VOL). The data shows that CE organisations have a combination of volunteers supplemented by essential FTE roles. Creating FTE roles can offset voluntary dependence; organisations with at least four active volunteers are less likely to have FTE members.

5.2.2 Main organisational activities

The collected data, in addition to prior desk-top research during the participant selection phase, showed that CE organisations primarily engaged in energy generation activities, predominantly in the form of electricity generation through solar PV. Descriptive information about the interviewees and their organisations showed 11 organisations whose main activity was RE generation. Other primary activities included consultation with other CE organisations and hosting and coordinating CE networks. Although several secondary activities were identified, they can be categorised as those targeting energy efficiency or education.

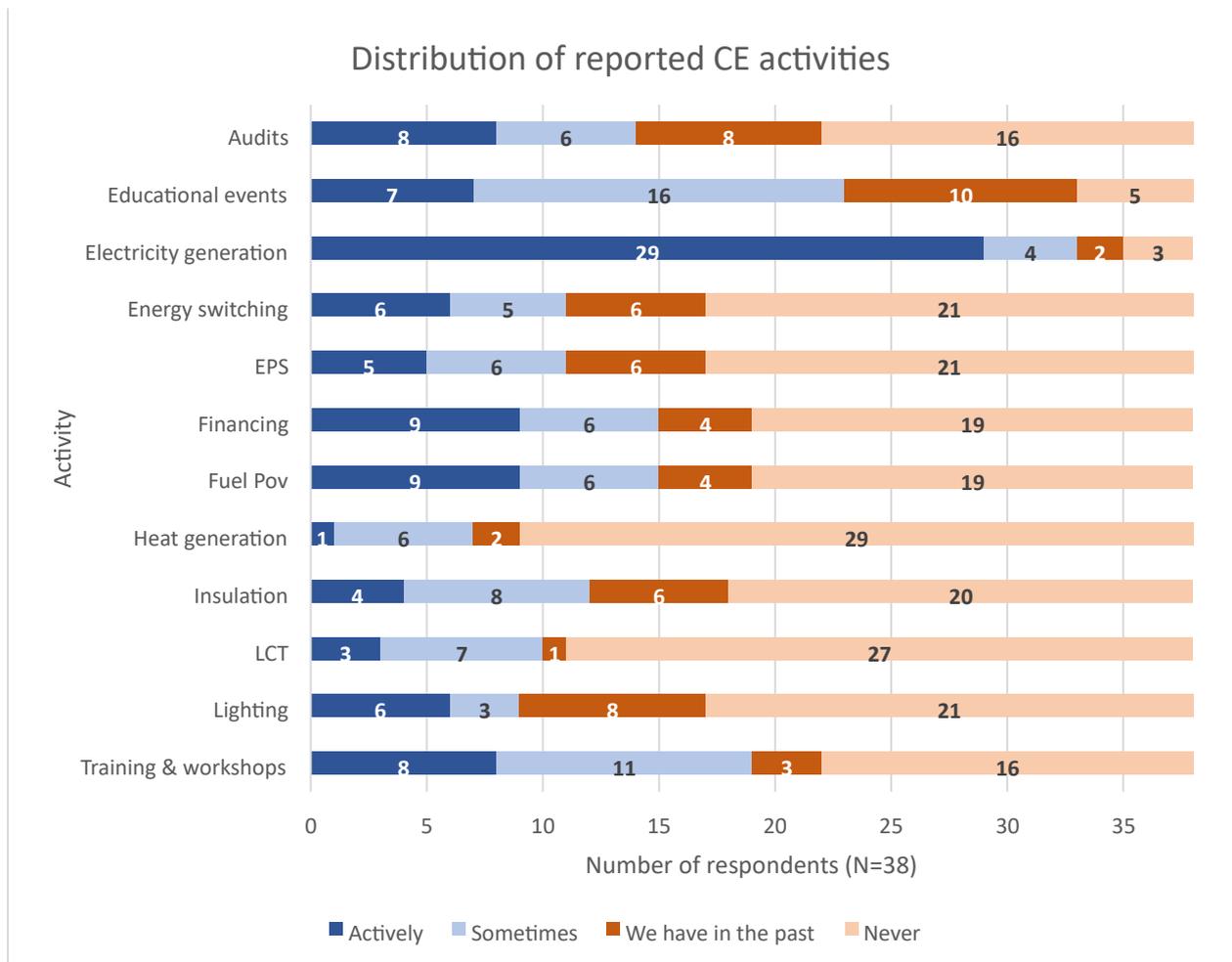


Figure 11: Frequencies of CE activities. Self-created using Microsoft Excel. Data were obtained from combined survey respondents (N=38). **Abbreviations:** EPS = Energy performance surveys, LCT= Low carbon transportation.

The surveys asked the respondents to clarify their primary organisational activity. 26 respondents stated that their organisation primarily engaged in supply activities involving RE generation. Four organisations responded that demand and supply activities were classified as primary. Four others noted they had no RE generation assets and focused on demand-related activities such as energy efficiency and reducing energy usage. Four respondents indicated that they did not fall within other categories, specifying in an included textbox that they considered their main activity as advocacy, consultations, carbon footprint and network coordination.

Following this, survey respondents were presented with 12 activities associated with CE organisations and were asked to specify their applicability to their organisation.

Recognising that the organisations may undertake new activities and current activities may

be dropped, the survey allowed the respondents to differentiate levels of engagement about the activities with the inclusion of “Actively”, “Sometimes”, “We have in the past”, and “Never” categories.

From Figure 11, it can be seen that most responding organisations reported active engagement across multiple activities simultaneously. Most survey respondents (N=29, 76%) indicated that their organisations were actively engaged in electricity generation as part of their main activities. Educational activities were found to be the main secondary activity, with 16 of the total respondents indicating that they “sometimes” conducted them and a further 10 respondents reporting that they had previously engaged in educational activities.

Other highly reported activities included the inter-related activities that target energy efficiency measures, comprising audits, lighting, energy switching and insulation, which are frequently taken together. The figure also shows that half of the responding organisations either actively (N=8) or have previously engaged in training activities (N=11). These activities and further consultation-based activities, which this survey did not include, constitute important supplementary revenue streams for the CE organisations successfully implementing them.

One drawback of the survey was its inability to differentiate between the purpose of the activities conducted by the organisations. For example, the interviews revealed that their organisations engage in some activities for commercial purposes and others to create social impact through community engagement. Additionally, the same activity may be conducted for a dual purpose, as explained by one interviewee who suggested energy efficiency was both a commercial activity and part of their social impact activities. They explained that their organisation was involved in commercially improving energy efficiency measures with local businesses. Simultaneously, a portion of the profits from this activity, in addition to some grant funding, whenever it can be obtained, was used to co-fund other energy efficiency measures offered free of charge to vulnerable individuals and families within their community. In another example, a second participant pointed out, *“The ethos of [REDACTED] is to empower communities across London through their energy generation and usage” P5 (CE, LDN, FTE)*. They explained that part of this broader goal of empowerment involved offering a training programme to young individuals, which may be regarded as a formalised training activity provided by the organisation, an educational activity by nature and a form of social impact. The participant further explained that *“Our*

training programmes are paid [...] the kids learn a wide range of skills [...] the idea is that it can boost their employability and boost their self-confidence” P6 (CE, SW, VOL).*

Chapter 4 (4.4.2) explained that a correlation matrix using Spearman’s two-tailed t-test was created to examine inter-item relationships. A specific matrix comprising the main CE activities can be found in Appendix F1. Between the 12 activities, 21 statistically significant correlations were identified. These were split between weak⁴¹ (10), moderate (7), strong (2) and very strong (2). All the statistically significant coefficients, except one (Egen-Switching -0.341), were positive relationships suggesting that the activities complemented each other. Only two activities, educational and heat generation, displayed no inter-item correlations with any other activity.

From the correlation matrix in Appendix F1, a core group of activities comprising audits, insulation and energy switching had comparatively strong inter-item correlations with most other activities. Other activities, such as EPS and Lighting, correlated with the abovementioned activities. They may all be regarded as small parts of energy efficiency and demand reduction activities taken up by CE organisations. Activities such as fuel poverty and training were also found to have correlations with these core activities, suggesting that CE training events and their fuel poverty alleviation activities all target these same facets. Interestingly fuel poverty and energy switching were found to have a comparably strong correlation of 0.621, whilst LCT and insulation were also found to have a surprisingly similar correlation of 0.671. Although the former may indicate a relationship between energy switching and fuel poverty, a concept which is also later discussed as “*Low hanging fruit*” P13 (CONS, NW, FTE) methods of fuel poverty alleviation amongst other similar mentions by two other interviewees (P5 (CE, LDN, FTE) and P11* (CE, NW, VOL)), the latter provides some indication that whilst inter-item correlations may be used to inform a relationship between variables, it does not imply causality.

5.2.3 Characteristics of CE organisations

The organisations’ emphasis towards specific traits is subject to change over time depending on multiple factors such as a change in the focus of an organisation, a temporary period of growth or hardship which may cause the organisation to change its actions or an adaptation to external influencers. Highlighting this change, one interviewee

⁴¹ Weak correlations = ($\pm 0.3-0.4$), Moderate correlations = ($\pm 0.4-0.5$), Strong correlations ($\pm 0.5-0.6$), Very strong correlations = Above/below (± -0.6).

explained how their ethos as an organisation shifted over time from one that primarily focused on environmental goals towards one that emphasises organisational growth “*The main ethos was for the community to do something to tackle climate change [...] the current ethos is to continue to build RE projects*” P10* (CE, SE, VOL).

Seven characteristics relating to CE organisations were identified in the literature review, which is split across three main facets of benefits, engagement and ownership (Hoffman & High-Pippert, 2005; Raven et al., 2008; Seyfang et al., 2013; Walker & Devine-Wright, 2008; Walker et al., 2010). The survey asks respondents to comment on how important the characteristics were to their organisation. Frequencies of the responses showing how much importance is placed on these defining characteristics are presented in Figure 12.

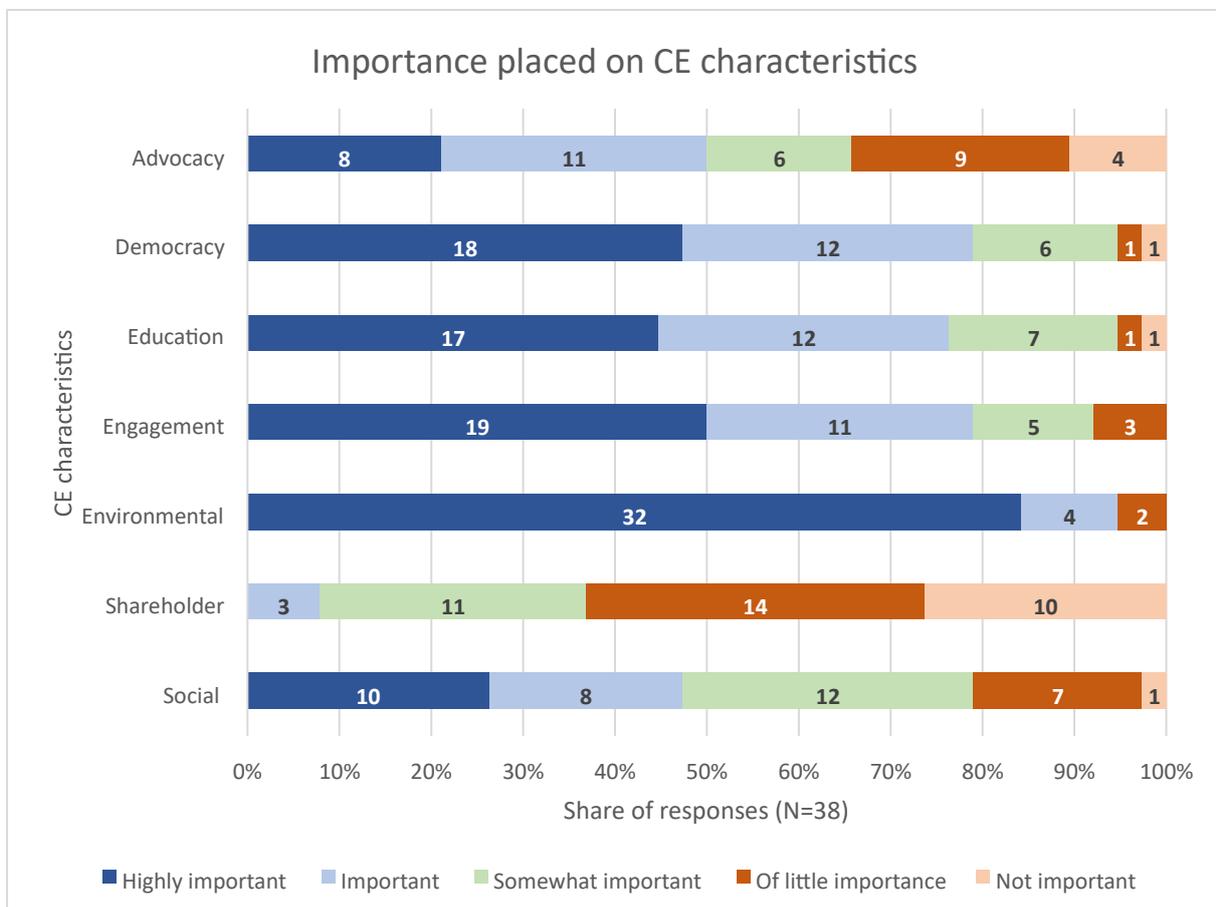


Figure 12: Frequencies representing degree of importance placed on CE characteristics. Self-created using Microsoft Excel. Data were obtained from combined survey respondents (N=38)

The responses in Figure 12 shows that the respondents share several similarities regarding the value placed upon specific characteristics. Initially, it can be seen that environmental value dominates the CE landscape, with 32 respondents stating that it is highly important to their organisation. This is closely followed by democracy within the organisation,

emphasising education and community engagement with 17, 18 and 19 responses, respectively. It is also observed that some characteristics, such as environmental emphasis, were likely to have been overstated while shareholder value was understated.

To better understand how these characteristics are related, an inter-item correlation matrix was created for the CE characteristics (See chapter 4) (Appendix F2). The correlation matrix returned seven statistically significant results, most of which were weak, with coefficients between 0.3380.395. Unsurprisingly, engagement was linked to advocacy, education and social impact, suggesting that engagement was a necessary feature of CE. A moderate relationship (0.429) between the importance of addressing environmental issues and social impact indicates that the two characteristics are intertwined. CE is argued to contribute mainly on social fronts through the RE sector. Interestingly, a negative relationship was observed between community engagement and shareholder reward. Although the correlation is weak, with a coefficient of -0.321, it indicates the balance CE organisations must find between their activities' commercial, community and social aspects.

As a final component of CE characteristics, individualised figures were created from the survey data for all the responding organisations to visualise their selected criteria in a comparative and standardised format. This can be referred to in Appendix G (G1 for RS respondents and G2 for GS respondents). Alongside the individualised figures, four combined diagrams were created to show differences in the importance placed on specific characteristics and how they shift based on these differentiating attributes.

Firstly, CE organisations were divided between four periods associated with CE development previously discussed in Chapter 1 (see Figure 1). In total, six organisations were founded in the first period (up to 2010), thirteen were established in the second period (FIT introduction 2010-2012), fourteen were founded in the third period (first FIT reduction, 2013-2015), and five were established in the final period (second FIT reduction, past 2015).

Secondly, the responding sample was categorised based on its region and location. Initially, the groups were split across five geographic regions (NW, NE, LDN, SW and SE); In figure 13 below, the NE was dropped from the location figure due to only one respondent (RS1) representing that region.

These are followed by categorising the responding sample about their legal structures and relative size, taken from the aforementioned descriptive statistics presented in section

5.2.1. These diagrams in the combined figure show how the respondents emphasised specific characteristics and how other factors may influence their interpretation of CE.

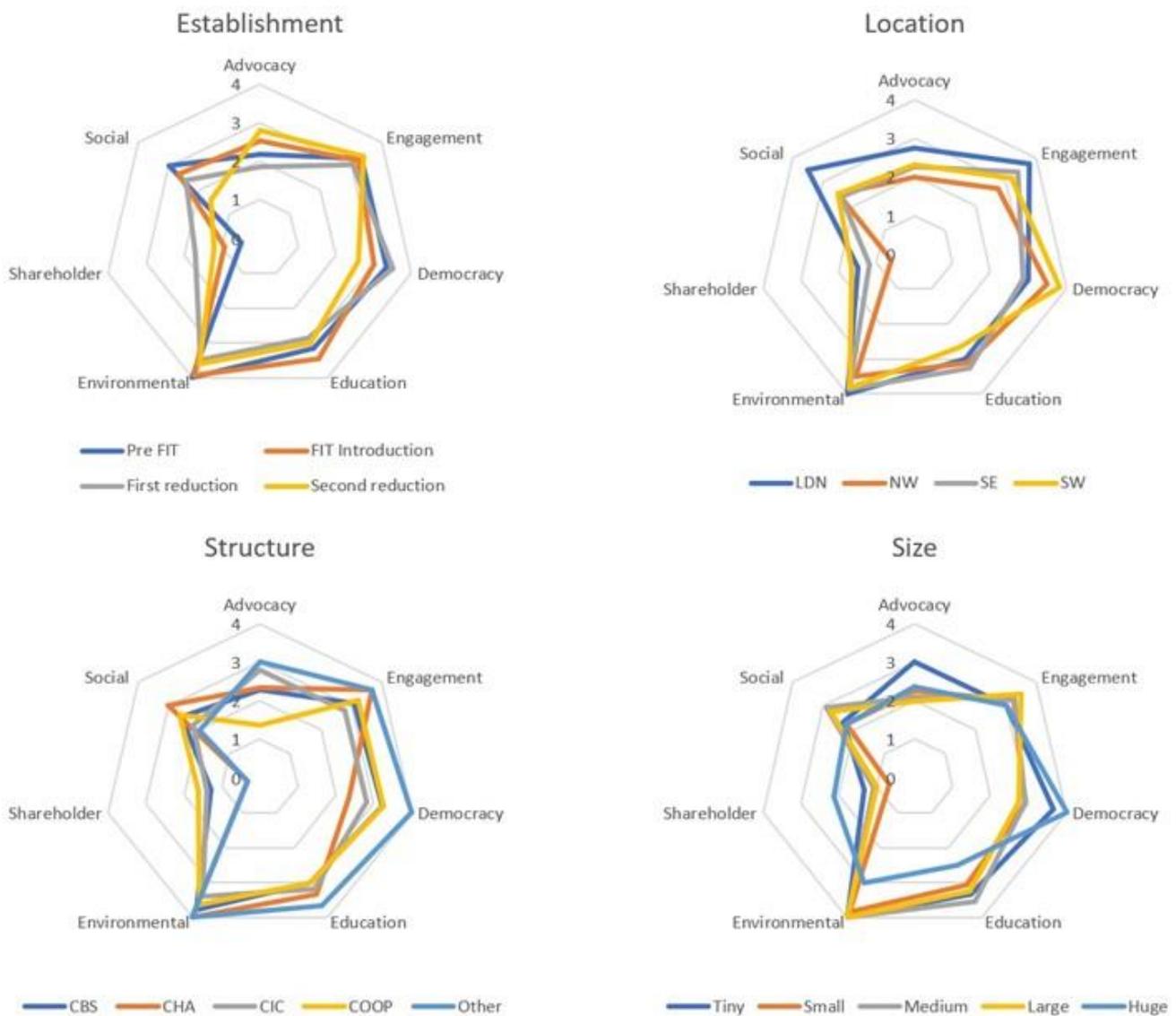


Figure 13: Compilation of diagrams denoting the importance placed on CE characteristics. Self-created using Microsoft PowerPoint. Data were obtained from a combined survey instrument. **Abbreviations:** LDN= London, NW= Northwest, SE= Southeast, SW= Southwest, CBS= Community Benefit Society, CHA= Charity, CIC= Community interest company, COOP= Cooperative. **Size:** Respondents organisations were categorised in 5 corresponding sizes from the raw data, these are: Tiny (2-4 individuals), Small (5-8 individuals), Medium (9-12 individuals), Large (13-16 individuals) and Huge (Over 17 individuals). **Scales:** 0=Not important, 1=Slightly important, 2= Moderately important, 3= Important, 4= Very important).

From the combined classification profiles presented in Figure 13 and the individualised profiles created in Appendix G, it can be seen that overall, the importance given by CE organisations concerning the derived characteristics was similar throughout the responding sample, irrespective of the different classifications that are presented. The

distinct “D” symbol denoted in the profiles is indicative that the most emphasis placed by the responding sample lies primarily on environmental considerations, followed by engagement, democracy and education constituting their purpose (Walker et al., 2007).

Although CE literature and several interviewee accounts suggest that CE organisations actively seek to contribute towards social impact issues, this was less demonstrated in the importance placed on social impact. Instead, social impact was a secondary component in their activities and defining characteristics with most respondents indicating that they were either slightly or moderately important. From these results, there may be an imbalance between the willingness to contribute on the social front and the reported importance towards this characteristic. This is most likely a result of the organisations' limited personnel and resource base capabilities, which often see them having to engage in these activities at a reduced capacity due to constraints.

Expanding on social impact, the classification profiles targeting establishment showed that CE organisations established before the FIT placed the highest degree of importance on social impact. It can be seen that social impact decreases in the upcoming periods, with a low mean of 1.6 in the final period for organisations established after the second FIT reduction.

Overall, respondents placed the same degree of emphasis on these characteristics irrespective of their region or locality. Although those in London noted having placed more importance on social impact, this may be a distorted finding due to the limited number of respondents (N=4) representing CE in London.

The most variability between the respondents was observed when they were categorised based on their legal structure. Unsurprisingly, charities were found to place the highest importance on social impact whilst simultaneously reporting no importance on shareholders. Their legal structures do not allow for the issue of shares and are primarily centred around social impact.

Cooperatives placed the highest emphasis on appeasing shareholders while reporting little importance on advocacy. Secondary research showed that responding organisations adopting a cooperative structure were mainly affiliated with Cooperatives UK. This may suggest that the intermediary organisation advocates on behalf of its members whilst the organisations themselves can better focus on their activities and daily practices.

Furthermore, their higher emphasis on shareholder value is still secondary to other characteristics such as environmental emphasis, community engagement and education.

When inspecting the differences based on the organisation's size, it was noted that tiny organisations noticeably placed more importance on advocacy than their counterparts. The interviews showed that smaller organisations, especially rural ones, had a closer relationship with parish councils and local authorities. Additionally, it was demonstrated that tiny and huge organisations placed more importance on democracy. Whilst this is unsurprising in tiny organisations, the findings relating to huge organisations suggest that once the organisation crosses a certain threshold in size, democracy is reemphasised due to diverging and sometimes contradicting interests of its members. Whilst the organisation can no longer appease all its members, its democratic values ensure that the vision and expectations upheld by the majority are reflected in the organisation.

Whilst most responding organisations fit the following criteria, certain outliers are observed when inspecting the individualised classification profiles in Appendix G. Firstly, there appears to be a group of respondents that places low emphasis on certain characteristics such as democracy, education and social impact.

Further, desk-top research made it clear that certain respondents, such as **GS3** and **GS20**, are large charities with a traditional hierarchical structure with CE activities. Other organisations, such as **GS15** and **RS8**, are CE organisations with FTE, and therefore notions of democracy in decision-making are subdued for a traditional, top-down structure.

With regards to educational activities, whilst numerous organisations (**GS1**, **GS22**, **GS23**, **RS6**, **RS10** and **RS13**, in Appendix G) were found to not engage in these activities, other respondents such as **GS21** was found to have conducted numerous instances of these activities with local schools, universities and other climate-driven local organisations.

Overall, from inspecting these characteristics, CE approaches can be considered unique and require individualised tailoring to suit the requirements and vision of the community itself. However, when mapping these across a standardised series of characteristics to allow for their comparison, the differences are subdued, and the striking similarities between the organisations are highlighted.

5.3 Formal qualifications and previous experience

Qualitative findings:

Interviewees were then asked to provide information about their educational and professional backgrounds to establish a basis for their levels of expertise and the skills available to their respective organisations. Whilst these factors are considered prerequisites for OL (Easterby-Smith & Lyles, 2012), especially at the individual level (Zahra & George, 2002), they are presented alone to provide additional context into the interviewees and their co-members within their organisations.

Participants were proud to recognise that the essential skills involving expertise in founding and operating the CE organisation came from within their communities. One individual stated that *“Within our community, we had an electrical engineer [...] [and] a civil engineer”* **P3 (CE, NW, VOL)**. Another commented, *“A lot of professionals in the village [...] working in the chemical, petroleum, electrical engineering type area [...] as well as a range of other expertise, community experience and so on”* **P12* (CE, NW, VOL)**.

Webpages of the participants' organisations were scouted before the interviews to better understand the organisations and their members. Through desktop research, formal qualifications from higher education institutions were prevalent across all organisations. Although participants were not explicitly asked about their formal qualifications, some shared these details to indicate their relevance or emphasise their irrelevance. Interview excerpts included *“I did an MSC in pollution and environmental control [...] MA in environmental philosophy [...] PhD in Philosophy, about the regulation of chemicals”* **P2*(CE, NW, VOL)**, *“I studied RE and architecture at postgraduate level”* **P7 (LEPEH, SE, FTE)** and *“I did classics at university”* **P9 (INT, SE, FTE)**. However, the generally older demography of individuals associated with CE organisations implied that academic backgrounds and formal qualifications were secondary to work experience and industry expertise. Overall, the interviewees demonstrated that these factors took precedence over traditional education.

When responding on their professional backgrounds, the interviewees explained that these were predominantly from STEM⁴² fields, with other socially driven experiences and minimal commercial backgrounds. The following excerpts were selected to provide context into the participants' work-related backgrounds. *“The key people were a retired manager [...], a telecoms engineer [...], a solicitor [...] I also volunteer for CAB⁴³”* **P1* (CE, NW, FTE)**.

⁴² STEM = Science, technology, engineering & mathematics

⁴³ CAB = Citizens Advice Bureau

“My employment background [...] was in customer services in finance” P4 (CE, SE, FTE).

“I’ve worked in the industry [...] but also voluntary organisations” P6 (CE, SW, VOL).*

The abovementioned roles show that prior experience in the CE field is not a prerequisite for involvement in its organisations; one participant explicitly mentions that their broader roles in the public and voluntary sector provided the tools and expertise to be applied to CE. They explain, *“I worked for a cooperative [...] worked in local councils [...] also communities [...] I’ve never worked in a for-profit context at all [...] no energy experience at all” P10* (CE, SE, VOL).* Similarly, another participant notes, *“I am a plant ecologist [...], but we all have to learn as we go along” P12* (CE, NW, VOL).*

Only one participant from the sample explicitly indicated a background stemming from the CE sector; they explained, *“My first job was in the local authority where I grew up [...] to work with communities on climate change [...] I was very involved in CE projects right from the beginning” P7 (LEPEH, SE,*

FTE). They explained that in addition to their current role as an *“Energy project manager” P7 (LEPEH, SE, FTE),* they also remain actively involved in assisting CE organisations to become established; they explained that *“I also have tried doing CE projects in my own personal time” P7 (LEPEH, SE, FTE).* Whilst no other participants had direct prior CE experience, there were several mentions of their colleagues within the organisation with some CE backgrounds. For example, one participant notes, *“We’ve got a board member who’s come from [REDACTED] [...] he had been with a small group, then came and worked with us” P15* (CE, NE, VOL).* The participant further explained that in addition to the benefits they have gained from this specific member, they have also benefited from this new role; *“We’ve been able to suggest some things for his group” P15* (CE, NE, VOL).*

CE members were found to have accumulated decades of experience in diverse backgrounds. In one interview, commenting on co-workers, one participant mentioned, *“They have phenomenal experience and networking connections” P4 (CE, SE, FTE).* Often, these individuals had multiple affiliations with organisations from academic, industrial, not-for-profit and public backgrounds. When asked about their co-members backgrounds, one

CAB is a UK-wide independent charity specialising in providing advice and assisting vulnerable individuals with various issues. In their 2021-2022 impact report, they have assisted over 3 million individuals, and 40.6 million have visited their website (CAB, 2022).

participant indicated that the key members comprised of *“A project manager, commercial energy assessor and someone to do full-time finance [...] volunteers are always changing [...] every winter I have a volunteer who helps me out with the fuel poverty stuff”* **P4 (CE, SE, FTE)**, whilst another indicated *“There was one director who has his own solar company [...] another director had technical experience”* **P10* (CE, SE, VOL)**. In a second example, the participant highlights the diversity of skills within their organisation, they mention; *“On the ecology side [...] we have a farmer whose very active [...] she runs another group, and she’s one of the founding members [...] We also have software designers, food technologists [...] councillors [...] teachers [...] it’s quite across the board, which is very nice”* **P6* (CE, SW, VOL)**. They further explained that whilst some members had previous affiliations in similar groups involving broader sustainability and environmentalism issues, others had *“Never been in an environmentalist group before”* **P6* (CE, SW, VOL)**.

Whilst various educational and professional backgrounds point towards overall diversity and inclusion, there was a slight inclination towards technical, financial and legal backgrounds and those affiliated with the energy and non-profit sectors. Regarding these skillsets, one participant commented, *“Anyone can contribute to a CE group [...] they require a diverse range so skills, you obviously need the people who might have legal or engineering background, but equally, you need people who can manage social media platforms or whatever”* **P14 (CE, SE, FTE)**.

The excerpt below shows another participant who suggested that the general self-selecting nature of individuals towards voluntary activities may be a key reason why this is the case, *“People are self-selecting [...] People are not going to volunteer to do something they don’t like or enjoy or know about”* **P5 (CE, LDN, FTE)**. Due to the self-selection process, these individuals are primarily attracted to these settings. They can see their experiences culminating into meaningful contributions within the CE sector instead of alternative forms of voluntary action. Supplementing this, participants were asked about their motivation for taking the step specifically into CE to gain insight into this self-selection process. In their accounts, most participants highlighted broader contributions and emphasised impact instead of directly being motivated by CE. A selected excerpt shows the general motivation; *“I just decided that if I’m going to be working [...], it might as well be towards something valuable [...] have a bit more of a lasting legacy”* **P4 (CE, SE, FTE)**.

Quantitative findings:

Due to the survey instruments targeting organisational level responses as opposed to questions aimed at individuals, the survey does not individualise scales for each member within the organisation to state their educational and professional backgrounds. As a result of the interviews, educational backgrounds were omitted from the survey. From the sequential design of the data collection, five categories were developed to group individuals from different backgrounds into relevant and comparable sections. Respondents were asked to grade the applicability of backgrounds to their organisational members, as shown in Figure 14. The results correspond to the frequency of responses concerning each of the given categories; for example, 18 respondents indicated that members from the energy sector, in energy-related backgrounds as the most cited form of background expertise to their organisations, whilst the minimum expertise came from the nonenergy sector, in non-energy backgrounds with 14 responses.

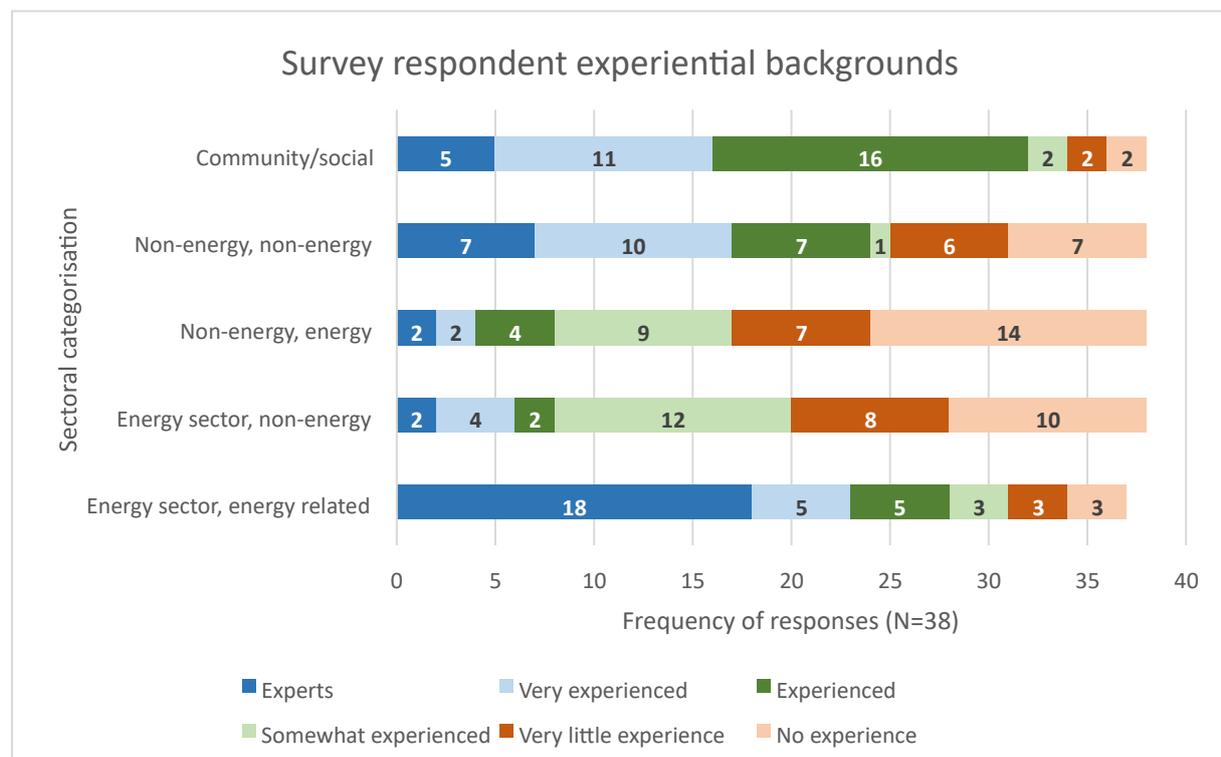


Figure 14: Distribution of past experiential backgrounds of organisational members. Self-created using Microsoft Excel. Data were obtained from combined survey respondents (N=38).

From Figure 14, it can be seen that individuals predominantly came from energy sector backgrounds, working directly on energy-related activities. The second most prominent experiential background came from those working in the broader community and social type backgrounds. The interviews suggested that individuals likely had a combination of energy and community/social skillsets, often specialising in one field as a professional

employment-based role whilst engaging the other voluntarily. Although the figure is skewed, emphasising specific backgrounds over others, the responses also highlight the variations between combinations of these skill sets between the organisations themselves. For example, most responding organisations to the survey instrument reported a mix of all these backgrounds. Three respondents noted having all their members represented by less than two categories. Two responding organisations, **RS7** and **RS8**, indicate that their individuals came from energy backgrounds in energy-related fields. Lastly, **GS12** reported that all its members were only affiliated with community and social backgrounds.

The interviews and survey instrument highlighted the diverse skillsets individuals brought to their respective organisations. Whilst there were clear overlaps between the individuals regarding their organisations' levels and areas of expertise, each organisation's combinations of the skillsets were unique. Some organisations were observed to have a disproportionate number of individuals from STEM fields, mainly from an engineering background, while others were of a commercial background, even within the wider RE field.

5.4 Covid-19

Following background and general information questions, the following section focuses on the impact of the Covid-19 pandemic. Question 3 in the interviews asked participants to describe their organisational experiences and changes to adapt to the changing circumstances due to the pandemic. Probes in question 3 attempted to steer the participants into discussing issues around their internal practices, community engagement, interorganisational relationships, networking events and financial impacts immediately related to the pandemic.

Based on the overall responses, the pandemic has had a mixed impact on CE in England. Whilst most participants noted little to no effect, others highlighted instances where they were negatively impacted. Four broad themes arose from the thematic analysis: organisational routines, community engagement, financial impacts and impacts on members.

5.4.1 Organisational routines

The following section focuses on organisational routines. The main routines the participants discussed were their internal communication between individuals concerning

key issues and daily tasks required by the organisation, site activities for organisations that hosted RE technologies and forms of community engagement and socially driven activities.

5.4.1.1 Working from home and online communications.

Participants were asked to discuss how their internal routines were affected in the lockdown period; probes focused on day-to-day operations, team meetings and sight access. A shared view was the relative ease of adapting to working from home and communicating via online platforms. One participant explained that as an organisation, they *“Quickly started working from home [...] Set up our meetings via Zoom and Google hangouts⁴⁴ using our shared drives”* **P8 (INT, NAT, FTE)**. Others explained the perceived benefits of this switch; one participant commented, *“We’ve had our AGM⁴⁵ on Zoom, and it was better than before because everyone could ask questions [...] People who might not want to speak up in a meeting with 80 people can type one in a chat”* **P9 (INT, SE, FTE)** whilst another notes that *“We’re communicating a lot more [...] one of the plus sides of Covid is that people can communicate more easily over a distance without having to expend carbon in travelling”* **P12* (CE, NW, VOL)**.

Several participants were familiar with these routines from previous experience; the following excerpts suggest that several routines were already carried out similarly. At an individual level, participants indicated, *“The lockdown hasn’t changed things in the sense that I sit at home by the computer all day”* **P2*(CE, NW, VOL)** and *“Most of the work is done by me [...] on this laptop, and that didn’t change”* **P14 (CE, SE, FTE)**. At an organisational level, one participant explained, *“Our internal way of working hasn’t changed [...] were a virtual team anyway, we’ve never had an office [...] activity did drop off a bit. But now [...] I’m busier than ever!”* **P7 (LEPEH, SE, FTE)**.

The excerpts above indicate that CE organisations benefitted from their previous experience and capabilities to adapt to a predominantly online platform during the pandemic. Participants were also unanimous in accepting that their members had access to devices, allowing for an online switch. One participant indicates, *“Most of the members of our groups [...] they are relatively well off and have devices”* **P9 (INT, SE, FTE)**. The availability of tools, digital platforms and the pre-existing knowledge base to access and

⁴⁴ Zoom and Google Hangouts are online video calling platforms utilised during the Covid-19 pandemic. Alongside them, other platforms that gained popularity included MS Teams and Skype.

⁴⁵ AGM = Annual General Meeting

utilise these tools should not be surprising, especially considering the high socioeconomic status CE members generally fall into (Radtke, 2014).

Whilst most of those interviewed provided positive accounts, one participant indicated difficulties in online adaptation due to a lack of technical expertise. Commenting on their ability to work from home, they mentioned, *“We’re a small and underfunded organisation, we don’t have an IT specialist, and our technology was a bit limited [...] you couldn’t get access to the shared drive [...] it was muddled and confusing for quite some time. So that had an impact”* **P10* (CE, SE, VOL)**. The interviewee later mentioned that this issue has since been addressed; however, it was also noted that problems involving communications and lack of access often frustrate members due to their adverse effects on the organisation.

In addition to technological barriers, another participant cited access to sensitive information as an issue directly resulting from home restrictions. They explained that their organisation comprises both FTE as well as volunteers and further indicated, *“It’s a bit challenging to give volunteers access [...] if they’re coming into the office [...] you can just give them a laptop [...] all of that stuff from their home is a little bit risky”* **P4 (CE, SE, FTE)**.

Interviews found that although distinct issues around information access, site access and technological barriers were noted, on the whole, there was a minimal impact on the ability of CE organisations to quickly adapt to a working-from-home routine through digital means. This confirmed the ease of adaptability of these organisations, and specific events such as AGMs and weekly meetings were confirmed to have improved.

5.4.1.2 Site Access

During the lockdown, the energy sector was exempted due to being classified as an essential activity. However, there has been some confusion regarding these guidelines, resulting in inevitable delays and work permissions despite exemptions (Busch & Hansen, 2021). Commenting on the sector, one participant indicated that site access issues have *“Impacted their ability to go and survey buildings [...] which has had knock-on effects on timescales and delivery”* **P7 (LEPEH, SE, FTE)**.

Looking for specific examples from participants representing CE organisations, it was reported that, on the whole, organisations without generation activities or new projects were not impacted by site access issues. Similarly, those with solar PV technologies were

found to be unimpacted by site access, perhaps due to the passive and low-maintenance nature of the technology.

Participants representing organisations with hydroelectric technologies reported their experiences relating to site access. In their accounts, one participant indicates, *“It hasn’t affected our hydro operations at all [...] when things go wrong, two people go to the hydro, they socially distance”* **P1* (CE, NW, FTE)**.

In contrast, another participant explains, *“We had an exceptional flood [...] we needed to get that stone out so we could run efficiently [...] we had nearly three-month period when we couldn’t work on-site legally because of work restrictions [...] working on half power [...] which had quite an impact on generating”* **P3 (CE, NW, VOL)**. The issues explained by the interviewee suggest that for these three months, revenue streams which depend on generation would have been reduced, reflecting the loss in generation due to the debris issues faced by the organisation.

No other instances were reported relating to access or any other site-related issues. This, however, may not be generalisable due to the participants’ respective organisation not being engaged in certain maintenance operations or installation activities during this period.

5.4.2 Community Engagement

Understandably, community engagement was one of the core activities impacted by the pandemic. The following section explains accounts from the interviews relating to the impacts of Covid-19 on their engagement activities; interestingly, we are provided with an insight into the nature of the activities themselves and how the organisations have adapted and responded in this domain.

From the interviews, it was ascertained that CE organisations conduct engagement activities for a purpose. Some of the goals cited given by the participants during the interviews included *“Community outreach”* **P8 (INT, NAT, FTE)**, *“Eco fairs”* **P5 (CE, LDN, FTE)**, *“Educational activities”* **P4 (CE, SE, FTE)** and **P11* (CE, NW, VOL)**, *“Fundraising”* **P9 (INT, SE, FTE)**, *“Share offer launches”* **P14 (CE, SE, FTE)** and *“Training events”* **P5 (CE, LDN, FTE)**. The examples mentioned above show that these activities revolved mainly around attracting and educating community members not involved with the CE organisation, as well as events around raising money for given projects.

Overall, all interviewees reported that in-person engagement was significantly affected. One participant, representing a large CE intermediary, notes, *“A real drop in the community outreach work that many organisations would do for obvious reasons”* **P8 (INT, NAT, FTE)**; suggesting that the drop in engagement-related activities may be regarded as sectoral in scale as opposed to isolated cases. Another participant mentioned that their organisation was considered a *“Centre for the promotion of the education of the scheme”* **P3 (CE, NW, VOL)** due to deep-rooted ongoing engagement activities with *“Schools, both primary and secondary. Colleges and universities”* **P3 (CE, NW, VOL)**. However, it was mentioned that *“That has stopped completely”* **P3 (CE, NW, VOL)** due to restrictions.

Different approaches were taken to adapt, in line with CE organisations’ resilient and creature nature (Gupta et al., 2019). Several successful experiences were noted where online adaptation was successful. However, as expected, engagement generally remained low throughout the lockdown period due to an inability to access *“Traditional venues”* **P14 (CE, SE, FTE)**, such as town halls, community centres and open spaces (Berka, 2017), and further restrictions on in-person interactions.

One participant, whose organisation is involved in educational engagement activities with schools and universities, commented that they had adapted their site tours digitally. *“We have done two virtual tours of the hydro at the request of two universities”* **P3 (CE, NW, VOL)**. Another participant, whose organisation also engages with educational institutions, explained that they had begun online talks involving community members and students from the local school. *“We did a series of Zoom talks [...] attracted up to 30 or 40 people [...], and just now, we’ve had a photography competition for young people.”* **P1* (CE, NW, FTE)**. The excerpts provide insight into some adaptations to CE routines relating to engagement. Although minimal, the excerpts indicate that temporary adaptations could sustain engagement-type activities.

5.4.3 Financial impacts

Before the pandemic, the CE sector was already undergoing a significant shift in its financial approach due to a shifting policy landscape and evolving business models. Regarding impacts on revenues, several organisations already possess Power Purchase Agreements [PPA]’s, guaranteeing their main revenue streams are unimpacted.

During the interviews, it was noted that host buildings that were the predominant consumers of the generated electricity remained closed for a period; this, however, was

found to have no impact on the export of electricity due to the business models of CE. As one participant notes, *“Our business model is based on themes export for FIT and PPAs [...] In terms of income, it didn’t change significantly.”* **P10* (CE, SE, VOL)**. When explaining what closed buildings meant for income, another participant indicated, *“The [Host] buildings small shops are closed [...] if we don’t sell it, then its exported.”* **P15* (CE, NE, VOL)**. Indicating that revenue streams from energy generation projects remained unimpacted.

Due to progressive dialogue, an extension to the FIT was secured predominantly through efforts by CEE—these extended FIT applications from March to September 2020. *“The FIT has been extended for CE groups, and then Covid happened, and we needed another extension [...] it’s great to have one national body [CEE] that’s going to advocate on your behalf and obtained this extension”* **P5 (CE, LDN, FTE)**. The excerpt mentioned that a pandemic-related extension to FIT applications came directly after a preceding extension was recently secured, highlighting the lobbying strength of CEE to further pressure bodies into allowing for a later deadline.

Interorganisational interdependencies from joint business models were reported to have negatively impacted intermediary organisations. As one participant explained, *“Some of our income is determined by the income of our member organisations”* **P8 (INT, NAT, FTE)**. When probed to expand on this point, the participant explained that a non-CE organisation involved in RE project funding with local authorities and other governmental bodies was responsible for the loss in income. They indicated that *“They got a huge backlog [...] and they’re not able to process all the applications which many projects were relying on [...] that’s going to be a death load for some of these projects unless its extended”* **P8 (INT, NAT, FTE)**. Similarly, another participant comments on charities: *“We’ve noticed some organisations, particularly charities, they’ve withdrawn their projects where the trustees have been nervous about charity income and expenditure”* **P7 (LEPEH, SE, FTE)**.

Additionally, raising capital predominantly through share offers was reported to be a critical issue that CE organisations had to contend with during the pandemic. This resulted from a lack of engagement activities, which fundraising fell into. When asked how fundraising activities were traditionally conducted, one participant explained, *“We would go to fairs and markets [...] distribute flyers and talk with people on the streets [...] since moving digital, it was more difficult”* **P5 (CE, LDN, FTE)**. As a result of restrictions on in-person activities, it was reported that several of them were delayed. One participant,

whose organisation specialises in communications and community engagement, commented, *“I’ve had a lot of CE groups that have had to delay launching share offers [...] you can’t do the level of engagement that would necessarily want to do with the general public”* **P14 (CE, SE, FTE)**. Although no explicit examples were provided, and no participants represented an organisation still in its inception, the financial impacts around fundraising and securing capital for CE projects suggest that those organisations that were in their establishment phase would have undoubtedly faced difficulties if these funds were not secured before the pandemic, as one interviewee suggests *“If we’d had to start some projects completely from scratch, in Covid, it would have been much harder”* **P7 (LEPEH, SE, FTE)**.

Generally, most interviewees indicated that their organisations were not engaged in fundraising, nor did they intend to be before the pandemic. Only three showed interest from the participant’s organisations to engage in fundraising. One participant noted that they delayed their offer and lowered their minimum investment in response to the pandemic. *“We’ve lowered the investment to £100 [...] well ask for [more] in the autumn [...] to give people a bit of time to recover”* **P9 (INT, SE, FTE)**. Another participant indicated that they conducted their fundraising digitally and benefited from increased online engagement to secure capital, *“We managed to do the fundraising [Online][...] it’s a success story”* **P5 (CE, LDN, FTE)**. The excerpts indicate that whilst the pandemic undoubtedly impacted individuals financially, those who fell into the potential CE shareholder bracket remained relatively unimpacted and could further invest in CE instead of other expenses. Expanding on this, one participant mentioned, *“Are we going on holiday? Are we spending on much [...] people are just going, well we’ve got the money, what should we do with it?”* **P9 (INT, SE, FTE)**. Similarly, the examples above also accentuate the points made in section 5.4.2, where online adaptations to traditionally in-person activities have indeed occurred successfully; however, they remain minimal, with most other groups opting to either focus directly on pandemic-related activities or remain in a passive state until the lockdown restrictions are lifted.

5.4.4 Organisational members

Members comprise the FTE and voluntary CE workforce engaged in the day-to-day activities of their organisations. From the interviews, the participants themselves were, for the most part, satisfied with the new working arrangements. Participants representing

intermediary organisations could provide a different account, viewing CE as a whole rather than individually. One of these participants representing an intermediary stated, *“Everybody suddenly got other responsibilities like homeschooling [...] we found the ones that could progress had people employed”* **P7 (LEPEH, SE, FTE)**. A second participant commented on their organisation, *“There has been a bit of a fall off from volunteers [...] volunteering has been one of the challenges to working from home”* **P4 (CE, SE, FTE)**. Whilst the two excerpts indicate that voluntary work towards CE organisations was reduced during the pandemic, in direct contradiction, other interviewees suggested that more volunteers were attracted to their CE organisations due to more time at home and the switch to digital platforms. They explained, *“We had a larger group of volunteers [...] it was easier to come to meetings because of Zoom”* **P5 (CE, LDN, FTE)**.

Two other instances where participants indicated that the switch to digital communications improved access to the organisation to include members otherwise unable to attend, ensuring higher degrees of engagement from their members and the inclusion of individuals who have since left their respective communities. *“[REDACTED], who initiated the project [...] he and his wife lived in the village for 35 years [...] they’ve gone to live in Scotland [...] since we’ve been on Zoom, he can attend every meeting”* **P12* (CE, NW, VOL)**. Echoing this story, a second participant mentions a board member that has become reassociated with the organisation, despite moving away. They note, *“As long as it’s all on Zoom, I might as well continue being a board member”* **P15* (CE, NE, VOL)**.

Although members quickly adapted, the participants yearned for face-to-face interactions and to return to normality. Although platform-based forms of communication are practical and more inclusive, they do not contribute on other fronts, such as informal conversations and relationship building. One interviewee commented, *“I miss going to things [...] going on the train [...] having a day out type of thing”* **P2*(CE, NW, VOL)**. A second interviewee mentions, *“We miss seeing each other [...], and the bonding doesn’t happen”* **P6* (CE, SW, VOL)**. Reiterating these experiences, one participant explained how they have begun to conduct network activities online with multiple CE groups; they noted that *“Although it is better for participation [...] it is to the detriment of the chat by the coffee machine [...] we’ve tried to replicate this experience by extending an event [...] sometimes people will stick around [...], but I think it’s trying a little bit too hard [...] it’s not the same and it feels awkward”* **P8 (INT, NAT, FTE)**.

5.4.5 Covid 19 concluding remarks

The interviews suggest that CE organisations could adequately adapt to changing working conditions and newly imposed restrictions. Whilst several in-person activities were stopped, their adaptation for moving these activities to digital platforms continued to see certain practices such as community engagement, educational activities and fundraising events take place. Although several issues were identified, these were primarily isolated to single-case organisations; however, the limited participants, as per the nature of the interviews, may also suggest that other organisations with similar deficiencies or characteristics may experience similar issues.

5.5 Intraorganisational learning processes

Intraorganisational learning processes constituted a small portion of interview findings as the questions were mainly focused on interorganisational learning processes and network-level interactions.

Learning processes from within the organisation follow a predefined coding system based on the 4I framework; codes in this section include the internal learning processes, intuition, interpretation, integration and institutionalisation, as well as the corresponding level of learning, being the individual, group and organisation.

Excerpts from the participants about the predefined codes came mainly from questions 2 and 5, which asked interviewees to provide context into how their experiences have contributed to the organisation and to give an example of learning concerning their organisation.

5.5.1 Intuition as the first learning process

Intuition represents the first learning process described by the 4I framework (Crossan et al., 1999). It is the process of problem-solving by finding patterns and solutions through previous experiences and expertise; it is observed exclusively at the individual level and is recognised as the foundation of the interplay between the internalised action of knowledge creation and its externalisation through a proceeding process of interpretation (Castaneda & Rios, 2007; Nonaka & Takeuchi, 1995).

Section 5.3 provided information about the participants' backgrounds and fellow members within their organisation. Excerpts from 5.3 showed that individuals affiliated with CE were

primarily well-educated and had long and often successful careers in many fields before their affiliation with a CE organisation. These factors are strong determinants in dictating the intuitive ability of the individuals involved (Zahra & George, 2002).

Due to its inherently cognitive nature, capturing instances of intuition amongst the participants in their responses and examples was challenging. Whilst they did not provide an explicit example, one interviewee displayed a high degree of intuitive ability through their example that hints towards expertise within CE and the broader field of RE; *“If I’m stuck [...] maybe because I’ve been around [...] I know where to go [...] I feel I can pick up the phone or send an email, and I get a reply,”* **P6* (CE, SW, VOL)**.

The interviews provided other examples of instances where intuition was demonstrated through expertise and entrepreneurial ability. Participants noted multiple instances where a member from the organisation could bring their previous expertise to use in the CE project. One participant provided an account of a fellow member of their organisation. When selecting their intended technology, they noted, *“It was our electrical engineer who was absolutely adamant that an Archimedes [screw] would be completely wrong for us, and he was right!”* **P3 (CE, NW, VOL)**.

A second participant provided an instance of a well-known individual within the community who combined their previous experiences in electrical engineering and entrepreneurial actions to influence behavioural change within the community through subtle nudges. The interviewee explains, *“He went and checked everything in his house and published a list of what are the saving whilst leaving things on standby [...], and we published it on our website. So, people were learning directly from others in the village”* **P12* (CE, NW, VOL)**.

Expanding on the abovementioned example, they explained that this further spurred demand reduction within the community, highlighting the reach of entrepreneurial impact. It was explained that *“My key role at that stage was to devise [...] a domestic carbon footprint tool [...] In the first year, [...] [our] best estimate was [a] 20% reduction in carbon emissions in people’s houses [...] and travel of both air and road”* **P12* (CE, NW, VOL)**. The example from the excerpts above highlights the potential benefits of targeting demand-side activities due to their impact on carbon savings in a low-cost manner.

In the following example, a third participant provides an insight into their intuition through their recognition of expertise within their respective fie. In addition to this, understanding

that a combination of expertise in addition to their current CE role creates a position of responsibility and can foster trust. They explained, *“People trust us to call their supplier on their behalf and get the information we need or make decisions on behalf of their account [...] I don’t wanna use the word expert [...] but [we are] more experienced [and] knowledgeable”* **P4 (CE, SE, FTE)**. A second participant demonstrated a high level of expertise and provided details about the low-cost methods that may contribute to fuel poverty alleviation; they explained, *“You can reduce your poverty with energy switching [...] that’s a kind of easy low-hanging fruit sort of thing”* **P13 (CONS, NW, FTE)**. Whilst this may be considered basic information to a specialised group, these act as meaningful information to unspecialised and especially vulnerable audiences.

5.5.1.1 Community energy champions

Commenting on their organisations and fellow members, several interviewees specifically mentioned that key individuals with leadership qualities were the central pillar in achieving success over various aspects within the organisation, phrasing them as CE champions.

“There’s one person who drives things” **P13 (CONS, NW, FTE)**. This unique combination of enthusiasm, skillsets and networking capabilities (Kanda et al., 2020) emphasises these leaders as a driving force in achieving organisational success (Dutta & Crossan, 2005). Moreover, the examples provided within these sections also indicate how intuitive ability may transpire into action within a CE setting, highlighting the unique circumstances of each organisation in which they unfold.

Individuals fitting the champion description possessed various relevant skills and affiliations. This combination of a pre-existing skill set and relevant capabilities, alongside their drive to realise their initiatives, provides them with capabilities beyond their peers. Commenting on the critical role of these individuals, one participant explains, *“I think if you look at any of the big projects in the South [...] it comes down to someone driving that [...] usually one or two people who either have preexisting knowledge in the technical side or management side”* **P13 (CONS, NW, FTE)**.

Overall, participants recognised that specific individuals were the driving force behind their projects. Interestingly, some accounts alluded to the participants being the champions within their organisation; however, this is to be expected as several participants are founding members.

Experiences recounted by the interviewees when probed about key individuals varied from actions at the community level to create initial excitement before establishing the organisation to ongoing efforts to create positive dialogue between community members for support. At the community level, the following excerpt explains how one participant was the 'champion' in ensuring the establishment of their CE organisation. *"I developed a proposal, and I went round and persuaded a few key people [...] I talked to the local Green Party and put something in the transition town newsletter"* **P2*(CE, NW, VOL)**.

In another account, a second interviewee explains how they engaged in lobbying efforts with the government over planning permissions *"It took five years to get the permissions [...] we ended up having to go down to Westminster to Parliament to lobby MPs and have it put onto the legislation process [...] the Environment Agency⁴⁶ couldn't agree on the framework of the policy to produce hydroelectricity"* **P3 (CE, NW, VOL)**.

A third interviewee representing an organisation hosting hydroelectric technologies explained a lobbying-related champion activity. They explained that the intended project site clashed with a water supplier, suggesting that electricity generation *"Wasn't part of their core business"* **P1* (CE, NW, FTE)**, ultimately necessitating action by an individual to ensure the intended project would continue. *"The people in charge of the waterworks didn't want people messing with the waterworks [...] having these amateurs turning up and interfering with their water supply [...] it required us to have a champion within United Utilities [...] in the end, it required him to do much-banging heads together"* **P1* (CE, NW, FTE)**.

When recalling an example of a driven individual who was the driving force of their respective CE organisation, one participant initially provided some background information about the individual, which was as a senior advisor within a large public, energy-related field suggesting that *"She had this existing knowledge of how to go through all these bureaucratic loopholes and processes"* **P13 (CONS, NW, FTE)**. In addition, it was mentioned that the person was *"Pretty frightening [...], but she just got stuff done!"* **P13 (CONS, NW, FTE)**, alluding to the goal-oriented drive and approach that these individuals possess.

⁴⁶ The Environment Agency (EA) is a public body established in 1996 whose primary purpose involves environmental protection. On their website, they note their responsibilities as (1) Regulation of industrial waste, (2) Treatment of contaminated land, (3) To monitor water quality and resources, (4) Managing fisheries and dealing with rivers, estuary and harbour navigation and (5) Ecological conservation (EA, 2014).

These individuals' actions often extend beyond their organisation's immediate needs. Several examples were provided where certain members were engaged at an interorganisational level with other CE organisations, CE networks and intermediary coordinators, and public and private bodies. Several individuals were mentioned on numerous occasions by multiple interviewees, highlighting their essential role within the CE sector. One participant explained the interpersonal interactions between these champions and how they act as intermediaries as collaborative entities within more extensive network settings. *"There are certain people that I'll always come across [...] [REDACTED] is at [REDACTED] [...] he's been a champion of the sector for a long time [...] If you look at CEE forward people; they're fantastic, [REDACTED], [REDACTED] [...] [REDACTED] [...] People like Regen, [REDACTED] [...] It takes these sorts of people and their organisations to take all the learning we've got [and] give that to the community [...] I think that's a necessary mechanism [...] [REDACTED] is a champion of CE for England [...] But it's one person [...] it's really hard to be everywhere"* **P13 (CONS, NW, FTE).**

The excerpt above, in addition to all other instances where the participants mentioned individuals, were recorded, and profiles were created to map and visualise the reach of these individuals through exchanges and organisational affiliations. Nine individuals were included in this mapping process, with 45 combined interactions with 35 organisations. However, it is recognised that differentiating between which members may be considered CE champions is a subjective process.

The sociogram in Figure 15 visualises exchanges and affiliations of the identified CE champions from the interviews. Within the figure, eight different categorisations are represented by the nodes, which will remain consistent throughout the remainder of the thesis. The egocentric nodes, related to the CE champions, are shaded in light grey. Nodes representing CE organisations are coloured olive. Green nodes correspond to non-CE socially driven organisations, such as CBS, charities and SE. The blue nodes represent governmental departments, such as the DBEIS and former DECC. The lilac nodes include both councils and local authorities. The red nodes represent network intermediaries and hub organisations. Pink nodes represent educational institutions, such as schools and universities. Lastly, all non-CE organisations which are commercially driven, such as private enterprises and PLCs, are denoted by the black nodes. Undirected edges between nodes specify an exchange and a relationship between the CE champion and the organisation. Furthermore, the nature of the relationships is specified with labels within the edges,

showing if the champion was formerly affiliated (FA) with the organisation, involved in its establishment (EST), is currently a senior member (SNR), provides advice and consultation (Advisor) or advocates on their behalf (Advocacy). Each of these exchanges is given a weight of one, and the nodes' size is adjusted based on the node's total number of observed interactions.

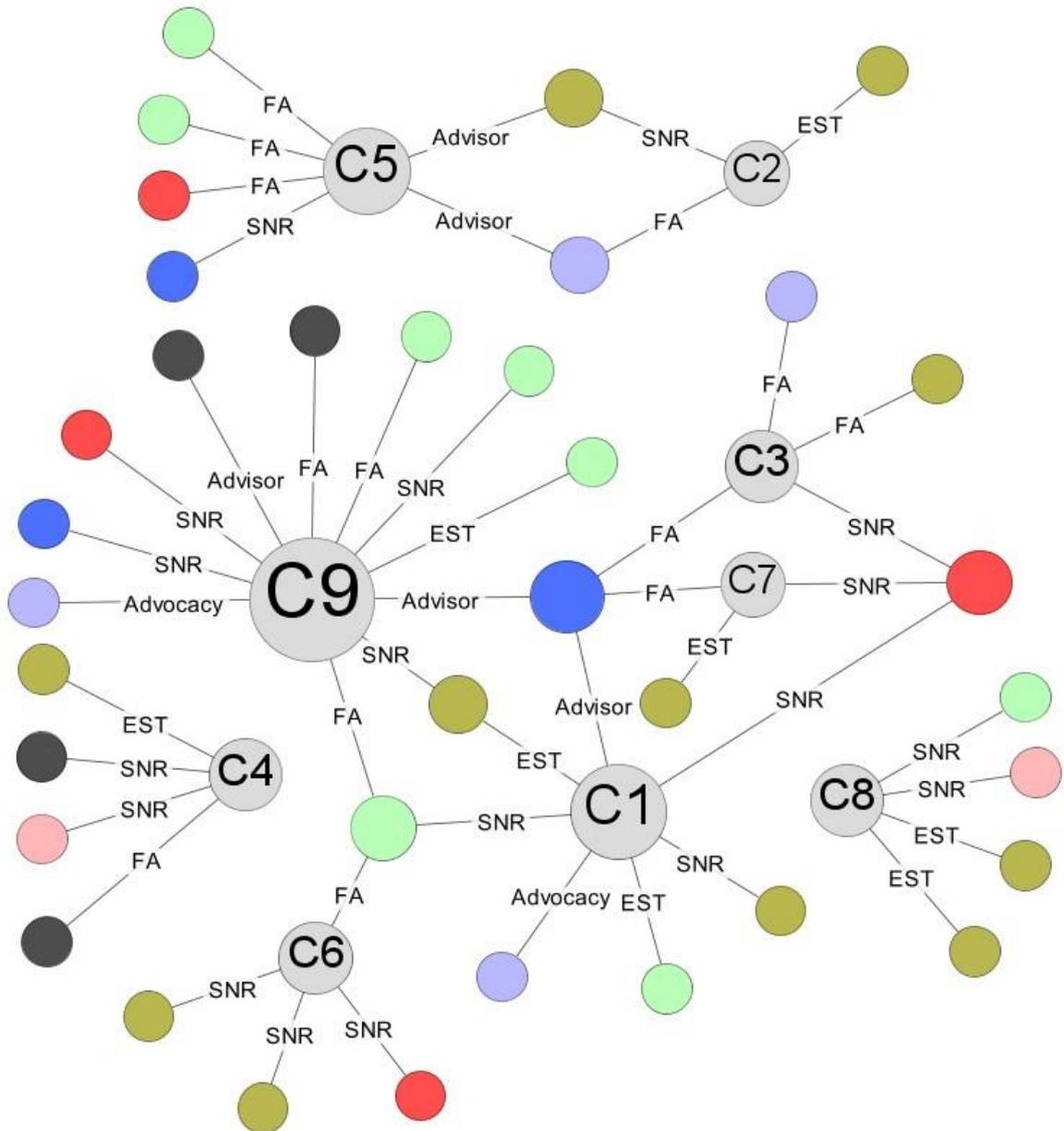




Figure 15: Sociogram representing CE champion interactions and affiliations, Self-created using Gephi. Data from semi-structured interviews. **Node size** is proportional to the number of exchanges. **Abbreviations:** FA=Formerly associated, EST=Involved in establishing the organisation, SNR= Senior role, C(x)= Identified CE champion.

Figure 15 represents instances of coding where the nine identified CE champions (**C1-C9**) were mentioned throughout the combined interviews. However, it is recognised that the edges depicted in the figure highlight a small instance of their wider reach and potential impact throughout the sector.

Initially, two clusters of relationships can be seen from the figure, with two individuals (**C4** and **C8**) displaying no interconnectivity. The first cluster, represented by **C2** and **C5**, shows they are both affiliated with a CE organisation and a government authority. The second, much larger cluster represents CE champions representing organisations in London and the Southwestern regions of England; a higher number of crossovers and interrelations between the individuals suggest a strong cohesion between CE organisations within these regions. When probed about the interconnectivity and overlaps of individuals within these regions, one interviewee commented, *“There’s a lot of shared directorships. Lots of people who are directors of one energy organisation are directors of another” P10* (CE, SE, VOL)*. In contrast, when probing a second participant, whose identified CE champion showed no interrelationships with the others, they commented that the lack of interconnectivity was attributed to internal focus as opposed to external search, *“We probably have gotten a bit lazy now [...] the focus is now more on to the carbon saving” P1* (CE, NW, FTE)*— indicating that their internal focus has taken precedence over their external, interorganisational relationships.

Furthermore, it can be seen that these individuals are responsible for establishing CE organisations as well as playing other critical roles in facilitating interorganisational and network-wide relationships between public bodies, local authorities, educational institutions, non-CE organisations and individual members of their respective communities.

Overall, the interviewees showed high intuition within their respective organisations, mainly attributed to their educational backgrounds and relatively long years of experience and expertise in various organisations. Intuition, as per the 4I framework, was revealed in three ways within the interviews. Firstly, instances of early decision-making before establishing the organisation relate to issues around technology selection, structure and capital acquisition. Secondly, contributions to the broader community through socially driven community benefit activities. Third, through contributions resulting in interorganisational cooperation between CE organisations and the broader stakeholders involved in the sector.

5.5.2 Interpretation as the second learning process

The process of interpretation comprises the resulting externalisation of the cognitive functions achieved from the intuitive process. It is expressed through conversational means at the individual and group levels by creating shared maps between individuals. Instances of interpretation are coded based on the ability of the interviewees to show examples of occasions whereby the mapping processes described have resulted in generated insights. Whilst it was relatively difficult to decipher, interpretive processes are linked with creating cognitive maps before their delivery through dialogue. Therefore, instances where mental models link a problem to a solution were captured and classified as processes of interpretation.

In one instance, a participant identified a key issue they currently face within their community, which may be extended to other communities. They suggest that *“People who are in real fuel poverty can’t switch because they’re either in rented accommodation or on meters [...] it’s a very vicious cycle, particularly as the rates you pay on a meter are much higher”* **P1* (CE, NW, FTE)**. The participant identified quite a problematic form of fuel poverty and further indicated that whilst their organisation does provide grants, they *“Only give grants to other CE organisations and not individuals”* **P1* (CE, NW, FTE)**. However, in their explanation of their potential solution, they perceived that by reducing energy demand from public schools, they would contribute to the government through tax savings which may be utilised in other aspects, such as those fuel poverty.

“The idea is to reduce school demand, which is a cost to the taxpayer” **P1* (CE, NW, FTE)**.

In a revealing example, one participant suggested that an essential feature of ensuring CE participation and the continued growth of the sector is through creating nudges to allow

others to intuit schemes and interpret their ideas to others within their communities; the participant explained that *“It’s much better if you can get people to think it’s their idea in the first place [...] Someone came up with the idea that we could put up a wind turbine and any money we made from that we can pay for the elderly care [...] drop a few hints and people pick them up”* **P12* (CE, NW, VOL)**.

5.5.3 Integration as the third learning process

Integrative processes manifest intuition and interpretation into the organisations’ activities, routines, structure or systems (Lawrence et al., 2005). The 4I learning framework explains that integration occurs between the group and organisational levels (Crossan et al., 1999).

The assimilation of groups sharing similar experiences and creating links between individuals with expertise within relevant niche areas was found to increase the likelihood of productive dialogue relating to critical decisions within the organisation, often leading to effective knowledge-derived solutions which may benefit the organisation. Within the CE case, most contributions involved the exploitation of previously acquired knowledge and the joint exploration of novel solutions. In the following excerpt, one participant explains how this coordination between individuals and group creation has helped their CE organisation benefit from several specialised integrated solutions. They note, *“What we did early on was [...] broke actions in a number of groups, some looking at local food [...] some looking at household energy, others looking at travel, and so on [...] we had a loose structure based around those groups [...] We’d meet every two or three months, and people will come and share ideas and learn [...] People contribute their expertise but also learn a lot from others. That worked pretty well for the first couple of years to come up with a number of ideas or initiatives”* **P12* (CE, NW, VOL)**.

In another example, a participant noted that a primary motivation for the adopted technology came from a similar solution on the same sight from several decades ago. *“From the early days, we were trying to replicate what was already on this site [...], so we went for the original design [...]. Having listened to other people’s expertise, we ignored it, which may or may not be the best teaching point [...]”* **P3 (CE, NW, VOL)**. When probed into expanding on the reasons behind the decision, it was explained that *“You don’t reinvent the wheel if you don’t need to”* **P3 (CE, NW, VOL)**. The above excerpt represents an instance where a CE organisation has purposefully deemed their solution superior to those

acquired externally. This has ultimately resulted in the pre-existing technical knowledge from within the community being integrated into the organisation.

5.5.4 Institutionalisation as the fourth learning process

Institutionalisation represents the final “I” of the 4I learning framework at the intraorganisational level (Crossan et al., 1999). It is expressed through changes at the organisational level, indicating that learning has been incepted at the individual level and fed forward within the organisation through those mentioned above intuitive, interpretive and integrative processes or obtained externally at an interorganisational level and embedded (Castaneda & Rios, 2007; Mozzato & Bitencourt, 2014). It is important to note that whilst these changes may be perceived positively, they do not necessarily lead to immediately improved performance (Knight, 2002).

Similar to the processes mentioned above, it is noted that several learning outcomes and their evidence came before the organisation’s establishment. In a continued example from the previous sections, one participant continued to explain the reasons behind their adoption of alternative hydroelectric technology, *“The vast majority of turbines in England have gone for the Archimedes screw [...] there was pressure for us to do the same, but we just didn’t believe it was the right system for the site were using [...] the third design is called a Pelton wheel [...] Pelton was too small for us [...] were on a much larger scale than those”* P3 (CE, NW, VOL).

The participant explained that they opted for a *“Coupler and drop turbine”* P3 (CE, NW, VOL), following the recommendations of an in-house member with an engineering background. It was explained that this was ultimately the preferred design due to *“A lot of debris coming down the river”* P3 (CE, NW, VOL) and that this technology was superior to its alternatives in coping with the high-volume flow and, with it, the higher chance of debris. The excerpt highlights how previously acquired knowledge through expertise at the individual level could be interpreted, integrated and, lastly, institutionalised into the organisation.

Concerning unimplemented forms of institutionalisation. From the interviews, participants whose organisations were engaged in generation activities indicated that organisations either benefitted from FIT-dependent models or other PPAs, rendering them unable to immediately apply institutional processes to their energy generation activities even though the institutionalisation process has been achieved (Saintier, 2019). Instead, these are

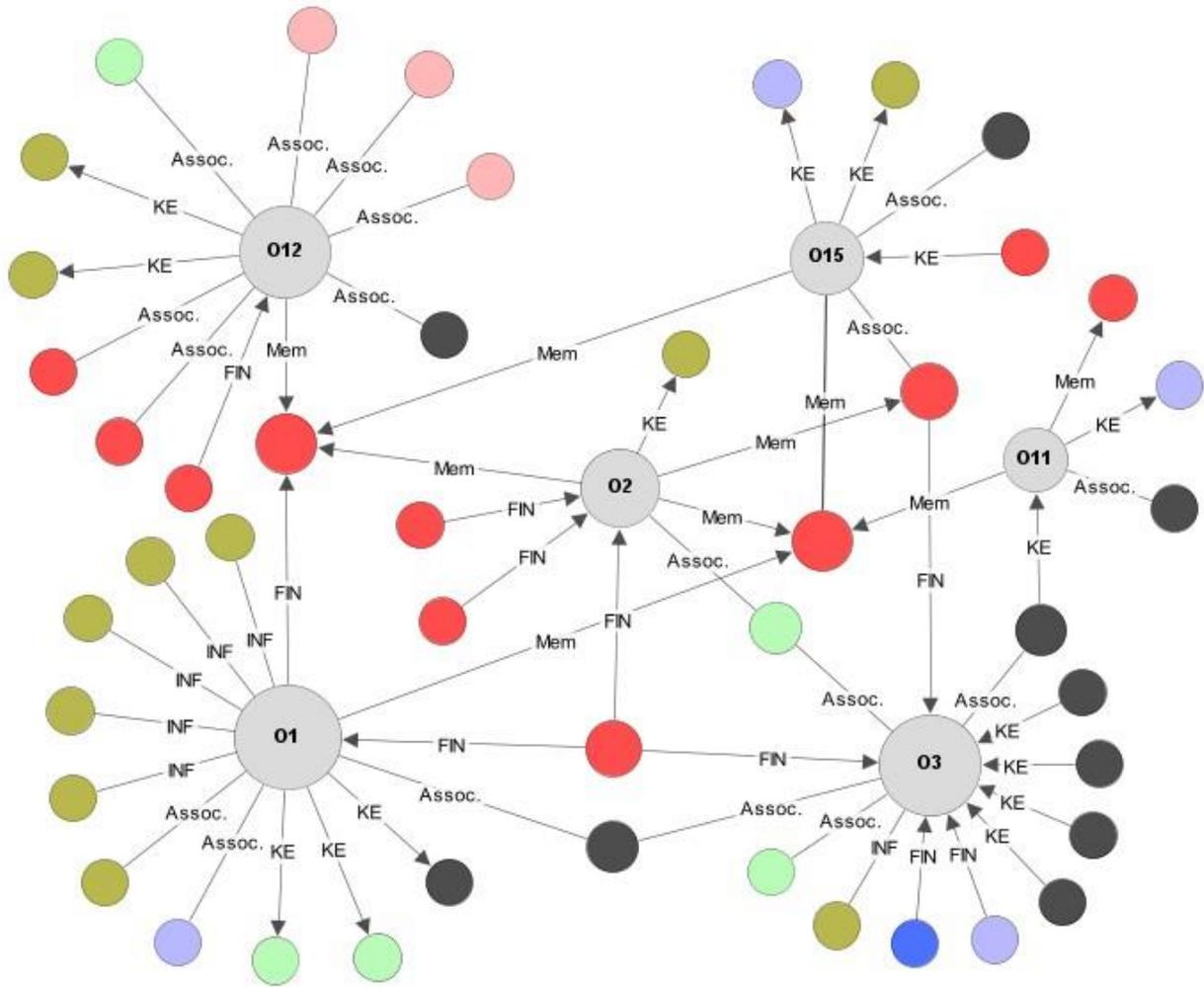
embedded into the organisational memory to be utilised when relevant or shared with other organisations. In one instance, a participant provided an account where the learning processes were achieved up to institutionalisation concerning post-FIT models; they explained, *“Everyone knew it [FIT] was going to stop. We already formulated all of our models, where we can be FIT-free, but we haven’t implemented any of them”* P6* (CE, SW, VOL).

Lastly, relating to implemented activities where institutionalisation was achieved, one participant noted that these processes could have resulted in more immediate success. Instead, even after its implementation, the energy savings activity was shown to need additional time and effort, suggesting several lessons learned and implemented.

The participant explained that their organisation began an energy efficiency service some years ago with tasks involving demand reduction, energy switching and consultations regarding household *“structural improvements”* P4 (CE, SE, FTE) to improve efficiency. *“The energy efficiency service wasn’t successful as a money-maker in its first couple of years, but through tenacity and perseverance, now it is [...] you have to grow your reputation and have something of a track record before people are confident enough to let you into their homes”* P4 (CE, SE, FTE). Although practices may be institutionalised, activities requiring external engagement also necessitate relationship building to ensure longevity.

5.6 Interorganisational dynamics

Shifting the focus from intraorganisational to interorganisational considerations, question 4 in the interviews asked the participants to describe their organisations’ relationships with the wider CE sector. Probes here focused on ascertaining the extent of their reach, their nature and the perceptions of collaboration vs competition when viewing these relationships. All the participants agreed that the CE sector was skewed more towards collaboration than a competitive mindset between the organisations. Additionally, all the participants highlighted the importance of interorganisational relationships to their organisation and provided examples of where these relationships significantly benefited them. From the relationships, a sample was selected, and a sociogram was compiled to visualise better interorganisational regional connectivity between CE organisations and other organisational stakeholders involved within the sector. A total of six CE organisations were represented in Figure 16, which comprised the representative organisations of the interviewees situated in the Northeast and Northwestern regions of England.



Key=

- | | | | |
|--------------------------|--|-------------------------|--|
| Participant organisation | CE Organisation | Governmental Department | Network hub/ Intermediary organisation |
| Private enterprise | Socially driven organisation (CBS, Charity, SE etc.) | Local Authority | School/ University |

Figure 16: Sociogram representing interorganisational interactions and their type. Self-created using Gephi. Data from semi-structured interviews. **Node size** is proportional to the number of exchanges. **Abbreviations:** ASSOC. = Association, FN = Financial exchange, INF= Informal relationship, KE= Knowledge exchange and Mem= Member. Directional exchanges are further specified with arrows showing the flow of the exchange.

The interviews showed that in addition to CE interactions, CE organisations interact with multiple non-CE entities, from public organisations and departments such as schools and local authorities to private enterprises such as independent energy suppliers, DNOs and

private companies. Furthermore, due to multiple personal relationships between individuals within the sector, it was noted that interactions created a high level of familiarity between the organisations through its contributions towards shaping a collective, shared vision, improving dialogue and creating a broader sense of trust and security between the respective CE organisations.

Figure 16 visualises interorganisational exchanges between six of the interviewee's respective organisations (**O1, O2, O3, O11, O12 & O15**). A total of 58 edges correspond to interactions identified between the participants and 46 other organisations.

These organisations were selected due to their geographic proximity, which was focused within the Northwest of England. All the organisations were found to foster several interorganisational relationships with different organisational types, from which financial and knowledge-based exchanges occur. Further instances were identified where the organisations were associated, had an informal relationship, or were members of (in the case of network intermediaries).

In addition to multiple interorganisational connections, the figure showed that the respondents' organisations were further connected through shared network affiliations. All the organisations were shown to have at least one relationship with a network-level intermediary or coordinating hub organisation, as shown via the red nodes. From the selected sample, O2 possessed most of these connections with five reported edges with network-level intermediary organisations.

Cooperation constitutes the fifth learning process unfolding within the network level, as indicated by the 4I learning framework. However, the interviews revealed some discrepancies within the cooperative process. Cooperation was observed between individuals representing different organisations and between organisations as an ongoing dyadic relationship. This was also extended to the broader community where place-based alliances were observed between multiple organisations cooperating towards a more comprehensive economic and environmental sustainability goal involving CE and non-CE organisations. Finally, groups of similar organisations were also observed to collaborate and coordinate in joint knowledge-sharing and learning approaches to the collective benefit of its members.

When probing participants into explaining why a collaborative approach exists within the sector, one participant said, *"All of the CE groups are fundamentally motivated by a desire*

to mediate climate change, and not to make money”, **P4 (CE, SE, FTE)** alluding to the collective approach that CE views itself. They further explained, *“You want to see the sector succeed as much as you want to see your organisation succeed”* **P4 (CE, SE, FTE)**.

A second participant explained that although competition is a natural aspect of human behaviour, it does not appear traditionally in the sector. Instead, friendly competition between colleagues is what may be observed. *“There’s a little element of rivalry that goes on with people [...] part of being human is that you get a bit competitive”* **P10* (CE, SE, VOL)**. However, competition is *“Just not the ethos of CE”* **P10* (CE, SE, VOL)** summarising the relationship as *“It’s kind of all friends being competitive”* **P10* (CE, SE, VOL)** due to the common goal of *“Support[ing] communities to decarbonise”* **P10* (CE, SE, VOL)**.

One participant suggested that one reason for the collaborative ethos between CE organisations is the relatively small profit margins that they operate by in addition to the collective size of the CE sector being a fraction of the wider RE sector, necessitating that cooperation overshadows competitive behaviours *“It’s not like we’re real competitors because it’s [CE] so marginal [...] There’s still a lot of potential in the market”* **P5 (CE, LDN, FTE)**.

5.6.1 Interorganisational relationships between CE organisations

Collaborative relationships amongst CE organisations constitute a crucial component in the sectoral interorganisational learning process. The interviewees provided multiple examples of these relationships, but their accounts indicated that the organisations are more than just affiliated. Instead, the relationships often extended to include joint activities, ongoing dialogue and even the development of partnerships between the organisations. One participant notes, *“We know pretty much on a first name basis, all of the different groups in the Southeast [...] They’re our friends and partners”* **P4 (CE, SE, FTE)**. The excerpt provides some insight into the collaborative and comradery nature that CE organisations view and interact with each other through.

Although collaborative, relationships between CE organisations arise mainly through purpose and necessity due to a shared sector and common organisational activities and goals. For instance, some participants indicated that relationships with other CE organisations were founded before establishing their organisation. Reasons for the relationship involved gaining an insight into their practices and methods of operation; one

participant explained to approaching other organisations in the following excerpt *“When we were setting up, we took advice and went to see places”* **P1* (CE, NW, FTE)**.

Another participant explained how they were approached by a group that is currently attempting to establish their CE organisation, *“I’ve had contacts from a village just three or four miles away [...] [They asked] Can you help us”* **P12* (CE, NW, VOL)**. The participant indicated, *“I was immediately able to send them information, a lot of it”* (**P12* (CE, NW, VOL)**). It was finally mentioned that the participant could direct the group to several web-based resources, which may assist them *“Go look at CEE [...] and the University of Exeter’s new Community Carbon Impact Tool⁴⁷”* **P12* (CE, NW, VOL)**.

In a similar example, the excerpt below also explains how other CE organisations frequently contact a second participant, in addition to being approached by individuals without an organisation and students, *“They have got lots of really clever people with no project to work on [...] we also get calls by a community centre up the road who put solar panels on, but not by us [...] so the lady often phones me for advice, which I always help because they are our community centre [...] I do get the odd call from other organisations [...] and students”* **P15* (CE, NE, VOL)**. The participant further explained that they always cooperatively approached these interactions and sought to assist whenever possible. Lastly, it was noted that although they receive many student requests and would *“Do as many student surveys as I can”* **P15* (CE, NE, VOL)**, time was often a limiting factor regarding this form of interaction.

As opposed to a knowledge provider/receiver format, there were several instances where the flow of benefits was found to be bidirectional, with both CE organisations benefitting from the relationship or interaction and both having learning outcomes; as one participant explained, *“We’ve learned an awful lot, and we’re happy to share that [...] equally, we always learn something when we go speak to another group [...] It’s very much a two-way process, always has been”* **P12* (CE, NW, VOL)**.

In another example, a second participant also mentioned an ongoing relationship with the intention of joint learning and collective action by three newly established organisations within geographic proximity. They explained that *“From the early days [...] I worked with*

⁴⁷ Impact was a tool designed in collaboration between the Centre for Sustainable Energy (CSE) and the University of Exeter’s Centre for Energy and the Environment as part of a wider project by Southwest Environment and Climate Action Network [SWeCAN] (CSE, 2021). The Impact toolkit can be found by following the following hyperlink: <https://impact-tool.org.uk/>

two other hydro schemes in the area [...] discussing our problems and trying to help each other out” P3 (CE, NW, VOL).

Expanding on the joint learning approach, others also alluded to engaging in organisational collaboration for learning based on specific activities, suggesting that when knowledge-based solutions are deficient, they will search specifically in certain areas where it is available. For example, it was explained that *“This is particularly relevant for our work around community support [...] other groups which are focused on energy advice also try and work with other groups” P5 (CE, LDN, FTE)* and *“CE groups also help each other in fundraising” P5 (CE, LDN, FTE).*

Other interorganisational relationships were found to be based on external funding sources to sustain them, such as the Peer Mentoring Scheme⁴⁸ offered by Co-operatives UK. In the following two excerpts, one participant indicated they were part of the mentoring organisation. At the same time, the latter explains that they were on the receiving end of the mentoring programme. *“We took part in the mentoring scheme [...] We were somebody whom other organisations in the Northwest came to [...] a lot of those organisations we mentored are now bigger than us!” P2*(CE, NW, VOL).* *“The mentoring schemes, where one group mentors another [...] we’ve had the benefits of that through coops UK” P15* (CE, NE, VOL).* However, these mentoring programmes require resources which may not be readily available. *“We run mentoring programmes [...], and we mentor people in setting up CE groups [...]. We do need some funding to pay people to mentor” P10* (CE, SE, VOL).*

Interestingly, interviewee accounts showed a disconnect between their interpretation of these interorganisational relationships. Whilst some interviewees recognised that these are ongoing relationships that require fostering an active action to sustain, others explained that these relationships were only temporary and would cease once they have been deemed to have shared or received information. *“We provided advice to other hydro’s based on our experience [...] we can help them to understand the problems that*

⁴⁸ Cooperatives UK offers multiple Mentoring Schemes for its members, which involve pairing newly established and relatively inexperienced organisations with more experienced counterparts to help support the co-development of other cooperatives (Co-operatives UK, 2021). Recently, a joint initiative by

Cooperatives UK and Next Generation has created a six-month Community Energy Peer Mentoring programme which grouped nine senior individuals from within the CE sector as mentors, each with four mentees representing newly established CE organisations (NextGeneration, 2021).

we've had [...] there's a minor local connection, but it's not industry-wide or even regional"

P3 (CE, NW, VOL).

In a unique observation, one participant noted that their organisation had no current meaningful relationships with any other CE organisation, either within geographic proximity or through shared activities. Although secondary sources showed that the organisation had some affiliations, these were deemed past relationships or those having shared members with the organisation itself. It was considered that the participant interpreted the question as affiliations outside the immediate circle of relationships, which was pointed out to be on their website at the beginning of the interview, *"I don't know if you've seen our website, but there's an awful lot of information on there"* **P1* (CE, NW, FTE)**. However, the organisation was found to have a relatively low networking presence regarding its interorganisational relationships. It was explained that the organisation delayed its community benefit and other networking activities due to initial financial issues to focus on repaying personal investments and acting more commercially. *"We had personal loans to pay back at the beginning [...] then we've decided we needed a sinking fund in for replacements for major problems [...] we're now getting into a position where we will have significant amounts of money available"* **P1* (CE, NW, FTE)**. It was then explained that the end of the repayment period coincided with the need to secure maintenance funding. The organisation remained in a passive state for several years whilst it was strengthening its financial capabilities.

5.6.2 CE relationships with non-CE organisations

The participants reported several interorganisational relationships with non-CE organisations throughout the interviews. Whilst this was not the intention of the findings, and no specific questions or probes targeted non-CE relationships, the examples reflect the real-world connections CE organisations have sustained to further their establishment and become embedded within their communities.

These interorganisational relationships emphasise the broader contributions of CE organisations to create value beyond their immediate reach through engagement. Furthermore, and to a degree of necessity, some participants noted that these relationships might also contribute to broader financial sustainability goals due to a changing policy landscape within the CE sector. Others expressed that the relationships

were not business-driven. Instead, they were socially driven and focused on providing tools and knowledge to specialised organisations with more substantial perceived social impacts.

Relationships with non-CE organisations were found to take on multiple forms, from affiliations with individuals from other organisations working in different sectors to large multi-organisational partnerships crossing several industries focusing on economic development activities incorporating CE as a tiny facet of a much more comprehensive approach. Similar to relationships with CE organisations, some interviewees noted that these relationships exist temporarily for a purpose. In contrast, others pointed out that these were ongoing and that there was a bidirectional flow of benefits between the organisations.

For example, one participant explained how, in one interaction with an organisation in a non-CE-related field, they benefited immensely from an individual who provided them with an insightful alternative approach to community engagement. They explained that through this interaction, they could foster an ongoing relationship, absorb the lessons that this relationship generated and integrate them into their activities. *“Recently [...] we got introduced to someone who done work on their neighbourhood plan and also works in the health sector [...] she had a new take on coproduction [...] that’s certainly something we can learn from, and start putting into our community engagement. So that was amazing”*
P9 (INT, SE, FTE).

A second account by another participant revealed how multiple non-CE organisations could gain energy-related knowledge, which may immensely benefit these organisations in creating and sustaining social impact directly from the participants’ CE organisation through an ongoing relationship. *“There’s an organisation called Sussex Syrian Community⁴⁹ [...] I’ve been working with them for about five years [...] the main organiser would act as a translator between me and the resident that we’re trying to help and be sitting next to me for several years [...] he’s quite competent himself now and helps people*

⁴⁹ The Sussex Syrian Community is a charity that supports Syrian families recently arriving in the UK through social and educational activities (Sussex Community Foundation, 2020). On its Facebook group page, the charity describes itself as; Open to all Syrian settlers within Sussex, irrespective of religious beliefs, socioeconomic status or political affiliations. It aims to make Syrians feel safe, provide them with educational benefits, and point them towards governmental support programmes and initiatives (Sussex Syrian Community, 2016).

to switch supplier or apply for the Warm Home Discount⁵⁰ [...] Another refugee food bank, called Voices in Exile⁵¹, someone who has been acting as a translator for a couple of years [...] can help people when I'm not there, which is terrific" **P4 (CE, SE, FTE)**.

A core reason behind engagement with non-CE organisations and individuals with no CE affiliations was to increase awareness and inclusion within these initiatives. One participant explained how they targeted these audiences to increase overall CE activity within their locality. *"We're trying to engage people who wouldn't generally be engaged in RE or CE in particular [...] it has engaged us to capture more interested people and start more community projects [...] we would have had more if we were not isolated [...] it's also something we can get better at [...] there is interest in CE but it's important to be able to capture the interest and make something out of it"* **P5 (CE, LDN, FTE)**. Reiterating these findings, a second participant mentions that *"We also help run a programme that's aimed at SMEs [...] in particular, retrofitting energy efficiency [...]. We're doing an energy audit, trying to find out what measures might be the best for you and what the best payment periods are on different measures"* **P9 (INT, SE, FTE)**.

Although beneficial to both the CE sector and the non-CE organisations choosing to engage, it was noted that most of these interactions were of limited commercial gain compared to other partnerships within the wider RE sector. One participant explained that *"CE just picks up the breadcrumbs [...] it requires engagement from much bigger players with much deeper pockets"* **P10* (CE, SE, VOL)**.

5.7 Network-level findings

Moving from interorganisational relationships to a network-level focus, participants were asked questions about the networks they were members of, the coordinating intermediary organisations that run these networks, the perceived benefits of these settings and how the organisations contribute to their respective networks.

Additionally, the survey also incorporates a total of seven questions directly related to CE networks. Q11 asks the respondents to comment on the nature of cooperation between their organisation and the wider CE sector. Q12, 13 and 14 then ask the respondents to list

⁵⁰ The Warm Home Discount is a government-led scheme to help eligible individuals benefit from cold payments of up to £150 in the winter season (EDF, 2022).

⁵¹ Voices in Exile is a charity in Brighton that offers practical and legal support to vulnerable individuals without access to public funds (Voices in Exile, 2022).

the networks they are members of, rank them in terms of their perceived value and comment on the tools and channels provided by the networks. Q15 focuses on the perceived benefits of network engagement to the organisations with several categories to allow the respondents to comment on their development, financial and non-financial performance, relationship building, shareholder attractiveness and ability to engage partners. Q16 focuses on the current and future outlooks of CE networks. Four subcategories focusing on perceptions of the benefits of CE networks, their role in the sector and barriers to knowledge sharing are presented in a short answer format to allow for flexibility in the responses.

Lastly, Q17 examines relationships between CE organisations in network settings and those between CE organisations and network coordinating intermediaries. This was split across five categories of interaction which are: (a) knowledge reception, (b) knowledge provision, (c) financial resource reception, (d) financial resource provision, and (e) informal relationship. This resulted in 480 interactions, of which 303 were knowledge-based, 115 were informal relationships, and 62 were financial exchanges.

5.7.1 Mapping interorganisational exchanges within a regional CE network setting – Regional survey.

An overarching aim of this study is to explore interorganisational interactions within a CE network. This section focuses on a single CE regional network in Southeast England coordinated by its intermediary hub (**INT1**).

Although **INT1** did not partake in the study, six interviewees recorded 35 instances where the hub was mentioned relating to its activities and role. Additionally, Q17 in the survey instrument asks respondents to specify whether a relationship exists between their organisation and those listed in the survey. Furthermore, respondents can select its type and direction if a relationship exists. One mailing list included members of the network and its intermediary coordinator. Additionally, national-level network intermediaries such as CEE (**NAT1**) and Regen (**NAT2**) were included. The survey was circulated to these members to provide details relating to interorganisational interactions with each other. Whilst there were many non-respondents, those who did respond could provide meaningful information about their interactions and relationships with those who did not respond.

Commenting on the network's objectives and the role of its intermediary coordinator, the participants mainly indicated fostering connections between its members and creating spaces for opportunity and engagement with non-CE partners on several initiatives. The network was described as a central common area where different CE organisations may interact together. In giving their account of the role of the coordinator, one participant further provided an example of a current search within the network, where a member is looking for information relating to linking different technologies together. *“A place where people will get together and discuss perhaps new technologies [...] or how to link up [...] [RS11] are looking how to link up existing solar PV installations with EV charge points” P5 (CE, LDN, FTE).*

Interestingly, a second interviewee who represented an organisation in the Northeast of England linked the role of INT1 to that of CEE, but at a regional level. They explained, *“When I went to a CEE event, there was a [INT1], which wasn't trying to replace CEE [...]; it was a smaller local face of the same thing [...], and they will mentor each other [...] they've [INT1 members] got stronger connections [...] those are some of the things which I've seen” P15* (CE, NE, VOL).* Ultimately, the interviewee suggested that such a cohort greatly benefited its members, something that they could not currently replicate in the Northeast. In another account, a third interviewee, whose organisation was a member of the network, described the role of its coordinator as *“To promote CE, to advocate for CE and to be the link between the community and the larger members of the energy infrastructure” P10* (CE, SE, VOL).* Overall, the network and its coordinator were spoken about with great admiration from the participants, with several praises and positive notions relating to their role and state of affairs.

Interestingly, INT1 was found to have evolved from another CE organisation, of which one participant was represented in the survey. The participant provided an account of how INT1 was established, explaining that its existence stemmed from a necessity to separate networking activities from CE activities in their organisation. *“Lots of communities started contacting [us][...] then what happened is [we] set up another organisation called [INT1] to field all the calls and manage interest from other groups” P10* (CE, SE, VOL).*

The regional survey returned a total of 211 interactions within the network split between knowledge exchanges (125), informal relationships (69) and financial exchanges (20). As a result of the density of the observed relationships, four separate figures are created to

allow for a more detailed examination and comparison. The combined sociogram of all relationships can be found in Appendix N1.

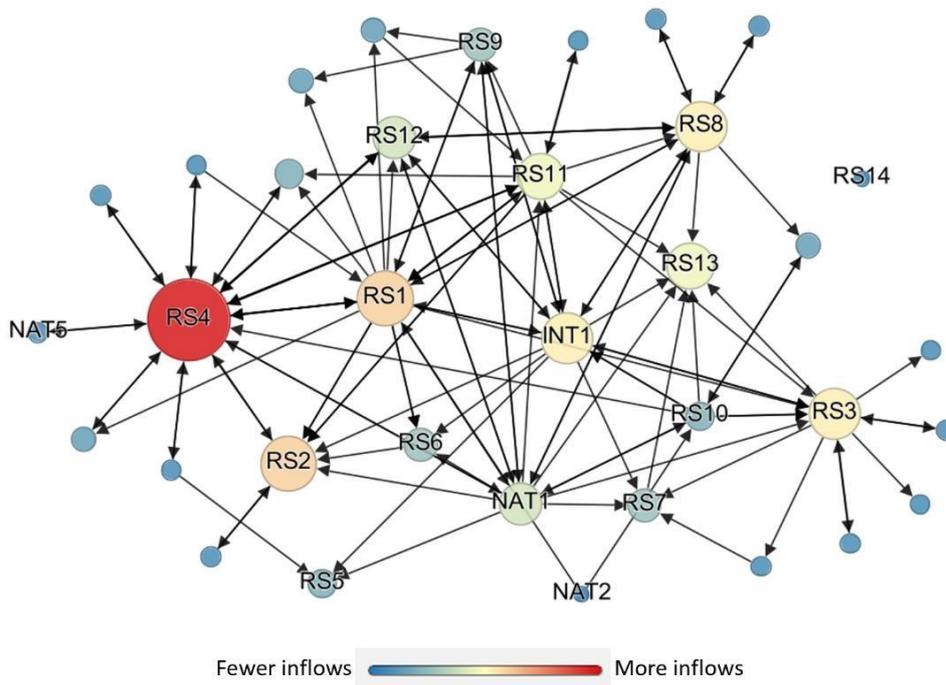


Figure 17: Sociogram representing knowledge inflow exchanges within the INT1 CE network. Self-created using Gephi. Data were obtained from Appendix M1, regional survey responses. **Node colour and size** correspond to knowledge inflows. **Node abbreviations:** INT(x)= Intermediary organisation, network coordinator. NAT (x)= National level intermediary organisation, RS(x) regional survey respondent.

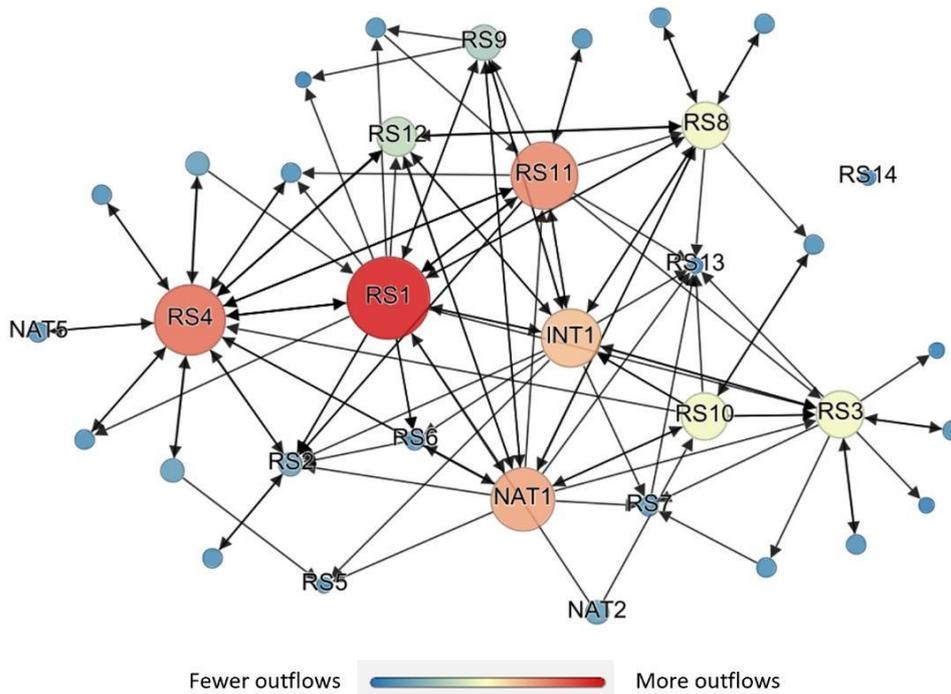


Figure 18: Sociogram representing knowledge outflow exchanges within INT1 CE network. Self-created using Gephi. Data were obtained from Appendix M1, regional survey responses. **Node colour and size** correspond to knowledge outflows. **Node abbreviations:** INT(x)= Intermediary organisation, network coordinator. NAT (x)= National level intermediary organisation, RS(x) regional survey respondent.

Both figures 17 and 18 represent knowledge exchange data coded from the regional survey responses. The main difference between the figures is those of colour and node size difference. Figure 17 emphasises inflow edges, highlighting the biggest recipients of knowledge within the network, whilst Figure 18 shows the biggest knowledge providers.

It can be seen that most organisations have multiple relationships with other members within the network setting. Only one organisation (**RS14**⁵²) recorded no instances of providing or receiving knowledge from the network coordinator (**INT1**) or other members. **RS4** is observed to be the highest recipient of knowledge within the network, as denoted by the node heatmap in Figure 17. Second-tier recipient organisations were **RS1** and **RS2**, followed by **INT1**, **RS3** and **RS8**; they comprise the internal network knowledge-receiving cluster. Examining Figure 17, it can be seen that **RS1** is the highest knowledge provider

⁵² Secondary research of **RS14** showed that this specific organisation is a charity with no energy generation technologies. Its primary activity was advocacy based with local authorities on behalf of CE and thus had no knowledge-based exchanges with other members of this specific network.

within the network, followed by RS4 and RS11 as the second highest providers, and all of **NAT1** and **INT1**, **RS3**, **RS8** and **RS10** as the third highest organisations giving knowledge within the network.

When comparing the inflows and outflows, evident discrepancies between the nodes from both figures can be seen. For example, **RS2** and **RS13** had noticeably higher interactions of knowledge reception than those where they provided knowledge to the network. A minor variation was observed between the latter, where organisations with high knowledge reception (**NAT1**, **INT1**, **RS1** and **RS11**) had noticeably higher knowledge provisions. The raw data of **RS2** and **RS13** shows that **RS2** was established amidst the pandemic in 2020, which may explain the discrepancy between knowledge provision and reception. **RS13** was established in 2014. However, its dependence on volunteers (14 in total with 0 FTE) may indicate its discrepancy stems from an overall lack of engagement capacity. Their short answers further specify that *“It’s difficult to maintain networking because of time”* **RS13**.

Lastly, of the respondents, **RS5**, **RS6**, **RS7** and **RS9** were all found to have comparatively lower overall knowledge exchanges. From the figures, although some interactions exist, they appear to neither provide nor receive meaningful amounts of knowledge. When examining the raw data, it was found that three respondents were also members of other networks⁵³ geographically closer to their organisation. Similarly, their short answers, citing the other networks as opposed to **INT1** in their benefits and lessons learned, confirm that their knowledge exchanges occur within another network setting. Only one respondent (**RS7**) was primarily affiliated with **INT1** and had low knowledge interactions. Their short answers indicated that although **INT1** supported them with their establishment, acquiring capital and registering their organisation, *“[INT1] support with powering up, RCEF and setting up a BenCom⁵⁴”* **RS7**, it was difficult to maintain ongoing network engagement due to limitations of *“Time, we are a small group of volunteers”* **RS7**, their organisation comprises only ten volunteers and no FTE.

The LEP energy hub representative explained that CE members of networks were often in a better position to apply to be awarded grant funding. It was explained that these network connections allow them to gain a certain familiarity through the experiences of others in the application process, the language of documentation and its presentation professionally

⁵³ The raw data notes that **RS5** was a member of **INT7**, **RS6** was a member of **INT3** and **RS9** was a member of **NAT2**.

⁵⁴ BenCom is a synonym for a Community Benefit Society.

and convincingly. “Groups that are members of [INT1] have some confidence in projects [...] they were the first to apply when we open the projects, they’ve been the first to complete their feasibility studies and progress through to delivery” P7 (LEPEH, SE, FTE).

Lastly, non-CE members of the network were found to have the least knowledge-based interactions overall as a group within this setting; individual examinations of the data reveal that they are primarily recipients of knowledge, indicating that they benefit from the specialised solutions presented to them by CE organisations for their sustainability targets. It should also be noted, however, that the low response rates and the inability of the non-CE members to comment on their relationships with CE organisations within the network may exclude potential relationships that the instrument has not captured.

Overall, the network and its coordinator provided ample support to its members. High knowledge interactions between its members, with many of those relationships being bi-directional, suggest that the network has strong knowledge-sharing channels and strong interorganisational relationships, both of which indicate that the network is mature (Dyer & Nobeoka, 2000).

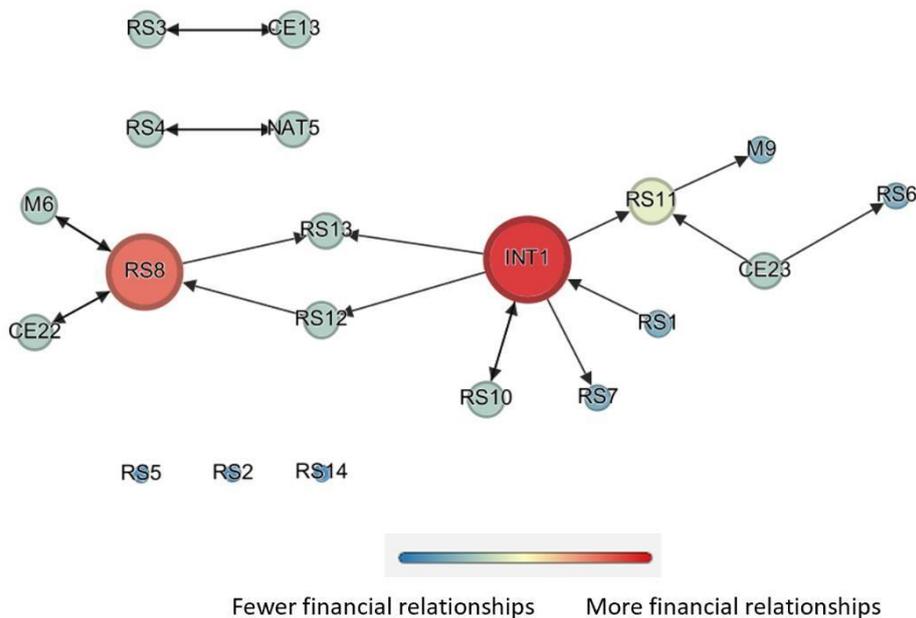


Figure 19: Sociogram representing financial exchanges within the INT1 CE network. Self-created using Gephi. Data were obtained from Appendix M1, regional survey responses. **Node colour and size** correspond to total financial exchanges. **Node abbreviations:** INT(x)= Intermediary organisation, network coordinator, M(x)= non-CE network member, RS(x) regional survey respondent.

Twenty financial exchanges were reported between the respondents, as shown in Figure 19, although secondary research shows several microgrants in the network setting. Unsurprisingly, of the limited financial relationships, **INT1** was found to have provided the most financial resources to its members. Secondary research showed that membership to the network was free, explaining the low inflows of financial resources to the network intermediary. The intermediary mainly benefitted from donations, grant funding, and partnership models as part of its revenue streams to sustain its activities.

Even though financial interactions were minimal, the ability of the intermediary organisation to create several partnerships with non-CE stakeholders across the energy sector has resulted in indirect but substantial financial exchanges, benefiting its members immensely. One participant explained how **INT1** was involved in establishing multiple CE organisations within its region, where significant financial resources were exchanged within the network setting but not captured by the instrument. *“I think what happened was when [INT1] was set up, one of the directors got funding to set up 12 CE groups [...] one of the directors was just great at securing funding” P10* (CE, SE, VOL).*

Although the survey instrument was limited in capturing financial interactions within the network setting, the interview data showed that these exchanges were indirect. Rather than being directly provided by the network coordinator, the intermediation of the coordinator to ensure partnerships and the development of relationships ensures the flow of financial resources to its members through other parties. For example, one participant explains two initiatives by the network that resulted in financial exchanges, significantly benefitting the CE organisation. Firstly, the participant explained how their organisation benefitted from a year-long revenue stream through their local DNO that was directly mediated through **INT1**; *“The joint fuel poverty campaign that we’ve run in the past with [DNO][...] we did that as part of [INT1] [...] we were only a junior partner [...] [but] Being part of this bid to [DNO] meant that we could offer year-round mobility” P4 (CE, SE, FTE).* Following this, the participant further explained how since that scheme has ended, they have since commercialised the activities they have gained experience from during the project.

In a second example, the same participant further explained a recent initiative where the intermediary has again successfully coordinated and secured an opportunity for its members; *“[INT1] is the lead partner on a ground-breaking initiative [...] [it’s] a collaboration of 10 partners [...] all involved under that umbrella of [INT1] [...] I think that’s*

a very successful example of the groups collaborating because it's given us a lot of money involved in that project [...]” P4 (CE, SE, FTE).

Indeed, the ability to secure partnerships by the intermediary for the benefit of its members was of crucial importance to these organisations. Alongside these examples, it was clear that the network sought to obtain long-time revenue streams instead of single payments to sustain activities and grow its regional CE presence.

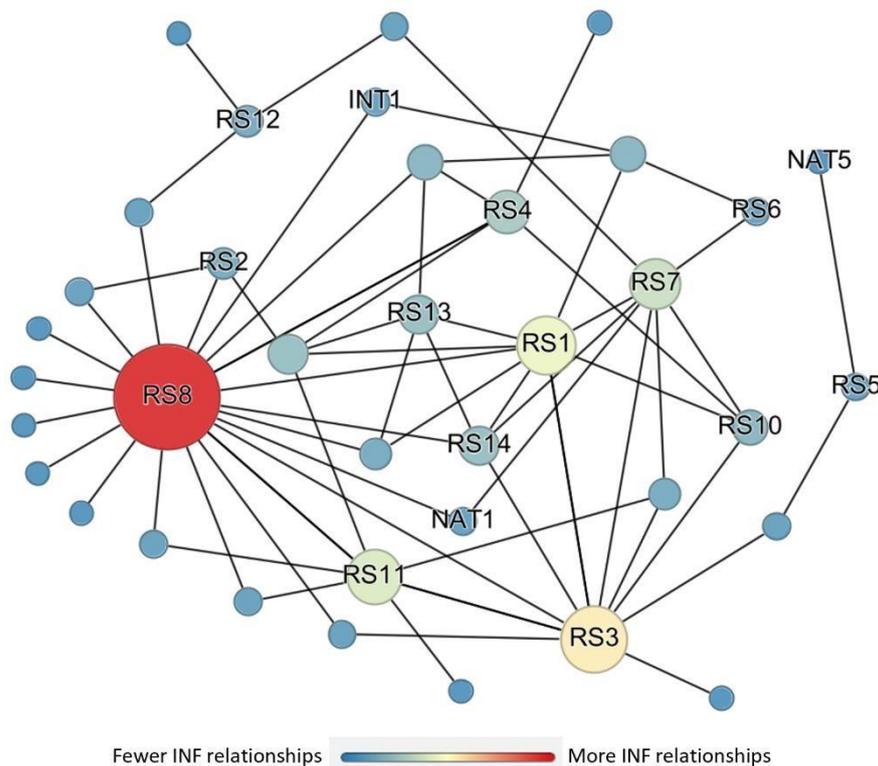


Figure 20: Sociogram representing informal relationships within the INT1 CE network. Self-created using Gephi. Data were obtained from Appendix M1, regional survey responses. **Node colour and size** correspond to the number of informal relationships. **Node abbreviations:** INT(x)= Intermediary organisation, network coordinator. NAT (x)= National level intermediary organisation, RS(x) regional survey respondent, INF= Informal relationships.

Figure 20 shows all the informal relationships among the regional survey respondents. These relationships denote informal connections and exchanges between the members within the network setting. Interestingly, whilst some respondents specified a financial or knowledge exchange with other organisations, they also included the informal relation category. This was interpreted as a single interaction between the organisations instead of an ongoing relationship. Additionally, whilst some respondents appeared to answer this

question diligently, with multiple informal relationships noted, others either ignored this completely or only specified an informal relationship alongside an additional interaction type.

Whilst some respondents noted having an informal relationship despite an additional interaction, others that indicated only an informal relationship appeared to at least be aware of each other, albeit at a general level. Plentiful informal interactions between CE and non-CE members showed that whilst non-CE organisations may not be interested in specialised CE knowledge, they benefit from having broad affiliations with the sector to achieve their sustainability targets while helping the CE organisations as potential clients for a host of activities.

Including an informal relationship also highlights lower-intensity relationships or those not ongoing between the network members. Reports of both financial or knowledge and informal relationships simultaneously imply a cooperative ethos within the setting; these relationships are expected to continue to grow and evolve as the intermediary continues to coordinate activities and facilitate exchanges between its members and the members themselves interacting within this setting.

When examining all four figures (17-20) together, it can be seen that specific organisations represented the highest number of interactions across most relationship types. These organisations represent those with the most connections with others within the network, rendering them critical players within these settings through their high degree of centrality (Tsai, 2001). This central position within the network allows them to be the primary beneficiaries of the networks as information primarily flows through them. In turn, they shape the overall behaviour and interactions within the network.

Although the network was mainly referenced positively, one survey respondent commented that **INT1** was *“A poor regional network, which seems to be run for the benefit of a selected few”* **RS4**. Previously, it was explained that **INT1** secured funding for establishing a core group of 12 CE organisations within the locality. This information, alongside the identified core group of beneficiaries from the knowledge exchanges, provides evidence of a cluster's existence of organisations reaping the rewards of the network. This creates an area of consideration for CE networks towards the flow of network benefits. As some organisations have ambitions of continued growth, others favour greater local embeddedness and choose to focus on non-CE activities within their

locality. CE networks and intermediary coordinators are biased towards CE growth, especially commercially. This translated into increased support and closer relationships with members with similar growth-based ambitions and targets.

The networks must therefore ensure an equal representation of commercial activities that sustain sectoral growth, allowing new organisations to become established and providing existing ones with renewed opportunities. The network must also ensure that organisations with a different vision of CE and their future direction are represented and provided with resources and support to ensure their continuity.

5.7.2 Mapping CE exchanges with regional and national level intermediaries – General Survey

Similar to the previous section, all the responses to the general survey instrument represent respondents' interactions with listed regional INT(x) and national NAT(x) intermediary organisations.

This section focuses on the relationships between CE organisations and intermediaries coordinating CE networks. General survey results are presented, followed by initial comments on the number of interactions, their type and the number of organisations the data represents. After that, the section focuses on specific intermediaries where CE relationships with councils, DNOs, local authorities (LAs), LEP energy hubs and CE intermediaries.

The general survey returned 266 interactions between the respondents and the listed intermediaries. These relationships are split between knowledge exchanges (178), informal relationships (46) and financial exchanges (42). Again, four separate figures (figures 21-24) were created due to the observed relationships' density. The combined sociogram can be found in Appendix N2.

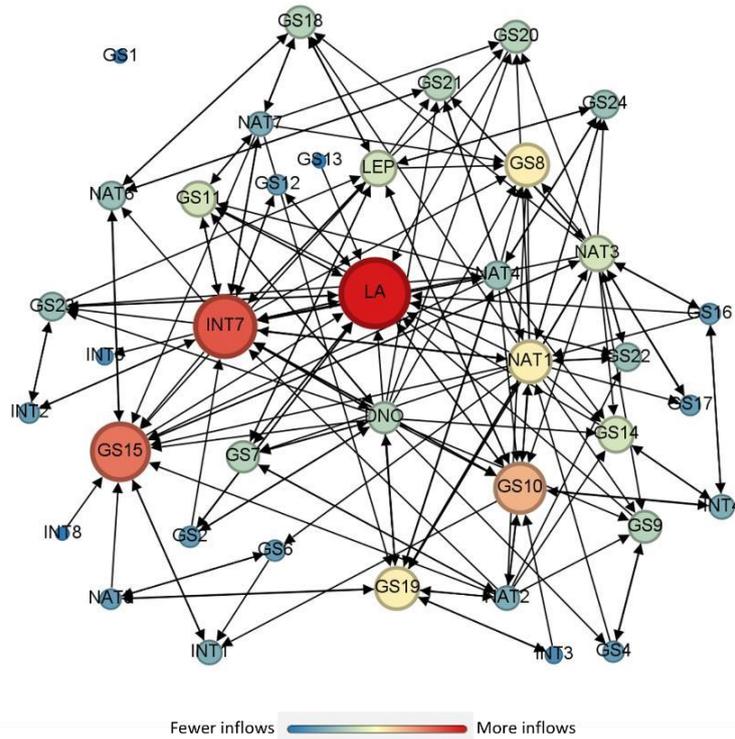


Figure 21: Sociogram representing knowledge exchanges between CE respondents and network intermediaries. Self-created using Gephi. Data were obtained from Appendix M2, general survey responses. **Node colour and size** correspond to knowledge inflows. **Node abbreviations:** DNO= District Network Operator, GS(x)= General survey respondent. INT(x)= Intermediary organisation, network coordinator. LA= Local Authorities, NAT (x)= National-level intermediary organisation.

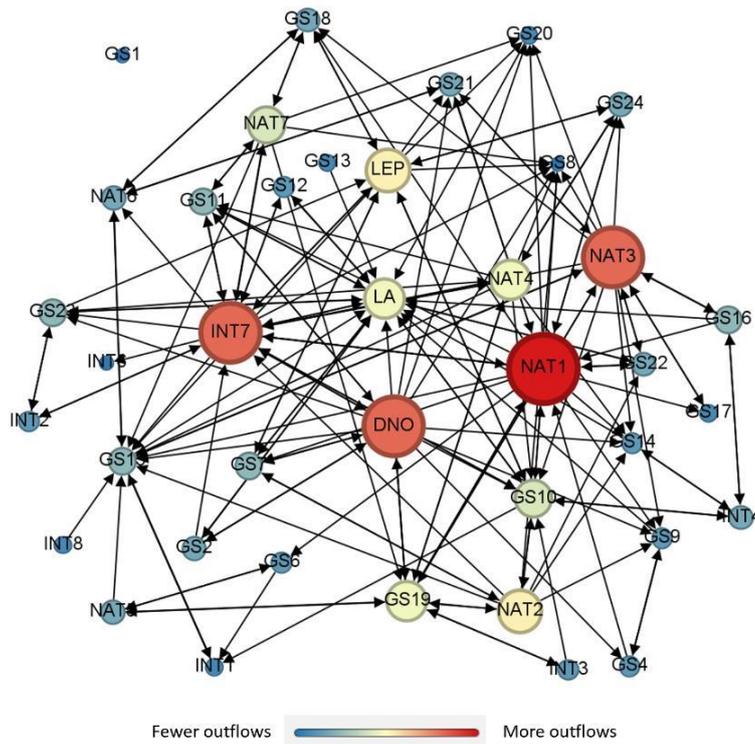


Figure 22: Sociogram representing knowledge exchanges between CE respondents and network intermediaries. Self-created using Gephi. Data were obtained from Appendix M2, general survey responses. **Node colour and size** correspond to knowledge outflows. **Node abbreviations:** DNO= District Network Operator, GS(x)= General survey respondent. INT(x)= Intermediary organisation, network coordinator. LA= Local Authorities, LEP= Combined Local Enterprise Partnership Energy Hubs, NAT (x)= National-level intermediary organisation.

Figures 21 and 22 represent knowledge-based interactions reported by the general survey respondents—178 knowledge-based interactions between 38 organisations. Only one respondent (**GS1**) indicated they had no knowledge interactions with any of the listed intermediaries. Initially, from the figures, it can be seen that CE respondents reported having more instances of receiving knowledge than its provision. Similarly, most of the listed intermediaries, except for the local authorities (**LA**), had more knowledge provision than its reception.

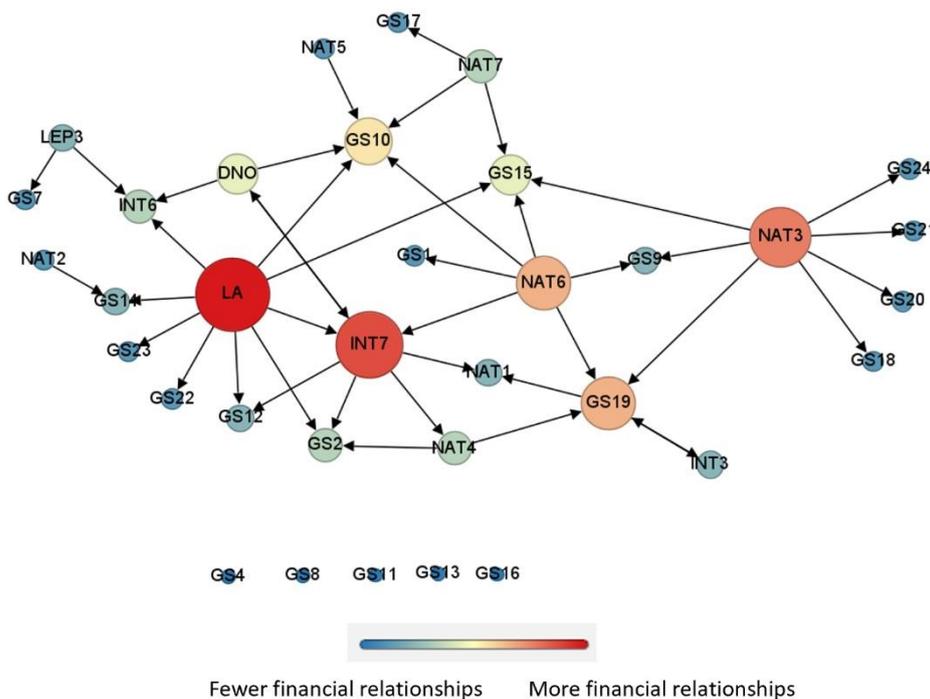


Figure 23: Sociogram representing financial exchanges between CE respondents and network intermediaries. Self-created using Gephi. Data were obtained from Appendix M2, general survey responses. **Node colour and size** correspond to total financial exchanges. **Node abbreviations:** DNO= District Network Operator, GS(x)= General survey respondent. INT(x)= Intermediary organisation, network coordinator. LA= Local Authorities, LEP(x), Local Energy Partnership Energy Hub, NAT (x)= National-level intermediary organisation.

Figure 23 represents the 42 financial exchanges between 37 organisations captured in the general survey mailing list. When inspecting the flow of financial resources, it can be seen that although some bi-directional relationships existed, the CE respondents were primarily finance recipients from the listed intermediaries. **GS4**, **GS8**, **GS11**, **GS13** and **GS16** all indicated that they had no financial interactions with any of the listed intermediaries, whilst **GS10**, **GS15** and **GS19** reported receiving financial resources from multiple sources. The figure shows that local authorities were the largest provider of financial resources, with nine recorded interactions. However, these figures measure instances of interaction and not monetary amounts. Secondary research showed discrepancies between the financial provisions. For example, most financial resources provided by local authorities were found to represent microgrants, mostly under £5,000. Other bodies, such as Cooperatives UK (**NAT3**), offered more considerable sums, albeit with lower reported interactions.

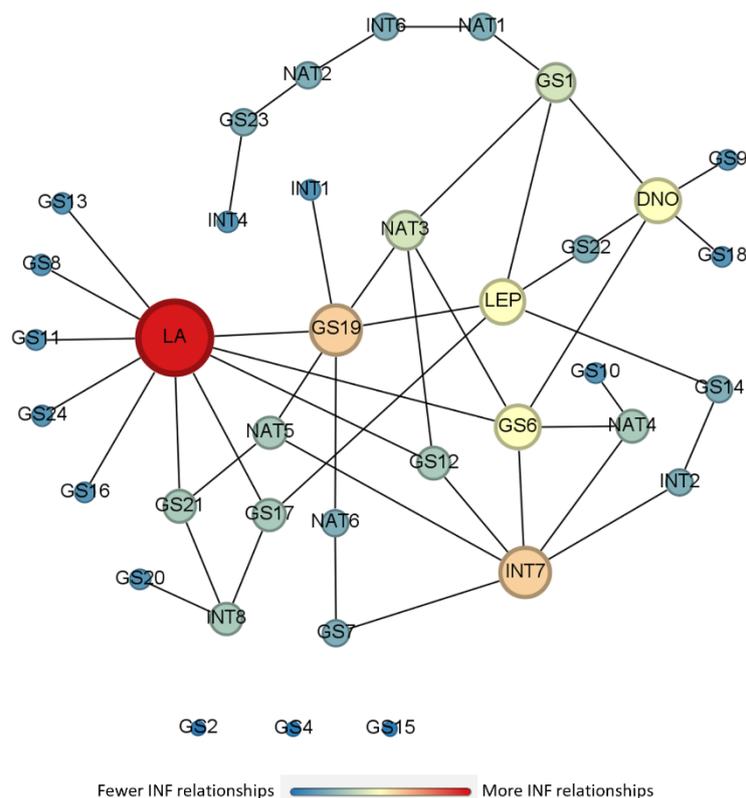


Figure 24: Sociogram representing informal relationships between CE respondents and network intermediaries. Self-created using Gephi. Data were obtained from Appendix M2, general survey responses. **Node colour and size** correspond to total informal relationships. **Node abbreviations:** DNO= District Network Operator, GS(x)= General survey respondent. INT(x)= Intermediary organisation, network coordinator. LA= Local Authorities, LEP= Combined Local Energy Partnership Energy Hub, NAT (x)= National-level intermediary organisation.

Figure 24 represents the informal relationships the general survey instrument captured. A total of 46 informal relationships were reported between the 43 organisations. Only three respondents (**GS2**, **GS4** and **GS15**) indicated no informal relationships with the listed intermediaries. Whilst several respondents noted having multiple informal relationships with other organisations, most respondents only indicated having one relationship.

Similar to knowledge and financial exchanges, the node representing the combined local authorities was again found to represent the highest number of informal relationships.

INT7 and **GS19** closely followed this.

5.7.2.1 CE relationships and interactions in non-CE networks

Both interviewees and survey respondents were asked to provide details about their network-level affiliations and memberships. Whilst the interviews did not specify the type of network and allowed the participants to give uninterrupted accounts of both CE and non-CE networks, the survey instrument explicitly asks respondents to list a local, regional, national and noteworthy non-CE network they were members of.

A total of seven participants reported that their organisations were members of non-CE networks in addition to having affiliations with CE networks. The main non-CE networks identified by the participants during the interviews included localised approaches of organisations within a town or city, which shared a common emphasis on creating social impact or addressing broader issues relating to sustainability, networks focusing on bringing together organisations with similar technologies and much larger networks, considered to be national level, which combine similar organisational types, such as cooperatives UK (denoted as **NAT3**). These non-CE networks then varied from localised cohorts to regional partnerships and nationwide networks, bringing together organisations with a shared mutual feature such as geographic proximity, shared emphasis on social impact or shared technologies.

Interviewee accounts suggested that these non-CE affiliations were highly beneficial to their organisations due to their ability to provide them with different resources such as financial and capital benefits, specialised knowledge which did not fit into the CE bracket and, most importantly, to connect them to other organisations, which may build ongoing relationships with CE organisations. As one participant explains, although they are connected to several CE networks and wider RE-focused networks, they implied that their membership to a non-CE network was perceived as the most beneficial, *“The organisation*

or the network that I thought brought more value to [REDACTED] [...] was a local organisation called the [REDACTED] [...], which is a network of social enterprises [...] when you are a member, you have access to weekly workshops on very specific things [...] we've certainly had a lot of value from being part of that network" **P4 (CE, SE, FTE)**.

In addition to gaining access to these workshops, it was explained that being part of a non-CE network created opportunities to engage non-CE member organisations and improve their overall market access to potential customers for their commercial purposes. As these organisations were socially driven themselves, sustaining ongoing relationships with these organisations translated into commercial opportunities where the CE organisation could support their non-CE network counterparts in becoming more environmentally sustainable and supporting RE projects within the locality. The participant notes that *"Different jobs have come [...] from being a part of that network [...] People wanting to reduce their own environmental impact [...] [They] say you should come and do a survey of our building [...] and we've got a few surveys off the back of that"* **P4 (CE, SE, FTE)**.

In a second example, another participant also explains how the non-CE network that they were affiliated with, operating primarily in the Northeastern regions in England, provides many benefits to its members such as *"Networking events, training and information [...] hot desking space [...] a small business unit [...] they sort of cover all of that stuff"* **P15* (CE, NE, VOL)**. It was further explained that the intermediary coordinating organisation of the network played an instrumental role in the establishment of the participants' CE organisation, *"Part of the money to do that was from [...] an organisation called [REDACTED]; who support local businesses [...] they said we'll lend you the money, and you buy the solar panels [...] if that goes wrong, we'll just have the solar panels, so we can't lose [...] that was an invaluable deal"* **P15* (CE, NE, VOL)**.

Whilst most participants provided positive accounts of their affiliations in non-CE networks, highlighting their benefits and commenting on the mutual learning processes between the members. In one case, a specific non-CE network was highly criticised due to its perceived inability to deliver and connect different organisations. When asked about their network memberships and broader relationships, the participant explained that whilst they have a *"Minor local connection"*, **P3 (CE, NW, VOL)** with other CE hydro schemes, other relationships were minimal beyond this, especially with organisations hosting similar hydroelectric technologies. When probed into further describing the reasons, the participant explained that *"The problem in England comes down to [...] the British Hydro*

Association [BHA]⁵⁵ [...] It simply has not and does not represent hydropower in England [...] If that organisation could stand up and do what it was meant to do, then we would have interconnectivity between the hydro schemes in the country” P3 (CE, NW, VOL).

Through desktop research, further details about the BHA's role and objectives were obtained to ascertain why the participant presented these notions. It was observed that the BHA supports hydroelectric schemes around the UK. There appears to be a generalised focus on hydroelectricity, which may entail a deeper focus on larger and more commercial organisations instead of a CE-specific focus. Similarly, whilst there appear to be specific channels and sub-networks devoted to micro-generating approaches, they make no distinction whether such an initiative is CE or commercial.

Although several non-CE networks and their intermediary coordinators were identified⁵⁶, interviewees and survey respondents cited Cooperatives UK and Regen as essential non-CE networks. Cooperatives UK supported CE, amongst all other cooperative and community benefit type approaches within the UK, through multiple aspects involving a booster fund, hosting the community shares unit, mentoring schemes and a myriad of online resources and toolkits which may be used at the disposal of its members (Co-operatives UK, 2021). Their fundamental role was found to provide multidimensional support, targeting several aspects associated with CE support.

Whilst two excerpts are provided in this section relating to their support, several other examples of their services and benefits were presented throughout the chapter. In one example, an interviewee pointed to their affiliation with Cooperatives UK and explained that they previously benefitted from their mentoring scheme. They further indicated that they have an ongoing connection with the intermediary organisation and approach them to

⁵⁵ The BHA is a trade membership association acting as the primary representative of the hydroelectric sector in the UK. Its primary role includes the promotion of hydropower and supporting hydroelectric development. Their other activities include advocacy and lobbying with public bodies and the government, providing its members with political, technical and regulatory information and advice, supporting sectoral collaboration through networking opportunities, organising training and development opportunities and more general hydropower promotion and innovation support (BHA, 2022).

⁵⁶ For example, one network identified in the survey responses was the 'North of England Hydro Electric Network'. Two survey respondents indicated their affiliation with the network; However, no secondary information, such as a webpage or other mentions in sectoral reports and informal blogs of the network itself could be found through online sources. This suggests that the network may either be of an informal nature or that its official name is different to the coined term presented by the respondents. It may also be the case that the identified network is indeed affiliated itself to the BHA, as one of the BHA's sub-regional networks, as its webpage specifies the existence of multiple regional and technological channels throughout the UK.

promote projects or share offers. They explained, *“Whenever I’ve got in touch [With Cooperatives UK] and said can you put this in the newsletter? They do [...] when I’ve asked them a question, they’ve pointed me to things that help”* **P15* (CE, NE, VOL)**.

After a lengthy conversation with another participant concerning Cooperatives UK, it was explained that their pedigree within the broader cooperative movement within the UK allows them to easily incorporate newly developing sectors, such as CE, who conduct similar activities that fit into their objectives. It was explained that *“There is a much better collective ideological understanding about collective support for CE within the Coop movement, which is a political movement”* **P11* (CE, NW, VOL)**.

Survey findings relating to interactions within Cooperatives UK (**NAT3**) report 30 interactions between 17 responding organisations and the network. These interactions were predominantly around Cooperatives UK providing knowledge to the respondents (N=14). This was followed by financial provisions from the network (N=7) and instances of knowledge transfer from the respondents to the network (N=6), suggesting that it was actively learning from the sector. One further example of Cooperatives UK was mentioned in question 16 of the survey, relating to perceived network benefits. The respondent commented, *“Through Coops UK, we were able to match our fundraising with a booster fund”* **GS18**.

As an intermediary organisation, Regen (**NAT2**) is the central coordinator of its network comprising RE stakeholders. Its main objective involves the promotion of RE to businesses, communities and households by advocating RE to relevant parties, connecting different stakeholders and creating and redistributing financial and knowledge-based resources (Regen, 2022). Both interviewees and survey respondents highlighted Regen’s value to the CE sector. Due to their perceived benefits, it was suggested that *“Regen represents real businesses”* **P6* (CE, SW, VOL)**.

In explaining their benefits, one interviewee explained that although membership to the network was expensive, their primary value came from their technical pieces of information around microscale RE systems, specifically solar PV, in the context of the conversation⁵⁷. *“I’m looking at very technical things [...] Regen is much better at that aspect than CEE [...] Regen is a paid-for membership, and it’s not cheap [...], but it’s quite an*

⁵⁷ Secondary research later showed that Regen provides technical information on a wide range of RE and sustainable technologies, such as biogas, hydroelectric, solar PV and wind.

important source of knowledge, and because they are now national [...] we get the connection to information from elsewhere” P6 (CE, SW, VOL).*

A second participant who commented on Regen similarly indicated that a colleague within their organisation with a technical background also greatly benefited from these sources of information and regularly attended their events. Additionally, the interviewee commented that their interactions with the network allowed them to become more closely involved with their DNO; *“Regen convene a CE forum [...] it helps the DNOs tick their community boxes [...] Also, it’s a really good networking thing for us” P15* (CE, NE, VOL).*

Survey responses reiterated these findings. Question 16 in the survey asks respondents to provide a network learning example from their own experiences, where three responses directly cited Regen in their short answers. Interestingly, two responses directly cited information related to battery storage technology, whilst a third respondent noted that *“Regen was instrumental in helping us set up” GS14.*

Further organisational interactions with Regen (**NAT2**) were captured in the survey, showing that the network provided knowledge to 11 CE organisations. Overall, the network was an essential resource for the CE sector. It provided member organisations with financial and knowledge-based resources and a platform that created opportunities for CE organisations to become involved in the wider RE sector. Although its membership was noted to be expensive, interviewee accounts specified that the knowledge acquired from such networks was quickly disseminated and shared across the localised informal network of CE organisations.

5.7.2.2 CE relationships with councils and local authorities

Due to commitments around zero carbon targets and, more recently, the declaration of climate emergencies, local authorities are increasing their responsibilities as crucial actors in the broader energy transition and, more specifically, as a potential avenue for CE-based partnerships (Bourdin & Nadou, 2020). The necessity of engagement from the perspective of CE organisations, however, often lies in the statutory power of local authorities and their role in providing approvals and planning permissions for projects to go ahead, an aspect noted to be a significant barrier leading to several project stalls as reported by the 2020 CEE anonymised database.

Eleven participants spoke at length concerning local authorities, providing accounts of their interactions and overall perceptions of the role and capabilities of local authorities in

developing CE, with over 60 specific instances coded. Additionally, seven survey respondents indicated they were directly affiliated with their local authorities and councils as part of localised networks.

Commenting on their relationships with these parties, one interviewee explained that despite limited capabilities by the lower-tiered councils concerning their resources, their determination had seen creative approaches in providing services which may reduce some of the burdens of CE costs. It was explained that their parish council provided them with office spaces at no expense to their benefit. *“The parish council, borough council and [REDACTED] are very supportive of CE [...] we had no problem in getting planning permission [...] The borough is one of our shareholders [...] the parish council provided office facilities and such like” P1* (CE, NW, FTE).* In a second example, one participant noted how their constituency changed parties during the last elections and highlighted how both parties have been equally as supportive of their CE organisation; they explained that *“Previously we had a labour MP, now we’ve got a conservative MP, and both are members” P15* (CE, NE, VOL).*

Other examples were where local authorities had been capital providers, awarding grants alongside other forms of support to their local CE organisations. The survey instrument finds nine respondents who indicated receiving financial resources from their respective councils and local authorities. Additionally, two interview excerpts show different forms of local authority funding supporting CE across different stages of the organisation’s life. One participant explained the existence of a construction fund that they were able to use for their projects, highlighting a solid relationship between the CE organisation and local authority, *“We have a great relationship with the city council; we’ve got a revolving construction fund [...] we can dip into that and then raise the money [...] no questions asked” P1* (CE, NW, FTE).* The second example explains how the local authority was able to contribute to capital costs in addition to the provision of an ongoing mentoring fund *“There was a grant scheme to support solar [...] the money came through the district council [...] There was a pretty for relationship from the start [...] we sometimes get paid by local authorities to run mentoring schemes” P10* (CE, SE, VOL).*

Together, the excerpts support the vital role that these public departments play in the overall development of CE. However, whilst some felt support, there were multiple negative comments about the councils and local authorities in this domain. In one case, one participant suggested that their local authority was not interested in their CE

organisation; they explained that *“In our community, the parish council were not involved [...] Our own local authority has no interest whatsoever, they don’t care”* **P3 (CE, NW, VOL)**.

Reasons for the lack of support were cited to be mostly the resource limitations and budget cuts faced by these public bodies, rendering them incapable of acting upon broader commitments and legal targets set by themselves and larger governmental departments. One participant explains, *“Our council is very ambitious [...], but they don’t have the funding to pay for additional services”* **P11* (CE, NW, VOL)**. Although goals, targets and a low-carbon vision exist, a lack of funding has rendered this unattainable.

In identifying these critical issues, many participants provided accounts with striking similarities, pointing towards a financial deficit and a secondary lack of expertise, especially with local authorities operating at the lower tiers of governance. It was explained that *“Part of the issue has been that they [Local authorities] have become stretched on their finances, and can’t afford to be as outgoing with their capital [...] We don’t get political support in this part [...] and it’s a shame. With a little bit more, we could do more”* **P3 (CE, NW, VOL)**. Other excerpts reiterated this, with a second participant commenting that *“Stripping down local councils has been going on for many years [...] their ability to deliver on what they have to do legally is already challenged [...] to come now and put resources towards something you are not required to is going to take second place”* **P6* (CE, SW, VOL)**.

Additionally, apart from financial limitations, a secondary cited reason for the lack of CE support from the local authority was strongly linked to them needing adequate experience and expertise in CE projects and their methods of operation. One interviewee mentioned that it was necessary to differentiate between different local authority tiers due to their personnel and expertise differences. It was noted that *“There’s a lot of technical know-how in the councils. But remember, we are talking about the largest bulk of the council [...] the parish and town councils don’t have the experience at all”* **P6* (CE, SW, VOL)**. It is then suggested that authorities in different tiers of governance possess different capabilities and responsibilities. Following on, a second participant explained that *“New entrants like parish councils [...] don’t know where to go for support [...] they’re missing that initial relationship building [...] existing groups need to offer that experience and service [...] welcome new people into the sector and help them get started [...] More effort needs to be made to bring in new groups [...] that are very motivated and concerned by climate change but don’t have*

energy backgrounds [...] they might not know about CE as an opportunity [...] multiplying CE groups rather than reinforcing the established ones” P7 (LEPEH, SE, FTE).

In the following example, the participant explains how these knowledge deficiencies unfold in a real-world example. It was explained that reluctance to act often saw vital decisions and planning permission applications being delayed or rejected due to their inability to understand the rationale behind specific CE projects. It was explained that *“They have very little money and they can’t force RE [...] the whole thing is a free-market ideology [...] local councillors on planning committees don’t always understand the rationale at all [...] there are a lot of people who get roles in local authorities as elected members who don’t pick up the opportunity for training [...] when an unusual request comes through, they pass it to the officers, and unless the officers are committed to this kind of this, they won’t move on it because it might look too risky [...] anything that looks like an additional cost [...] just gets side-lined” P11* (CE, NW, VOL).* Expanding on this, the participant provided an insightful instance of interaction with a member of a local authority in their city, *“I spoke to a counsellor in the North of the city where they have the worst health statistics, the most unemployment, the most drug use [...] it’s just a very poor community [...], and they are just combative with the progressive council members in the South of the city where they’re trying out all sorts of things” P11* (CE, NW, VOL).*

Similar accounts were also revealed throughout the survey responses. A total of 21 respondents indicated that their organisation interacted with their local authority. From the interactions, 15 stated that they provided their local authority with knowledge, of whom eight specified that they also received knowledge. Interestingly, some respondents also indicated that whilst they had an interaction with their local authority, the relationship may be considered informal. Figures 21 and 22 show that the node representing combined local authorities has more knowledge inflows than outflows, suggesting it is a primary recipient of knowledge.

Overall, the experiences noted by the interviewees relating to their councils and local authorities showed that some were supportive of CE and benefitted the organisations through easing planning permission applications, investing in projects and providing them with necessary facilities like workspaces. Others were limited in support, almost inhibiting CE development within their locality. Reasons for this were determined to be due to limited funding within local authorities and their current and arguably more essential activities, necessitating direct action taking priority over CE. Similarly, whilst some local

authorities were found to possess great degrees of experience and expertise, those that fell within the lower tiers of governance, such as parish councils, have a different experience or familiarity with projects of this nature.

5.7.2.3 CE relationships with Local Enterprise Partnership energy hubs

The DBEIS established five regional LEP energy hubs in 2010 as part of a national strategy to support RE growth. These energy hubs are considered partnership-based initiatives between local authorities and local businesses within these localities. The main activities of the LEP energy hubs target aspects of decentralised RE capacity building, technical expertise provision, overall assistance to organisations engaged in localised energy activities (Liverpool City Region LEP, 2017) and the management of public grant funding such as the RCEF and UCEF (Hempshall et al., 2021).

During the interviews, the LEP energy hubs were only mentioned by two participants, even though other organisations represented by some of the other participants benefitted from services provided by the LEP energy hubs, such as the provision of grant funding which secondary research revealed several participating organisations benefitted from. One of these participants was an employee of one of the five LEP energy hubs. In their words, they explain, *“Were funded by the BEIS [...] we’re technically employed by the LEPs [...] our role is to work with the LEPs, local authorities, businesses, other partners and CE groups to help accelerate the delivery of local energy projects [...] We’re there to be an extra resource [...] we can parachute in at any point to help unblock any barriers that are holding back from progressing” P7 (LEPEH, SE, FTE)*. When commenting specifically on their role in the CE sector, the participant commented, *“With the CE groups [...] our main role is with the RCEF [...] we act as grant administrators [...] we also work to draw up their initial applications, and project bids [...] signpost them to experienced individuals as well” P7 (LEPEH, SE, FTE)*.

Apart from dialogue with this specific participant (**P7 (LEPEH, SE, FTE)**), only one other instance of discourse relating to the LEP energy hubs was recorded in the interviews. The second participant was asked to describe their network-level affiliations and relationships with intermediary organisations. After indicating that they were members of CEE, they mentioned that they were aware of their regional LEP energy hub. However, they stated there had been no progress beyond an initial communication. *“We’ve had talks, but nothing’s come about [...], but we do know they’re there” P15* (CE, NE, VOL)*. The participant further explained that they initially approached an employee of the energy hub with a request for funding through a share offer, but they were ignored. *“I did with our*

share offer [Contact the LEP energy hub], but they didn't come back with any funding or wanting publicity [...] he didn't come back and go, we can do this! [...] maybe one day”
P15* (CE, NE, VOL).

Similar to the interviews, there were limited responses to the national survey instrument regarding interorganisational interactions with the LEP energy hubs. Four survey respondents indicated their organisations were affiliated with their regional LEP energy hub in question 12. Additionally, question 17, which asks respondents to state interactions and their type between CE organisations and network intermediaries, reported 26 relationships between 16 responding organisations and all five LEP energy hubs.

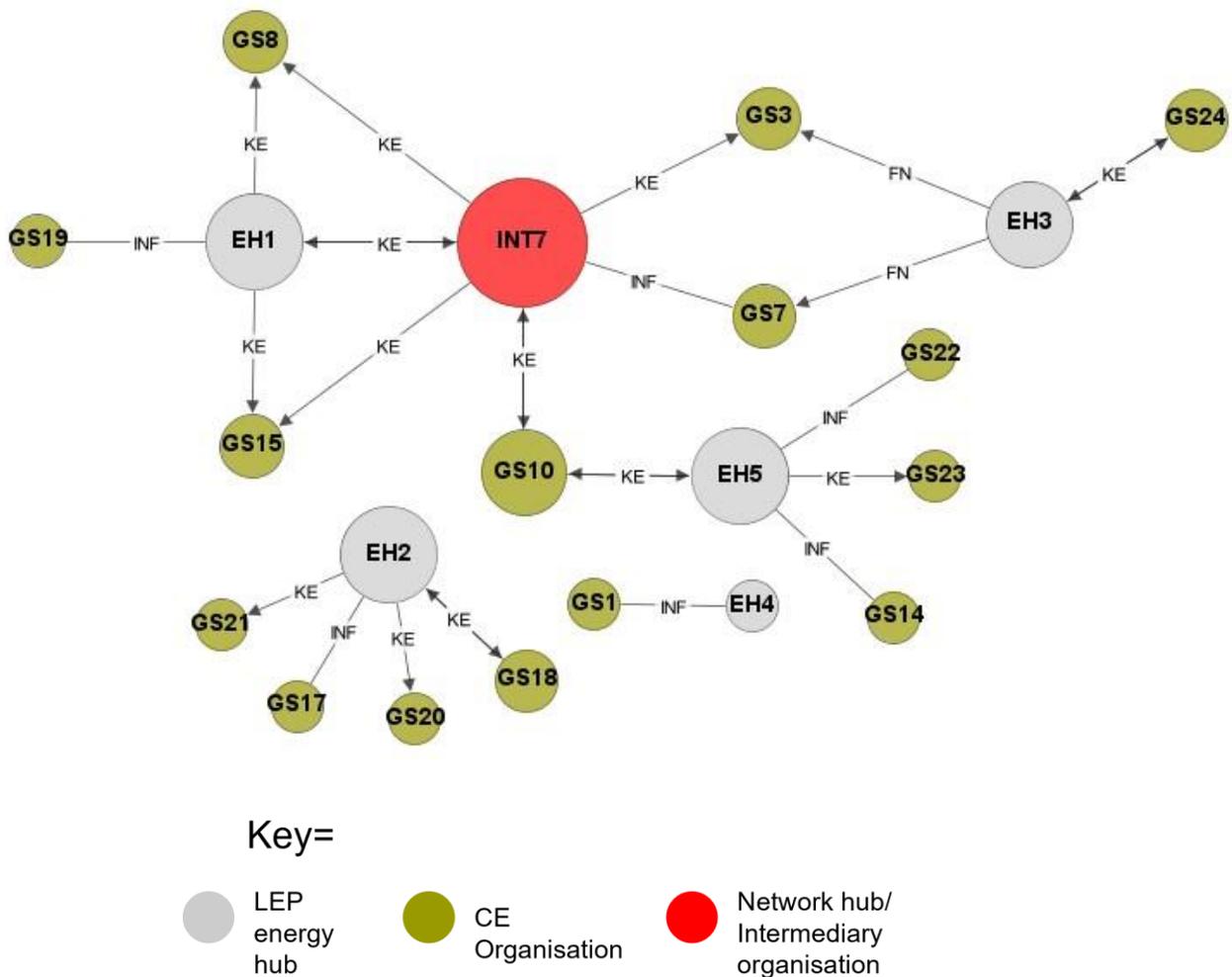


Figure 25: Sociogram representing LEP energy hubs exchanges with CE organisations. Self-created using Gephi. Data obtained from Appendix M2, national survey instrument responses. **Node size** is proportional to the number of interactions. **Node abbreviations:** EH (x)= LEP energy hub, GS (x) = National survey respondent organisation, INT (x)= Intermediary organisation, network coordinator. **Edge abbreviations:** FN = Financial exchange, INF= Informal relationship, KE=

Knowledge exchange. Directional exchanges are further specified with arrows showing the flow of the exchange.

Relationships between the LEP energy hubs and the CE sector, as reported in the national survey instrument, are denoted in Figure 25. The SNA found three clusters of interorganisational interactions between the regional LEP energy hubs and the respondents. The first is observed between EH1, 3 and 5 through interactions with ten CE respondents and a network coordinator (INT7). Both other clusters comprise **EH2** and **EH4**, with interactions reported by four and one CE respondent, respectively. Most of these exchanges were reported to be knowledge-based (11), followed by informal relationships (4) and two financial exchanges. Secondary research showed that both recipients of these financial exchanges benefitted from the RCEF. The representing participant commented on the RCEF, suggesting increased interest in the scheme as grant programmes such as the UCEF have now stopped. They commented, *“In terms of actual interest in the scheme, we’ve had over 320 inquiries [...] For our region, it’s a huge amount of interest”* **P7 (LEPEH, SE, FTE)**.

Whilst the participant representing the LEP energy hub provided several insightful examples relating to CE organisations’ interactions, several other examples and the overall dialogue of the interview suggested a closer working relationship between the LEP hubs and local authorities. It was suggested that it was easier to interact with them because they were public organisations. *“When it’s local authorities, we can work with them directly”* **P7 (LEPEH, SE, FTE)**.

It was explained that although several co-learning initiatives the LEP energy hub created were aimed explicitly at local authorities, this was not reciprocated in their interactions with CE organisations. *“We’ve worked with the heat networks delivery unit in BEIS to set up a forum where local authorities can interact with one another in their own space [...] I tend to support [CE network] activities rather than hosting our own events [...] For example, [INT1] has been running what they call a pathways project [...] they’ve been contacted by █████ County council with parish councils and community groups to promote the idea of CE. They’ve been doing that through webinars and other workshop sessions [...] they call them CE masterclasses. I’ve been invited to present for a slot on those events [...] We have had some people contact us following presenting at some of those events [...] more around a specific problem”* **P7 (LEPEH, SE, FTE)**. In concluding statements about their relationship with the CE sector, the interviewee suggested, *“There is an opportunity for us to be a lot*

more coordinated across the sector and offer a more coherent support package” P7 (LEPEH, SE, FTE).

5.7.2.4 CE relationships with DNOs

DNOs play a primary role within the energy sector and in the development of CE due to their critical position as national grid operators. A total of 14 DNOs condensed into six central bodies constitute the network operators in the UK. It was suggested that *“They run the grids and are a gatekeeper to any energy project” P13 (CONS, NW, FTE)*. All projects involving an element of generation must register with their respective DNO so long as they exceed the 4kW threshold (Simonds & Hall, 2013). Throughout the interviews, six participants commented on issues related to their experiences with their respective DNO. Expressing opinions relating to the perceived limitations and barriers they encountered by the DNOs themselves. Participants expressed a certain degree of understanding of the broader issues faced by the DNO, suggesting that there are apparent gaps between the deliverability of the DNO and the requirements put upon them by the more general zero carbon transition.

As an integral part of the energy system, the DNOs are undergoing a transition period concerning their systems and ensuring smooth energy delivery from decentralised, renewable sources (WPD, 2020). In the following excerpt, the interviewee recognises that the DNOs are proactive in their approach towards accommodating and creating capacity towards decentralised RE

technologies. *“This push for decentralisation, digitisation and democratisation is the last element [...] DNOs are reacting to this, and they are conducting research” P13 (CONS, NW, FTE)*. It was explained that whilst the DNOs recognise their need to adapt, issues of load management and adapting to RE technologies with different requirements on the current systems are not being addressed quickly enough. Expanding on this, a second participant further explained, *“One of the issues facing the DNOs is [...] to upgrade is incredibly expensive [...] Its really within the interest of the DNOs to encourage people to save energy, rather than use more” P10* (CE, SE, VOL)*.

The participants recognised many DNO initiatives aimed at interacting more closely with the CE sector and positively contributing to their sectoral development. This was achieved mainly through financial and knowledge-based support to aid CE organisations in the

establishment, to find alternative business models to remain competitive post-FIT and engage in experimental initiatives in search of novel and innovative approaches.

It was also clear from the interviews that different DNOs could be considered at different stages in their relationship-building and creating links with the CE sector. For example, most interviewees positively reported one specific DNO due to their proactive support in ensuring CE development within their operational parameters. Commenting on their own DNO, one participant noted that they had a relatively positive relationship with their respective DNO in which both the DNO and interviewees' CE organisation were benefitting, they explained *"They [DNO] knew all about electricity [...] they didn't know so much about engaging their customers and community groups [...] we gained a lot from them in terms of technology and to connect our generation [...], but equally, they found it very beneficial to work with a community organisation to learn how things went"* **P12* (CE, NW, VOL)**. In the excerpt above, the participant alludes to the DNOs having a wealth of explicit knowledge of their technical expertise and an intimate understanding of their energy systems. However, they did not possess tacit knowledge regarding interacting with communities, their organisations and individuals.

Interviews also showed that the same DNO might be reported differently by the interviewees, depending on their organisation's experiences in their interactions. It was indicated that this specific DNO currently has *"Two stakeholder groups"* **P11* (CE, NW, VOL)**, which encompasses CE members from the represented area, and *"Doing £10,000 grants for CE groups working on various innovation projects"* **P13 (CONS, NW, FTE)**. However, the same DNO responsible for a close working relationship with the CE sector was also criticised for significant project delays, resulting in adverse knock-on effects with other bodies. The participant explains that *"They wouldn't allow [our project] to connect to the grid [...] they wanted to charge us another £6,000"* **P2*(CE, NW, VOL)**. Although it was explained that *"We ended up not paying, but there were quite a few letters, right to the MP"* **P2*(CE, NW, VOL)**, the delays resulted in the organisation exceeding the funding deadline. *"We installed it in March [...], and it didn't get connected until June [...]. This had been all grant funded, and the deadline for spending the grant was the end of March [...]. We're already past the deadline"* **P2*(CE, NW, VOL)**. Due to multiple bodies having key roles within CE establishment, often, these delays have a domino effect, impacting commitments to other bodies such as grant providers and FIT registration deadlines.

Some interviewees appeared to be quite sceptical of the DNOs even though they recognised their role within the energy sector and further contributions specifically towards CE, as well as accepting their inherent barriers and difficulties. In the following example, one participant appeared to question the intention of the DNOs, regarding whether they were genuinely motivated to include CE or if it was considered to be a form of corporate social responsibility [CSR], they explained *“That’s a matter of [if] it makes us look good [...] like a type of CSR to say we’re supporting it, but are they? [...] Are they just saying, look at these CE groups doing work in our area [...] we’ve been helping them [...] or are they actively saying CE groups come and talk to us, we’ll give you funding or support”* **P13 (CONS, NW, FTE)**. In direct contradiction, others appeared to alleviate the DNOs from any blame, directing the blame on current issues instead on the energy regulator Ofgem; *“It’s not the DNOs, it’s Ofgem”* **P12* (CE, NW, VOL)** suggesting that the DNOs work within the parameters and requirements set up by the larger regulatory body. These critical accounts may indicate the overall lack of belief in the larger representative bodies involved in the energy sector due to the broader drop in emphasising CE development by larger parties such as the government and the regulator.

A common theme from discussions with the participants around the DNOs was the idea of local energy supply. This involved the ability of small-scale organisations, such as CE, with generation assets to utilise these for localised supply instead of the current system involving grid exports. One participant stated that one of the main barriers involved the considerable costs of gaining supplier status: *“An operating license will cost you £1,500,000 a year [...] this is why CE groups rely on existing suppliers”* **P6* (CE, SW, VOL)**. Currently, the Local Electricity Act 2021 is seeking to address this through the creation of a local supply license. Commenting on local electricity supply in the context of DNOs, the participant indicated that they had previously explored this as a viable CE solution and could obtain a grant through an external body to explore innovative local supply models. They explained, *“We got a grant to look at [Local electricity supply] [...] We talked to the DNO [...] came across all the hurdles [...] they said to us [...] it’s better to wait until the tariff to change to make your electricity FIT free and all that”* **P6* (CE, SW, VOL)**. When probing the participants into sharing some insights from the lessons learned during the grant, they concluded that CE organisations should focus on a low-customer, with higher demand models to enable local supply whilst simultaneously benefiting from reduced administrative and systems charges associated with numerous customers, they explained

“Its only worth doing in industrial sites [...] where you have large consumers [...] You put your installation on one of those sites [...], and you sell it to everybody else” P6 (CE, SW, VOL).*

Expanding on the issues of local energy supply, a second participant indicated how this is currently undergoing an experimental phase within the UK, with hopes of the Local Electricity Act bringing it to fruition. They provided an example of where this experimentation had occurred and how it continued to develop and grow *“One of the first things they [Energy Local⁵⁸] did was work in North Wales with Co-op Energy⁵⁹, and they got permission from Ofgem to run a trial of community supply [...] they wanted to sell that locally [...] at half the cost of what you would buy from your normal supply [...] they set up an energy club, people had to be members [...] and agree to buy the electricity from Co-op Energy [...] that ran as a trial [...] and was successful which means we’re now getting wider rollout and Energy Local are currently setting up several other energy clubs around the country [...] We’re working with them at the moment to set up one here so that we can use the surplus power we generate to provide electricity at half price to our village shop, which is a community run shop” P12* (CE, NW, VOL).*

The excerpts in this section indicate that different DNOs may be in different phases regarding their degrees of support for broader CE development. Overall, the interviewees presented critical views when expressing their opinions on the role of their respective DNOs concerning CE. Interviewees highlighted the problems faced by the DNOs, which mainly revolved around their lack of resources and inadequate CE experience.

Furthermore, it was recognised that DNOs have a much more significant role, with much bigger players than those represented by the CE approach. Given these difficulties, the DNOs were shown to be supportive nonetheless with several identified grant programmes, innovation support and cooperation with CE organisations.

The survey data represented the DNOs through a combined node, resulting in 26 interactions. Most of the relationships (18) were knowledge-based, with 13 instances of

⁵⁸ Energy Local is a CIC established in Bethesda, the North of Wales, in 2016. Their innovative approach to CE involves the creation of an Energy Local Club under a cooperative structure with specific PPAs in place to guarantee matched tariffs for local electricity supply, the surplus of which is exported (Energy Local, 2021). ⁵⁹ Established in 2010, Co-op Energy is an alternative energy supplier to the traditional big-six that focuses on RE supply and adopts ownership through a membership model (Co-op Energy, 2022).

knowledge provided by the DNOs and five instances of DNOs receiving knowledge from the respondents. Four instances of the DNO providing finance and four informal relationships were reported. It was also observed that eight of the recipients also had a relationship with **INT7**, indicating wider regional connections across several sources of knowledge by the CE organisations.

Due to its central role, the DNO has multiple affiliations with the wider energy sector, of which CE comprises a small facet. It is then essential that both CE intermediaries and organisations reach out to the DNOs in their search for knowledge. By examining the direction of knowledge inflows and outflows, it is evident that DNOs are regarded as a primary source of knowledge. Additionally, other bi-directional exchanges between the DNO and recipients and between the DNO and **INT7** indicate that the DNOs regularly approach the sector and are open to receiving knowledge should the opportunity and necessity present itself.

5.7.3 CE Networks

All the organisations in the interviews and surveys were found to be members of at least one CE-specific network. Discrepancies between the participants were mainly observed in the type of networks they were affiliated with, their degree of interaction with the network intermediary and its members and the networks' reach. Participants and survey respondents representing organisations from London, the Southeast and Southwestern regions are generally noted to have multiple CE network affiliations. These included a regional network and a national-level network (mainly CEE).

Participants and respondents representing organisations in other regions, in the Northeast and Northwest, were primarily affiliated with a single CE-specific network, which in most cases was CEE.

In describing the different activities provided by the intermediary organisations through the network and the network coordinator's perceived role, the interviewees provided several details ranging from general descriptions of a broader role to specific examples of intermediation. CE networks were found to exist mainly at the regional level, with national-level networks, such as CEE, acting as representative bodies. Similarly, some open-ended survey questions provided insightful details about the networks' perceived benefits. The survey further allows for SNA and network mapping techniques to explore inter-network interactions and the type of interactions within these settings.

Reporting the perceived value of the networks to the CE sector, regional-level networks were perceived to deliver the highest benefits to their members, whilst local networks were of the least value. Interestingly, national CE networks and non-CE networks (such as Cooperatives UK and Regen) were perceived to deliver similar benefits through approximately equal representation in the survey instrument.

5.7.3.1 Community Energy England, A national CE network

CEE was described as being a central hub of CE in England. Their membership page was taken as a starting point for the sample selection of this study, and their annual reports have been instrumental in providing this study with information relating to the dynamics of CE within England. Due to their prominent role within the sector, CEE was included in the regional and general survey instruments, denoted as NAT1. It was not surprising to see that most participants stated they were members of CEE, and a further 30 survey respondents also indicated their affiliations with CEE (**NAT1**).

One interviewee who provided an account of the role of CEE indicated that *“The purpose of CEE is to “Raise the voice, and the profile [of CE] [...] Help with introductions between people [...] upskill them to grow the sector in an intelligent way [...] the organisation is small for what it wants to achieve, but it achieves a lot because of the members that it has”* **P8 (INT, NAT, FTE)**. In a similar example, a second interviewee suggested that the network acted as a central place to allow CE organisations to benefit each other. They explained, *“That’s the role of CEE, right, to bring us together”* **P5 (CE, LDN, FTE)**.

Commenting on their wider role regarding their engagement with regional-level network intermediaries, another interviewee commented that part of the wider activities that CEE engaged in was the establishment of other network coordinators at the regional level. They explained that *“[CEE] work with a lot of the hubs and help set up some hubs [...] [CEE] were quite involved with the creation of CEL [...] and [CEE is] currently looking at value in creating a Yorkshire CE forum because people tend to operate better on a regional basis”* **P8 (INT, NAT, FTE)**.

Lastly, multiple interviewees also indicated that CEE hosts a practitioner forum. This was described as a common virtual space hosted by the network that aims to allow individuals and CE organisations to interact, share experiences and offer resources to each other. From interviewee accounts, some participants appeared keen on this forum and indicated active

interaction on the platform. Others knew of its existence but expressed no necessity or previous interest to engage.

Whilst most participants expressed positive accounts of their relationship with CEE, and the value that the network brought either to their organisation or in a general format to the CE sector, some interviewees indicated that whilst they were affiliated, they did not necessarily engage the network or participate in ongoing events.

One participant explained that *“CEE represents largely voluntary organisations”* **P6* (CE, SW, VOL)**, comparing the network to Regen, the participant suggested that their relationship with the latter network brought many more benefits, albeit at a premium cost of entry. It was explained that these benefits were mainly technical knowledge, which the participants’ organisation actively sought. CEE was an advocacy hub representing the CE sector to the government and non-CE actors involved.

5.7.3.2 Regional CE networks

Interviewees and survey respondents were asked to provide information about their affiliated networks. Specifically, they were asked to provide some details relating to the activities hosted by the network, the role of the intermediaries and the perceived benefits of these settings to the organisation.

Commenting on their affiliations, one interviewee indicated that organisations within their locality had established an informal network of CE organisations to engage in collaborative dialogue with other groups in the area, especially between those with overlapping activities. *“██████ is an informal network of CE groups, were all affiliated to CEE [...] we meet regularly, and we also have set up a kind of trading arm [...] which is looking at projects”* **P6* (CE, SW, VOL)**. They further explained that one of its network members was affiliated with Regen and would share the knowledge they obtained from this relationship with its informal regional network.

In a second example, another interviewee indicated that a key role of the network they were affiliated with was to act as a hub organisation, bringing CE organisations together and assisting working groups in establishing their CE initiatives. *“The aim of [INT3] is to become a central place [...] if you want to set up a community group, you go there [...], and they put you in touch with a potential group”* **P5 (CE, LDN, FTE)**

Commenting on INT3, a second participant whose organisation was not affiliated with INT3 nor was it within its regional boundaries commented that one of the specialisations of the network was its activities that target fuel poverty alleviation due to its prominence within their area. They explained that *“A lot of the CE groups get involved with fuel poverty projects [...] you can get some really good ideas from to how to create valuable local partnerships that you haven’t thought about from other groups [...] I learned quite a lot from one of the London groups talking about partnerships they created with different BAME⁵⁹ communities”* **P4 (CE, SE, FTE)**.

Role of INT7 and recorded interactions within its network

INT7 was identified as the regional intermediary with the highest recorded instances of interaction from the general survey instrument. In total, 42 interactions were reported by the intermediary, who responded to the survey, and other respondents. These were split between knowledge (28), financial (8), and informal (6) interactions/relationships. One interviewee has described the role of this intermediary as; *“[INT7] helps talk people through how to set up [A CE organisation]”* **P9 (INT, SE, FTE)**.

Examining the direction of the knowledge interactions from **INT7** shows that knowledge sharing constitutes an essential element of the overall activities of **INT7**. Comparing inflows and outflows of knowledge, **INT7** was shown to have an approximately equal number of interactions, with 13 edges of knowledge reception and 15 edges representing knowledge provision.

Commenting on the interorganisational relationships within the network setting, one interviewee suggested that the strong interorganisational relationships and interactions within their regional CE network in their area resulted from years of interaction between the organisations. This naturally resulted in an organic system of interconnected webs instead of artificial creation. They explained that *“We call it the ecosystem [...] Here in [REDACTED]; it’s all built on very long-standing partnerships [...] a lot of trust has been established [...] some projects test that trust, where it’s all a bit harder [...], but that’s sort of the way it is”* **P9 (INT, SE, FTE)**. In providing some examples of its development, the participant explained that the regional hub currently acting as the central regional coordinator and financier of CE organisations and projects was unable to deliver on its intended role for some time due to its focus on self-sustainability. The participant

⁵⁹ BAME = Black, Asian and minority ethnic.

explained that “[**INT7**] was just trying to get some renewable installations when the FIT was there to generate an income [...] at that point, [**INT7**] wasn’t doing much for its members [...], but now we are generating an income, we are doing much more for the communities again” **P9 (INT, SE, FTE)**.

In addition to knowledge interactions, **INT7** was also actively engaged in financial exchanges, with eight edges representing the flow of financial resources. When combining these findings with the interviews, it was found that this intermediary utilises and redistributes these resources across its many initiatives and CE members. Specifically, the intermediary was found to have a strong involvement in the individual initiatives that its member organisations conduct. Another organisation that can be seen to play a strong role within this restricted setting is **GS6** which engages in several interorganisational exchanges and informal relationships with **NAT5**, **NAT6** and the node representing local authorities. From the external links between the organisations, external to those fostered by **INT7**, it can be seen that strong interorganisational relationships exist between all organisations within this specific locality.

Secondary research of the individual organisations showed that most organisations that interacted with **INT7** were neither members of the network itself nor located within its regional geographic boundaries in Southeast England.

Although the organisations were not immediate members of **INT7**’s network, the networking effect denoted by the strong cluster of interorganisational interactions suggests that the networking effect is strong. This indicates that two tiers of networking exist within the CE sector.

The first tier represents CE organisations that seek knowledge irrespective of its source and applicability to the organisation. These organisations, such as **GS15**, had multiple relationships with different regional intermediaries and networks and were observed to seek knowledge, adapt it and integrate it into the organisation. When comparing inflows and outflows, it was observed that whilst these organisations were active in their search for knowledge, this was not reciprocated in their provision of knowledge.

The second tier represents CE organisations that possess ample amounts of knowledge. These organisations are perceived to understand the benefits of sharing best practices through interorganisational and network-level interactions. Due to their perceptions of the value of these lessons, they do not enter these settings with a preconceived idea that they

will either provide or receive resources from the network. Instead, they engage in these forms of collaboration and sustain ongoing relationships to gain a central position within the network setting. As long as they remain engaged, they will gain access to all the knowledge that flows within the network and ensure that any potential opportunities will pass through them due to their prominent position. Whilst it can be argued that these organisations enter network settings for different purposes, the knowledge gained is simply a product of interaction.

As these organisations grow, their lessons continue to be disseminated across the network. Commenting on the important aspects of network engagement, one respondent indicated, *“Sharing our expertise with starter organisations”* **GS13**. The shared knowledge even makes its way to those affiliated with network members and coordinating intermediaries, but not necessarily network members.

5.8 Methods of cooperation

The interviews revealed several different methods of cooperation that allow CE organisations and networks to interact and share knowledge. These comprise both in-person and online forms of collaboration. The availability of digital platforms, coordination of events and training were the main methods of cooperation between CE organisations in an interorganisational and a network setting. Commenting on the tools available by the network, one participant mentioned, *“Having a really good digital platform for knowledge sharing [...] this can be really helpful, and this is something we can get better at”* **P5 (CE, LDN, FTE)**. Similarly, in another example, a second individual mentioned that these platforms were an important source of information that could direct the participant to other resources, *“I look at things like newsletters and social media, of all the other groups to see what looks successful”* **P4 (CE, SE, FTE)**.

The role of digital platforms has strongly impacted how individuals, organisations and networks alike can communicate and interact together. In the CE sector, the interviews demonstrated that although some organisations already had a robust digital presence, the impacts of the pandemic have seen greater utilisation of these tools. As one interviewee indicates, *“There’s a really good, cooperative sense [...] we have all these email lists and various forums for people, and they go to conferences, and people exchange things and share things”* **P2*(CE, NW, VOL)**.

Internally, the utilisation of video calling applications to conduct virtual meetings in addition to shared server drives allows for efficient information transfer between organisational members. Furthermore, other organisations have also begun utilising digital tools and platforms for their activities. One participant indicated using mapping tools in their organisation and between a group of others across the region. The combination of these tools provides ample information. They explained that individuals could inspect the local area through *“Geographic representation”* **P6* (CE, SW, VOL)** and gain knowledge about the ongoing environmentally driven projects and key persons involved. In conclusion, the participant explained that they have since aided other CE organisations to create similar maps for their areas, *“People can find out whom to contact, and I know we’ve helped other groups do that [...] So, [REDACTED] is doing that now as well”* **P6* (CE, SW, VOL)**.

At the interorganisational and network levels, countless online platforms exist to facilitate better information exchanges and create various hubs where explicit knowledge may be accessed. Intermediaries and other organisations are utilising digital platforms for key knowledge, learning and financial activities such as crowdfunding now exist through the digital realm. Forms of soft digital interaction include newsletters and social media platforms. Events were also cited as important avenues from which learning outcomes and financial exchanges may be enabled between network members.

Although the participants highly regarded the shift to digital platforms, some interviewees mentioned that they do not necessarily lead to immediate fruition. One participant explained that online events generally require *“Follow-ups”* **P6* (CE, SW, VOL)**, and it was argued that *“Things never manifest out of online events”* **P6* (CE, SW, VOL)**. In direct contraction, a second interviewee mentioned how as an organisation, they benefitted greatly from adopting meaningful events to suit their context, *“There was a fuel poverty teams meeting [...] they’d had an online workshop, and they had over 100 attendees [...] I’m thinking; maybe we should do that”* **P4 (CE, SE, FTE)**.

Recognising that these events do not necessarily lead to immediate fruition, in addition to understanding that the online nature of these platforms can be maintained incise they may be revisited, it was noted that these events were *“beginning to become archived”* **P9 (INT, SE, FTE)**, which may contribute to wider databases which is a requirement of community energy organisations and an important feature that these networks may offer. *“An*

inventory of all community projects, where they're meeting, what they're doing, what their plans are and more case studies on different projects.” P5 (CE, LDN, FTE).

5.9 Quantitative findings relating to the 4I learning framework and extracted variables.

It was previously explained in Chapter 4 that the PCA tests were conducted as part of the quantitative aspect of the study to operationalise the 4I learning framework and measure the interitem relationships between the extracted variables representing the learning constructs. The conducted PCA tests resulted in seven factors represented by the data. Following the PCA process, a correlation matrix for the extracted variables (4.4.5) was created (Appendix F4) to inspect the interitem relationships between the learning constructs. The matrix revealed five statistically significant relationships for the newly created variables.

Firstly, group and organisational learning were found to have a small but negative relationship (0.344). This indicates the opportunity cost to the organisations for pursuing one form of learning over the other. Although the relationship is small, the implications suggest that an organisation must be selective over the different levels of learning it wishes to implement and focus on. This is deemed to be a result of the limited capabilities of the organisations, the largest of which are limitations of time and volunteer capacity to engage in these activities. As the group and organisational learning levels constitute different processes, and the same individuals achieve these processes at both levels.

This supports the low correlation due to these activities being undertaken by the same individuals. They can simultaneously capture different processes and achieve learning outcomes with the same interactions. However, there is undoubtedly a trade-off as a direct result of capacity. An individual cannot be in two places at once. An additional correlation coefficient with the inclusion of variables regarding FTE and volunteers was created. Still, it did not produce a meaningful relationship between the variables.

Furthermore, the individual scales for group learning comprise several group dynamics aspects. These aspects revolve mainly around the key characteristics of these organisations, as an organisation emphasises and is structured to promote democratic decision-making, participation and the inclusion of its members, which is further compounded by the voluntary nature of the work being carried out, it is important to

ensure that individuals dedicating their time and efforts are heard. These organisations cannot afford to lose the value of their volunteer capacity. This is also emphasised by the diversity in which individuals are found to represent in these settings. Therefore, an essential aspect of these considerations shapes a larger culture of positive dialogue and strong group dynamics.

The extracted Feed-forward variable, representing the flow of learning from the individual to the higher group, organisational and interorganisational levels, respectively, was found to have the most significant relationships with the highest number of variables. Firstly, it shows strong but negative correlations between group and organisational learning. A coefficient of 0.648 between feedforward and group learning implies eagerness to share information from groups to the higher levels of learning. Based on the interviews, CE organisations appear eager to share information and best practice. However, the forms of information being exchanged mainly constitute tacit knowledge around non-technical aspects of learning, which represent the individual items within the group learning scale revolving around aspects of dialogue. The scales imply a relationship whereby if a culture of inclusion shapes strong group dynamics, feed-forward processes are also expected to be encouraged.

A negative correlation coefficient of -0.644 between feed-forward and organisational learning suggests that processes of exploration interfere negatively with the organisation's structure. As an organisation obtains new knowledge and best practices, these could change the dominant structures of organisational routines and processes. Again, due to limited capacities, adaptation and effective implementation of learning episodes into organisational systems can be expected to affect other aspects of the organisations temporarily. Both strategic renewal scales (feedback and feedforward) show a moderate relationship with a correlation coefficient of 0.337. This relationship implies that CE organisations engage in both exploitation and exploration modes of learning and that these processes are interlinked.

The final correlation that presented a statistically significant relationship with a coefficient of -0.328 was between the generated variables for network maturity and network benefit. This suggests that as a network matures, its perceived benefit to the organisations decreases. Although this finding may seem confusing, considering that one of the key facets of network maturity is the development of independent organisational relationships between its members, this is a natural feature of these intermediaries. That is, as network

members gain access to different organisations as well as the potential benefits that these organisations may provide them in terms of knowledge, financial resources and broader exchanges, it is expected that CE organisations create and foster independent relationships with others and thus finding their benefits from interorganisational relationships whilst using the network as a platform to remain informed to wider developments and newly emerging sources of knowledge. Furthermore, as the networks reach maturity, their presentation of knowledge is expected to transform from unorganised and mostly tacit exchanges to explicit forms of knowledge that may be freely shared between its members. Furthermore, the networks themselves act as primary coordinators of knowledge sharing. Thus, as they mature, so does their ability to source expertise concerning specific forms of knowledge, which contributes to their role as a coordinator but decreases dependence on them as a source of knowledge. The nature of the dissemination of knowledge through the network is less centralised as experts enter these settings in addition to expertise forming within the network due to the simultaneous growth of the member organisations as the network reaches maturity. Comparing these to the construct scales created by Botnis et al. (2002) shows comparable results for all the factors except for individual learning stocks. However, their scale contains many more items and higher responses, allowing them to capture more accurate data.

5.10 Post-analysis discussion of findings.

This study intended to corroborate the main findings with key members from the CE sector to provide further confirmations and explanations of the findings revealed throughout the chapter. This was adopted to increase the overall validity of the results. It was previously explained that only one individual agreed to participate in the discussion. The individual who participated in the discussion was a senior member from the CE sector (**V1**) with governmental affiliations and an active role in the wider RE sector.

Hence, whilst this may not be considered a corroboration, the discussion aims to reinforce the findings. This section will present the main points discussed and specific excerpts providing confirmations, disagreements or opinions about the topics.

For the discussion period, the senior CE member that kindly agreed to participate was provided with a synopsis of the main findings from the semi-structured interviews alongside early renditions of figures 13, 18-24, table 6 and appendices F and G.

The one-hour and a half long discussion began by exploring the development of the CE sector, the overall meanings of CE and how the CE term was being interpreted by its stakeholders. Commenting on historical development, the participant pointed towards an event hosted by the DECC as a pivotal moment in the recent development of CE. It was explained that *“The DECC brought people to London to disseminate learning [...] Part of that project was to share information online [...] The DECC set up a platform where we could exchange ideas and files [...] that helped galvanise the links between groups and speed up learning” V1.*

Following this, the participant was shown several figures relating to the defining characteristics of CE organisations and how the respondents upheld them. The participant explained that although, in their experience, some individuals were seen to engage in CE as a form of *“Hobby project” V1*, the overall results were unsurprising and further indicated that most CE organisations stemmed from other environmental action groups. This finding was also reported in this study. The discussion confirmed that CE organisations were predominantly concerned with environmental issues. CE organisations could contribute on these fronts and link them with social impact through their activities.

Interestingly, commenting on these characteristics and the broader considerations of what CE represents, the participant noted that although CE organisations regard themselves as more incorporating and having a more profound social impact than traditional energy organisations, they were still exclusive concerning their ownership and ownership distribution of benefits. It was explained that whilst the concept of CE was *“Ethereal” V1*, the cost of entering CE as an owner often disenfranchised the most vulnerable individuals within the community as they were *“Busy trying to make ends meet” V1*. This was explained to have ultimately resulted in no changes to these individuals as they remained dependent on different forms of aid and community benefit. The participant further explained how their CE organisation followed a similar interpretation by providing microgrants targeting fuel poverty alleviation campaigns.

Commenting on the individuals affiliated with CE, the participant explained that whilst certain groups traditionally dominated the sector, this has become much more inclusive due to several factors since then. Speaking from personal experience, the participant commented that previous childcare responsibilities and constant transportation requirements hindered their participation in the CE sector. The participant noted that many others shared this alongside similar inhibitors to involvement.

This was further expanded to suggest that the various processes that CE organisations must overcome to establish their organisations, in addition to the ongoing requirements that the individuals must be content with and satisfy to ensure that the initiative remains sustainable and in operation, further creates barriers to entry as they are *“Overwhelming and off-putting” V1*. It was finally suggested that although CE fell into wider activities around volunteering, *“Participation in a CE organisation is different to other types of volunteering” V1* because of the inability to *“Switch off” V1* past the immediate activity itself.

Moving the discussion towards learning and specifically the role of networks in contributing to the learning process, the participant quickly mentioned the importance of local authorities and councils as the primary non-CE entity in this domain. The participant said that discrepancies between the role of local authorities and councils in different areas were a key factor leading to differences in CE development across the regions in England. The participant explained, *“I felt that the North/South divide in terms of CE was because of attitudes towards action” V1*. The excerpt was further expanded to explain that local authorities and councils in Northern regions, specifically the Northeast of England where CE was lagging behind other regions, were perceived as *“Didn’t want to try something new” V1*, whilst their counterparts in the Southern regions were *“Forward-thinking” V1* in their approach with the CE sector.

Additionally, the participant noted differences in how the CE term is interpreted by different local authorities suggesting that local authorities in Northern regions perceived themselves as the community. This, however, was not shared in the findings of this study. In fact, contrary to the suggestions mentioned above, two interviewees representing organisations in the Northeast and Northwest of England both spoke very highly of their councils and their interactions and overall approach with CE organisations and broader issues of sustainability within their communities, whilst two other interviewees, from the Southeast and Southwest, indicated that their local authorities had no interest in CE.

When discussing issues reported by some participating individuals from the semi-structured interviews, it was mentioned that participants hosting hydro schemes were reportedly underrepresented by their hydro network intermediary, The British Hydro Association, and their neglect from CE intermediaries due to their specialised nature. The respondent noted that Whitby Esk Energy set up a community hydro forum in 2014, explicitly targeting CE organisations of this nature. The hydro forum had previously

conducted several workshops and seminars, reporting an average attendance of approximately 20 individuals from various other hydro groups. The forum, alongside the workshops and training programs, was stopped in 2015 and is set to be resurrected in 2022 through an online event due to renewed interest (Whitby Esk Energy, 2014).

Further expanding the discussion, the participant commented that switching to online communication and interaction within the CE sector had made such a forum and other events possible. The resulting adoption of digital tools for communication was welcomed as an essential avenue to provide a more accessible entry point for individuals interested in engaging in these organisations and a means for more far-reaching knowledge-sharing activities with larger audiences. It is noted by the participant that *“The convenience of how we can communicate is going to massively accelerate what we can deliver as a CE sector [...] Our knowledge sharing, our ideas, sharing support, giving peer to peer between groups [...] it’s exponentially grown because we can do Teams” V1*. This was further expanded when the participant mentioned that digital platforms were perceived to ultimately *“Change net zero ambitions [...] because you can inform people so quickly and easily” V1*.

Moving to network-related considerations, the participant mentioned that several working groups in the Northwest of England want to create a new CE intermediary and network within their region. It was explained that although these groups were keen to achieve this, CE requires a so-called *“Dump of knowledge” V1* constituting specialised knowledge and skills they did not have. To compensate, a series of seminars and workshops comprising specialised CE knowledge and best practices from other CE organisations were hosted to provide them with the necessary resources and knowledge base. However, the initial approach did not spur the establishment of the intended intermediary. The participant, who hosted several of these events, explained, *“I was talking to them about three steps ahead of where they should be [...] they need to have gone through an organic learning process” V1*.

Amending the events, the knowledge dump strategy was substituted with an organic, step-by-step approach which was perceived to be more successful in its impact. The participant explained that the new approach led to the groups being probed to consider how a CE approach may contribute to their localities and how they may combine it with their current activities. *“They’re starting to think about, what does this mean in my community? How can I make this happen in my community, and at that point, I can then go, okay, well, you could do this [...] And here’s how I can help you do that” V1*.

Remarking on the broader consideration of networks within the CE sector, the participant was asked why there were inconsistencies in network development and overall sectoral development between different regions within England. It was explained that the development of CE has reached a theoretical limit concerning the self-selection model, which is currently prevalent. It was explained that those with all the prerequisites to enter the CE sector had done so and that the current development was simply a reflection of organic forms of collective action towards CE. To ensure the sector continues on a growth trajectory, new entrants must be motivated and upskilled through external intervention to provide them with the necessary skill sets to establish a tailored CE solution.

The necessity to upskill individuals alongside financial constraints due to a changing policy landscape puts additional strain on CE establishment. The combination of these considerations was cited as collectively contributing to the slowed-down development of CE, which is now considered a new phase of its sectoral life.

Commenting on the historical development of the sector, the participant provided an insightful example of a comparison between two intermediaries, Regen in the Southwest, CO2Sense in Yorkshire and an additional intermediary (which the participant could not remember the name of) in the Northwest, that was historically involved with CE and related the development of the CE sector to these intermediaries. The participant indicated that the two intermediaries were part of larger regional development agencies that aimed to increase RE uptake that was disbanded in 2010. Following this, the participant explained that both intermediaries have since restructured themselves as community interest companies to continue their activities. It was explained that *“Regen was the only one that managed to keep going” V1*. Whilst CO2Sense also adopted a CIC structure, the key individuals involved stepped down from the organisation, which was believed to have severely impacted the organisation's ability to engage in knowledge-driven forms of intermediation. The main activities of CO2Sense were reduced to the coordination and management of a revolving fund targeting economically viable and ethically driven RE projects.

Concluding their comparison, the participant mentioned that the departure of these individuals resulted in a significant loss of region-specific CE knowledge. *“All the knowledge had just dissipated [...], And all that knowledge that went has been a big reason why the North has been behind the South” V1*.

In addition to the abovementioned factors, the participant indicated that intermediaries in the Southeast and Southwest actively engaged in cross-network knowledge sharing and inter-network collaboration. The synchronised contributions from intermediaries across multiple networks were cited for having certainly played a crucial part due to them allowing cohorts of CE organisations to gain a foothold across the Southern regions and, in particular, Southeast England.

Comparing these with intermediaries in the Northwest, such as Greater Manchester Community Renewables [GMCR] and the Carbon Coop, the participant mentioned that whilst they were initially comparable to their counterparts, they have since taken on different specialisations focusing on specific field-level CE activities as opposed to network-level coordination.

To conclude the discussion, the participant was asked to comment on the collaborative nature of CE organisations and how this collaboration had led to a snowball effect in certain regions regarding CE growth. It was explained that whilst some CE organisations were eager to engage others and share knowledge for the betterment of the sector, a small cohort of first movers were less enthusiastic. *“A lot of local projects are very local [...] they aren’t too bothered about what people are doing down the road [...] they’re not interested in communicating and sharing” V1.*

Similar to the interviews, the individual who participated in the corroboration discussion also showed how different parties interpreted the CE term differently. It was informative to see the differences in interpretation between the participant and the local authorities cited. One interpretation attempted to place the local authority as the “community,” whilst the participant’s interpretation attempted to exclude them altogether. Although the initial acceptance of an all-encompassing definition fostered early CE development through enthusiasm, a favourable policy landscape and the availability of skilled individuals. Misalignment between these factors has coupled into uneven sectoral growth, resulting in the overrepresentation of CE in specific pockets and their underrepresentation in other regions.

Now that these conditions have changed, intentional efforts must be made to ensure cooperation from knowledge providers to guarantee that best practices and failed lessons are shared and, more importantly, stored within network channels for dissemination. Furthermore, overdependence on CE champions to coordinate these exchanges must be

replaced with networkwide processes that ensure independent coordination of these activities without the immediate interference of the champions themselves.

Lastly, it is understood that CE development is strongly dictated by the individual contexts in which the organisations are situated. Different regions within England have seen different rates of CE growth as a result. Therefore, although regional intermediaries are cited as the most appropriate scale in their impact on sectoral growth, more coordinated efforts must be directed towards cross-regional intermediary collaboration where different CE networks may contribute the knowledge they have gained thus far. These activities are necessary to ensure that other regions traditionally lagged in CE development can catch up with their growth.

5.11 Summary and concluding remarks.

This chapter presented the integrated findings from the data collection, consisting of 15 semi-structured interviews, 38 survey responses and an additional discussion period to corroborate the findings with one senior representative within the CE sector.

The findings showed that CE organisations generally attributed their establishment to various reasons. These may be in the form of a specific event, such as a natural disaster, the necessity to address a social issue within the community or to generate revenue to sustain public assets and contribute to other ongoing community projects. Additionally, several CE organisations were found to have stemmed from previous ideological movements around wider sustainability issues or simply from an opportunity to allow hobbyists to engage in a microscale RE project.

When inspecting their key characteristics, the interviewees provided accounts of their perceived uniqueness, whilst survey data showed that the organisations were more alike than initially observed. Correlations between the characteristics indicated that social impact was a secondary feature of CE, contrary to it being argued as a focal reason underpinning CE.

Although inclusion was cited as a central feature of CE, the findings showed that the individuals involved in CE were generally those from a specific socioeconomic background, hinting at a certain degree of exclusivity to participation where community benefit activities led to positive social outcomes but not necessarily empowerment.

Individuals associated with CE organisations were found to possess various skills and experiences. In many cases, these individuals were senior representatives in their previous roles bringing with them a great deal of expertise, industry-specific knowledge and networking opportunities through previous affiliations. Due to their multi-rolled and cross-organisational reach, these individuals were referred to as CE champions.

Whilst various backgrounds were cited, the most relevant skills were deemed to be those from engineering backgrounds. However, those with backgrounds stemming from the public sector, as well as those involved with the not-for-profit sector engaging in socially impactful activities, were also highly valued, as noted from the findings. These individuals represented the primary source of knowledge that organisations could utilise for their internal learning processes. Individual expertise from within the community was found to shape the main organisational decisions and ultimately dictate the overall direction of activities of the organisation.

The relatively small size of the organisations often saw the same individuals involved in multiple groups focusing on different activities. The findings show that the boundaries between different organisational levels, as specified in OL theory and the 4I learning framework, were less evident in the CE sector. However, larger CE organisations have more formalised organisational structures and a more apparent hierarchy of the organisational levels.

After that, the chapter presented findings exclusive to the interviews relating to the impacts of the Covid-19 pandemic on the CE sector. Apart from some isolated issues relating to digital adoption and site access, the interviews noted a relatively smooth adaptation to the changed practices.

Participants further suggested that some practices, such as utilising digital communication platforms, would remain due to their perceived benefits and convenience. Only community engagement activities were noted as being severely impacted.

Findings related to intraorganisational learning processes following the 4I learning framework were then presented. The findings report that the majority of the intraorganisational learning processes occurring were of an incremental nature. They mainly related to how to improve current activities and how to engage in new activities in a meaningful way. Excerpts from the interviews suggested that the primary forms of

intraorganisational learning addressed issues around community engagement, raising capital and improving socially impactful activities.

Quantitative data analysis returned a negative correlation coefficient between the group and organisational levels of learning. This indicated that CE organisations were limited by their capacity due to an over-dependence on a voluntary workforce in addition to the relatively small size of the organisations. These limitations often meant that individuals operating within CE organisations could not achieve learning processes simultaneously as the 4I framework stipulates. Instead, group learning dominated the learning processes due to the nature of these activities dominating day-to-day practices. A positive relationship between extracted factors representing feedforward and group learning implies that intuitive processes and their subsequent interpretive processes were quick to unfold within CE settings due to open dialogue, enthusiasm to share ideas and receptiveness from colleagues within these settings.

Similarly, the nature of CE organisations often saw organisational routines, especially those engaged in generation activities, locked in on a long-term basis. Therefore, learning processes were not immediately apparent within the organisation and did not necessarily lead to immediate changes and improvements.

Learning at the interorganisational level was prominent across two specific stages within the broader learning domain. Its first phase was observed to occur between organisations before joining networks and with those situated within geographic proximity, those with similar technologies and those conducting similar activities.

Interorganisational relationships between CE organisations were found to constitute the first step in the organisations' external search for knowledge and often began before the organisation's inception. Due to the collaborative nature of the sector, this was mostly welcomed by other CE organisations who were quick to provide support alongside a genuinely perceived interest in their counterparts. Collaborative relationships, however, were found to be temporary and dependent on the perceived benefits gained from their sustenance.

The second stage, where interorganisational learning was observed to unfold, was noted as being after network benefits were perceived to be achieved. Newley developed relationships arising directly from network engagement were preferred to ongoing network engagement after they have been developed. These relationships are attributed to forming

partnership models and joint initiatives, which often incorporate larger parties of CE and non-CE organisations attracted by the network intermediaries.

The chapter then presented network-level findings where figures denoting network-level interactions between CE respondents, network members and intermediary bodies were presented alongside excerpts from the interviews. Four main network types were identified in the findings. Firstly, national networks acted as the main representatives, primarily conducting sectoral research, providing generalised knowledge and advocating on behalf of the CE sector. Secondly, bottom-up CE networks at the regional level were found to be incepted by successful CE organisations. These intermediaries and the networks they coordinate were found to exist as a regional hub of resources and collective development of CE within its boundaries. Thirdly, including the five LEP energy hubs is identified as a governmental solution to create bodies within the energy sector to distribute funding and fill the role of a top-down knowledge-sharing intermediary. Lastly, looser networks by non-CE organisations that incorporate them either due to their focus on sustainability or social drive can connect the CE sector with new markets and sustain novel opportunities which the sector may utilise in their search for increased revenues, diversification of business models and non-CE knowledge.

The factor analysis showed three scales to be representative of the networks and interorganisational exchanges. These scales represented network maturity, interorganisational relationships and network benefit. An interitem correlation matrix suggested that whilst the networks themselves yielded several benefits to their members and were an important facilitator to interorganisational learning and knowledge exchange, their benefits diminished over time.

Local authorities were identified as an important non-CE entity engaged in the sector, with multiple interactions reported in both data collection methods. The findings suggested inconsistencies regarding the capabilities, expertise, resource availability and motivation between local authorities and the CE sector. Whilst some local authorities were reported as highly engaging with CE organisations in their locality, others were either uninterested or incapable of providing the CE sector with the required resources and support. Overall, local authorities gained specialised CE knowledge, which greatly assists them in achieving environmental commitments through a limited resource base. In turn, they provided CE organisations access to working spaces, public building sites and assistance with planning permissions. Lastly, as local authorities often have a close working relationship with other

social enterprises within the locality, they can also play a role in facilitating interorganisational relationships to coordinate knowledge sharing and joint approaches to socially impactful activities.

DNOs were also cited as important non-CE entities involved with CE due to their essential role as gatekeepers in the energy sector. The findings indicated that although these operations have multiple initiatives targeting CE, their transition to adapt to net zero commitments often sees their efforts and time focused elsewhere. Despite this, the DNOs were found to be a primary knowledge provided within the sector. They are expected to increase their interaction with CE organisations due to their increased resource base and experience sustaining these new relationships.

The findings noted that CE networks were cited in positive regard for the perceived benefits and value they could bring to their respective members and their wider contributions to sectoral CE growth. In many instances, the figures showed CE organisations engaged in knowledge-sharing activities with multiple intermediaries even though they were not network members.

Specific clusters representing the central CE organisations were identified. These represented organisations have gained prominence within the network due to multiple interactions with its members and coordinating intermediaries. Organisations that recorded a high number of interactions relating to knowledge provisions also reported having multiple instances of knowledge reception, whilst those with high knowledge reception did not reciprocate instances of knowledge provision.

Even though knowledge exchanges were reported as important and influential within the sector, their delivery method was contested. While some participants preferred a digital approach and platforms to store and find relevant forms of knowledge, others preferred in-person events where the interactions were perceived to be more genuine, and the relationships extended beyond an initial interaction.

Although some financial interactions were reported, they were found to be minimal and mostly flowed between local authorities and CE organisations as opposed to between CE organisations within the sector. This was indicative of the dependence of CE organisations on external forms of financial and securing capital. Secondary research relating to the identified exchanges showed that intermediaries, CE networks and successful CE

organisations have begun to provide microgrants to others within the sector, slowly shifting the nature of financial resource sharing in CE.

Interestingly, similar patterns between informal relationships and knowledge exchanges were observed between the respondents. Organisations that maintained relationships and connections with their network counterparts and other CE organisations within the sector were observed to engage in these relationships as a broader form of collaboration. Those with limited interactions were observed to enter these settings for a specific reason and would cease active engagement when they had achieved their intended target.

Lastly, the discussion with the senior corroborator was presented. The main results relating to CE characteristics, learning within and between CE organisations and network-level considerations were presented to the corroborator and later discussed.

Chapter 6 – Discussion

6.1 Introduction

The overarching focus of this study was to apply a learning lens to the CE sector. Specifically, this study explores interactions between CE organisations in England, emphasising networks and their contributions to this learning process.

The findings presented in Chapter 5 have provided useful insight into CE organisations, OL within the CE sector and the impacts of networks on these learning processes. The following chapter comprises the discussion where the integrated findings are interpreted and related to the relevant literature. Key implications on the CE sector and OL literature are discussed.

This chapter is structured as follows; The first section comprises background information, characteristics of CE organisations and their subsequent classification profiles created through the survey responses.

The second section of the chapter discusses learning within the CE sector and how the levels of learning and their associated processes as per the extended 4I framework unfold within and between CE organisations.

Following these discussion points, the following section focuses on network-related considerations where intermediary coordinators, network activities and findings relating to

the interorganisational exchanges within these settings through a SNA and network mapping techniques are discussed.

Lastly, this is followed by a discussion on the adopted 4I learning framework's overall applicability and suitability to a study targeting organisation types that have not yet been studied under the 4I lens.

6.2 Characteristics of CE organisations and their background information.

6.2.1 Background information

Supporting previously put forward notions of why CE organisations were established (Bauwens, 2016; Berka, 2017; Berka & Creamer, 2018), the findings confirm previous literature, indicating that CE organisations are predominantly established with a specific purpose or objective in mind that the organisation is trying to address (Seyfang et al., 2014; Walker et al., 2010). From the several individualised accounts provided, these can be summarised as a form of energy-related support to broader community initiatives by different parties, as a response to increased environmental awareness or disaster within the locality, as a result of a keen individual that was able to mobilise others or as an energy-strand organisation, either as part of or directly founded through an environmentally driven organisation that was previously established. Overall, individual contexts about the environmental and socioeconomic concerns within the locality were important as a key motivator behind CE establishment (Becker et al., 2017; Wirth, 2014).

Additionally, the establishment of CE organisations, up to this point, has been found to rely on a self-selection process guided by pre-existing relationships between key community members. These preexisting relationships imply the existence of a shared, upheld vision by the individuals and a high degree of trust between them (Alvial-Palavicino et al., 2011; Walker et al., 2010). Often, these individuals were previously engaged in other non-CE initiatives, implying an existing working relationship in addition to informal connections through a shared locality (Behrens et al., 2016; Hempshall et al., 2021). Previous initiatives involving these individuals also fell within environmental and social awareness boundaries, such as transition towns and sustainable groups (Seyfang et al., 2013) that the CE approach now targets through energy-related activities. Recognising that CE organisations often stem from other pre-existing initiatives and combining these insights with the year of

establishment of the CE organisations supports the notion that there has indeed been an ongoing desire from individuals and communities to become more engaged in their energy management.

Therefore, it is apparent that the determination and skillsets necessary for CE already existed within specific communities, and through favourable policies, these combinations mobilised into a CE organisation (Berka, 2017; Gardiner et al., 2011; Nolden, 2013; Walker et al., 2007). The notion that previous initiatives, in whatever capacity or form, involving the same individuals currently engaged in their respective CE organisations further supports CE literature that has previously put forward notions of trust being self-reinforcing within the CE sector (Goedkoop & Devine-Wright, 2016). It appears then that the CE approach is simply one of many initiatives' individuals may undertake within their communities.

Interestingly and contradicting widely accepted views of inclusion (Berka & Dreyfus, 2021; Hoffman & High-Pippert, 2010) presented throughout the CE literature, the findings pointed towards a certain degree of exclusivity that came with CE participation. There appeared to be a cost of entry to CE participation which either involved a direct financial buy-in through shares or a skills prerequisite involving a reasonably deep level of specialisation in the relevant fields. This was additionally confirmed through the discussion period that preceded this study's data collection.

The senior corroborator explained that the self-selection process linked with the historical development of CE had reached its natural limit and that a skills gap now existed to continue sectoral growth. The initial groups of environmentally cautious individuals who possessed the money, skills, time and previous experience of engaging in environmental-type initiatives are already affiliated and engaged in various CE initiatives in some form. These factors, combined with other international and domestic considerations concerning the energy sector (Busch & Hansen, 2021; Cairney et al., 2019), have undoubtedly led to fallout in newly established CE organisations due to the necessities associated with upskilling potential working groups as well as navigating tighter financial and policy-based landscapes (CEE et al., 2022); however, the extent to which each of these factors has impacted CE development remains unclear.

Whilst some articles that comment on the demographics of the individuals involved within the CE sector have pointed towards similar findings (Anderson, 2022; Radtke, 2014; Seyfang et al., 2013), they have not addressed the implications of the socioeconomic

demographics on the meanings and notions of participation and inclusion. Although CE appears inclusive, its entry costs can inhibit a large proportion of the population from CE participation. Therefore, notions of inclusivity are more applicable to only a subset of the population, those with the money, skills, time and, most importantly, interest to become involved. It is important to consider the factors and necessary steps to make the CE sector more appealing to individuals and groups not traditionally linked with the CE approach or even concerned with environmental action.

6.2.2 CE activities

Regarding the activities undertaken by CE organisations, this study finds that the CE approach remains heavily involved in electricity generation through RE technologies, predominantly solar PV, where 76% of survey respondents indicated that electricity generation constituted their main organisational activity (CEE, 2020; Holstenkamp & Kahla, 2016). This is unsurprising, considering that most organisations utilising these assets have done so as a response to favourable policies and hence are generally locked in over long-term PPAs (Braunholtz-Speight et al., 2021; Nolden et al., 2020).

However, in line with the multifaceted nature of the CE approach (Seyfang et al., 2013), the study found that CE organisations were also engaged in several secondary activities, with an increasing number of organisations adopting energy efficiency measures in addition to educational events as part of their secondary activities.

Moderate correlation coefficients between activities targeting energy efficiency suggested that CE organisations undertaking energy efficiency measures often combined multiple cost-effective methods to achieve effective results instead of complete specialisation in one activity. Examples include combining insulation alongside LED lighting as a joint activity to target demand reduction.

The uptake of secondary activities was perceived as a key means of revenue diversification. These activities were approached with the commercial goal of generating an income, ultimately contributing to revenue diversification (Braunholtz-Speight et al., 2021), away from grant and subsidy dependence to a self-sustainable business model (Nolden et al., 2020).

Additionally, some of these activities also included a social impact aspect, where the organisation would combine their community benefit funds alongside external forms of finance (Braunholtz-Speight et al., 2020), primarily through grant schemes (DECC, 2014a),

to target vulnerable communities, such as fuel poverty reduction through energy switching and combined efficiency measures (Hills, 2011; Lorenc et al., 2013). The interviewees perceived several energy efficiency activities as relatively easy for their CE organisations to enter and target precisely due to the immediate benefits and social impact they could deliver. Although the perception that these measures may dramatically impact vulnerable households is encouraged. The findings highlight a worrying knowledge gap between energy consumers and the energy market, of which the most vulnerable are generally the most affected.

6.2.3 Classification Profiles and Characteristics of CE Organisations

The findings showed discrepancies in the overall characterisations of CE and their notions of the underlying objectives of their organisations. Whilst there was a shared emphasis on environmental considerations, variations in legal structures between the organisations appeared to influence the degree to which they upheld specific characteristics. This was attributed to the purposeful selection of a legal structure to reflect the organisations' objectives (Hillman et al., 2018; Raven et al., 2008). For example, CE organisations that emphasised social impact adopted a charity structure, while those with a more commercial interpretation of the CE term adopted a CIC. Hence, the possibility of variability between the organisations' different objectives and underlying values could be further incorporated into the organisational structure through different legal adaptations. CE organisations then adapt their legal structure, from which multiple options exist, to suit their organisational requirements depending on their unique vision and local requirements (Becker et al., 2017; Radtke, 2014).

Reiterating the conclusions of Bauwens et al. (2022), this study also found that CE organisations placed less emphasis on social impact than initially perceived from the literature (Becker et al., 2017; Rogers et al., 2012). However, the interviewees spoke at length about the contributions of their organisations to their communities, especially their impacts on vulnerable communities. These activities were highly dependent on external funding from larger bodies, as opposed to the CE organisations actively creating opportunities and self-funding socially impactful activities. Similar results were also observed when examining the classification profiles of the respondents, which showed that social impact was the fifth prominent characteristic, ranking behind environmental, educational, engagement and economic objectives which preceded it.

Different perceptions of what the CE term should constitute are also highlighted in the findings. The main difference between the notions appeared to be those around a community bound by locality and a community bound by activity, reiterating early classifications of the term by Walker & Devine-Wright (2008). Similar to the findings of Radtke (2014), this study also found that participants emphasised either the 'Community' or the 'Energy' aspect of CE, leading to a distinct variation between those interpreting the term as a place of identity or community and those interpreting CE as an ethically driven energy enterprise (Hicks & Ison, 2018). For example, those who entered CE settings with the goal of knowledge sharing were found to be actively engaged on this front, maintaining numerous interorganisational relationships, being affiliated with several networks and actively participating in sectoral research, whilst those that entered the setting with deeper notions of community engagement were observed to be more active locally, interacting with local authorities, schools and other organisations in their respective communities as opposed to wider engagement with other CE organisations and networks.

Those who interpreted the CE term through its locality emphasised notions of the community itself (Walker & Devine-Wright, 2008). The CE organisation appeared to be an energy strand, often part of numerous specialised initiatives seeking to create value and deliver collective benefits to the host communities. CE organisations operating in this space tended to be relatively small in size with limited resources and limited personnel, most of whom came from within the community itself. One advantage of this approach is that these groups often have a deep understanding of the problems faced by their communities as well as how best to address them. Additionally, individuals involved in these approaches often have longstanding relationships as community members and were found to be involved in various initiatives even prior to the CE organisation, suggesting a deep level of trust and understanding between them.

In direct contradiction, those who focused on the energy aspect of CE appeared to adopt a more commercial view of CE. The focus here was on increased generation capacity through new projects, opportunities to enter new markets through new activities, such as battery storage, energy efficiency and low carbon transport, and joint enterprises with both CE and non-CE organisations involving projects in the RE sector. CE organisations in this space appeared to be more similar to private enterprises involved in RE, with a more apparent hierarchical structure and less dependence on a voluntary workforce.

Throughout the interviews, there was a noticeable gap between these different organisations in how they interpreted their idea of CE. Smaller organisations appeared more localised and inherently focused on the 'Community' aspect. Larger CE organisations appeared to emphasise the 'Energy-related' considerations and objectives of the CE term. Although overlaps were observed between both small and large CE organisations as reflected by the social enterprise structures they adopt, small organisations still require economic sustainability, whilst larger organisations remain community-minded. Indeed, multiple variations around the levels of investment came from within the community (Braunholtz-Speight et al., 2020) in addition to the outsourcing of management activities (E4A, 2021), both of which challenged key questions of ownership and benefits previously put forward by Walker & Devine-Wright (2008).

Comparing the correlations between the defining characteristics of CE organisations and their individualised classification profiles showed slight differences between how the organisations upheld specific values. However, the findings point out that smaller organisations tended to adopt a more participatory and inclusive approach, emphasising aspects such as democracy and engagement, whilst larger CE organisations appeared to focus on commercial aspects of the organisation. This, however, cannot be generalised due to the variability and real-world interpretations of how these characteristics take shape and evolve.

It was previously noted that the values upheld by CE organisations are subject to shift over time (Raven et al., 2008). Whilst this study was unable to capture these changes within a single CE setting over a prolonged period, mapping the characteristics of CE through the classification profiles over notable periods, such as prior to the FIT and throughout changes in FIT payment rates (Nolden et al., 2020) revealed incremental increases in shareholder value at the expense of social drive, indicating that CE organisations are becoming more concerned with their economic sustainability. Additionally, several examples were provided in the interviews where CE organisations had to pause or completely stop community benefit activities due to investment and loan payments and major project maintenance expenses. The limited resource base CE organisations must contend with strongly impacts their ability to conduct their activities (Berka & Creamer, 2018). As a result, they may temporarily change their overriding framework of operations.

6.3 4I learning framework, organisational levels and learning processes.

Chapter 2 explained that the 4I framework specifies multiple levels in which learning processes unfold. Its initial conceptualisation presented the individual, group and organisational levels where OL processes involving intuition, interpretation, integration and institutionalisation would occur (Crossan et al., 1999), whilst the adopted extension put forward by Mozzato & Bitencourt (2014) included an additional network level where the process of cooperation may occur between organisations.

The adopted framework then conceives learning processes as being multi-levelled and multi-faceted. Furthermore, it recognises that some processes overlap, such as interpretation between the individual and group levels and integration between the group and organisational levels. Other learning processes are exclusive to a singular level (Dutta & Crossan, 2005), such as intuition at the individual level and institutionalisation at the organisational level. These processes are also recognised to have causal interrelationships, suggesting that they influence each other (Botnis et al., 2002).

The 4I learning framework further specifies certain dynamics associated with each level of learning and its pertaining processes. For example, intuitive learning processes at the individual level are viewed as an inherently cognitive function (Sandler-Smith & Sparrow, 2009), conceived as a byproduct of experience and expertise (Dutta & Crossan, 2005).

This study finds that organisational levels, especially between individuals, groups and organisational units comprising multiple groups, were less clear within CE organisations.

Due to their organic organisational structures (Burns & Stalker, 1961), CE organisations defied traditional organisational boundaries and had a less clear internal hierarchical structure, focusing on horizontal communication channels (Luenenburg, 2012).

Additionally, it was very interesting to observe that terminologies such as “*our organisation*”, “*our group*”, and “*our project*” were used interchangeably throughout the interviews and the entire research period from the researcher’s attendance at CE events in person and online. Frequently, these were taken by the individuals to represent the same concept of the “*CE scheme*” and the same core of individuals providing further evidence of the multi-rolled approach that individuals adopt when engaging in CE.

In most cases, the only observable hierarchy within smaller CE organisations was at a structural level (Radtko, 2014), with distinctions drawn between board members and

founding members (in most cases, these contained overlapping individuals). However, both identified groups were observed to engage in the same activities, in many cases, to a greater degree than their counterparts. In contrast, a minority of CE organisations representing a larger-scale approach to CE (Seyfang et al., 2013) were observed to have the beginnings of a traditional hierarchy that may be better comparable or reflective to commercially driven private enterprises (Goedkoop & Devine-Wright, 2016). These organisations often had greater incorporation of FTE workers as opposed to volunteers. They were observed to have a generally more professional style of operations (Radtke, 2014) compared to their bottom-up counterparts.

6.3.1 Considerations around the individual level of learning

To capture learning at the individual level and how intuitive processes unfold within CE organisations, this study asked interview participants as well as survey respondents to provide some information relating to the experiential backgrounds of their CE members as key determinants of individual intuitive ability (Argote & Miron-Spektor, 2011; Castaneda & Rios, 2007; Easterby-Smith & Lyles, 2012; Muscio, 2007; Vinding, 2006).

Although the scale targeting individual learning was omitted from further quantitative analysis due to its low Cronbach α (0.346), interview findings and the descriptive information presented in the survey instrument provided sufficient data to analyse and draw inferences about how intuition unfolds at the individual level within the CE sector.

Most individuals affiliated with CE were found to bring decades of experience from multiple backgrounds to their respective organisations. This study finds that individuals involved within CE organisations can be considered the most crucial element of the CE approach and are indeed an embodiment of the “champions” term that they are commonly referred to within the CE sector (Devine-Wright & Wiersma, 2013).

Individuals were found to represent diverse backgrounds with varying degrees of experience from many professional backgrounds in public, private and not-for-profit sectors. In most instances, this was taken as a positive feature of CE participation as these individuals were able to bring with them different areas and view similar issues in numerous ways. Self-selected collections of highly specialised individuals enable CE initiatives to utilise their experiences, network connections and leadership ability to ensure their respective organisations' continued success and sustainability. The study found that

most of these decisions came before the organisation's establishment, during its inception phase.

When considering the high emphasis these organisations place on democratic decision-making and encouraging the participation of their members (Devine-Wright, 2004), these diverse skill sets can be utilised in numerous ways by the organisations. The key decisions that had to be addressed during the inception of a CE organisation, such as its main activity (and subsequent technology in the case of energy generation), legal, organisational and ownership structures, securing funding and planning permissions and methods of social impact were found to be crucial due to their long-term effects on how the organisation conducted itself.

Furthermore, as these individuals possess a high degree of intuition, they can organise themselves and align individual skill sets with organisational activities, tasks and other operational routines, guaranteeing internal efficiency. The findings showed that these individuals collectively possessed a large body of knowledge directly applicable to CE that informed key decisions concerning their organisation's establishment, ongoing operations, and future prospects. Additionally, it is suggested that organisations which are better able to utilise the skillsets of their members and those with the capacities to allow enable individuals to demonstrate their abilities entirely can exploit externally acquired knowledge and transform this into usable and tangible lessons within the internal organisational setting, to the benefit of the CE organisation itself (Zahra & George, 2002). Combining these diverse yet highly specialised skill sets allow CE organisations to be better placed in their decision-making and overall ability to adapt to a changing external environment.

The relatively small size of CE organisations often saw the same individuals engaged in multiple organisational activities, often across different facets, simultaneously. For example, many instances were recorded of the same individual being involved in their organisations' community benefit activities, operating the project itself, and maintaining their organisations' external relationships around their immediate locality and at a network level. It is then optimistic to consider that these individuals may conduct all of these activities simultaneously to their best ability (Bomberg & McEwen, 2012).

In addition to possessing skillsets deemed crucial to CE development, these individuals could act as intermediaries themselves (Kanda et al., 2020; Kivimaa, 2014) as they were

found to have affiliations and previous connections with numerous bodies such as public, private and not-for-profit organisations, individuals and networks. They were found to contribute to their respective organisations' wider networking activities through their ability to build and foster external relationships, eventually culminating in partnerships and joint enterprises between CE and non-CE organisations.

Mapping the CE champions identified in the interviews in a sociogram format with different connections revealed multiple channels for interaction and meaningful exchanges, even though the interviews did not necessarily reveal a connection. The crossover of relationships between these individuals revealed a web of interconnectivity, similar to previous network mapping approaches between organisations operating within the CE sector (Berkhout & Westerhoff, 2013; Nochta & Skelcher, 2020; Parag et al., 2013). Compared to other studies in this domain, the advancement in this study was its ability to differentiate between individual and organisational interactions, highlighting connections between individuals through organisations and network channels instead of organisational connections. This approach allowed for a deeper appreciation of the vital role of the individual within the wider CE sector.

The findings here support previously put forward points by Parag & Janda (2014), who suggested that the important contribution of these individuals in mediating interorganisational interactions is often neglected within the CE sector. Although interlinked with their respective organisation, senior individuals operating within the sector often bring greater than any single organisation due to their multi-faceted nature. Often, the combined experiences of an intersectoral view across numerous affiliations and roles throughout a prolonged period create a high degree of established trust and reputation within any sector in which they are involved (Argote & Miron-Spektor, 2011; Gray, 2006) and are considered to be the key vehicles through which the learning processes unfold (Dutta & Crossan, 2005).

However, it is important to note that constraints of organisational capacity due to a limited resource base and volunteer dependence severely limit the capabilities these individuals provide to their respective organisations (Gray, 2006; Bomberg & McEwen, 2012; Kanda et al., 2020). One of the main factors impeding ongoing intuitive processes and OL, as a whole, throughout the CE sector was the overdependence of the CE organisations on a predominantly voluntary workforce. The overall impressions from the data indicated that volunteers were overworked and overstretched, which in some cases led to diminished

ambitions (Hempshall et al., 2021) that were reflected between the initial perceptions of the organisation's role during its inception and since then. Although the nature of the CE approach is volunteer-based, the findings suggest that this aspect diminishes the learning processes' ability to simultaneously unfold within an organisational setting due to the setting itself creating an opportunity cost between different forms of learning as a result of constraints.

This is only further compounded due to the medium-to-long-term necessity of these organisations to search for alternative forms of revenue to ensure that they are sufficiently prepared to become subsidy-free and the immediate necessity to adapt to the Covid-19 pandemic. Whilst adaptations to the latter were swift and saw a range of adaptations and different forms of community benefit take shape to target the pandemic and its impacts specifically. These considerations considerably stretched the CE organisations and wider CE sector and have collectively put an additional strain on the already limited capacity of these organisations and the individuals operating within them.

6.3.2 Considerations around the group level of learning

As per the 4I learning framework, two learning processes, interpretation and integration, are considered to occur at the group level (Crossan et al., 1999). Interpretive processes unfold between the individual and group levels. This is followed by the latter integration process, which seeks to incorporate the newly acquired learning into the organisation (Botnis et al., 2002). Integration, therefore, is observed between the group and organisational levels (Argote et al., 2003; Lawrence et al., 2005).

The process of interpretation was observed to occur through conversational means, incorporating aspects of group dynamics alongside dialogue in the search for the creation and amendment of shared cognitive maps between collections of individuals (Tippins & Sohi, 2003). The process of interpretation, within the group level, is believed to unfold daily within CE settings, both formally within the organisation through meetings and informally through general conversational means that occur within any workplace (Jenkin, 2013). From the findings, a reasonably strong correlation coefficient of 0.648 between the extracted factors representing feed-forward (specifying the direction of learning) and the group level implies that individuals are eager to share information with their colleagues within CE organisations. Their communication channels and organisational structures

further support this indicating that numerous interpretive processes are aggregated within CE settings.

Literature around integration has strongly linked the integrative process with IT systems in its conceptualisation (Argote & Ingram, 2000) and measurement (Templeton et al., 2002; Tippins & Sohi, 2003). Successful integration processes are classified through structured databases that allow for ease of storage and access by the organisation's members of the lessons learned and experience gained (Easterby-Smith & Lyles, 2012). Additionally, the integration process is expected to be stronger within organisations comprised of individuals with a prior collaborative history and those who share a similar vision of the organisation and how it should best carry out its objectives (Orlikowski, 2002).

Integration processes were observed to occur within the CE organisations at two main stages. Firstly, the integration of ideas and best practices was observed to unfold during the establishment of the organisation, as previously mentioned, where key decisions relating to adopting technologies and methods of governance must be addressed and integrated into the organisation. Learning processes at this development phase mostly rely on individual decisions through intuitive ability, interpreting and sharing ideas with fellow members, engaging in dialogue to adapt and tailor potential solutions, and integrating these solutions into organisational routines and structures.

Secondly, integrative processes were observed within CE organisations as part of their ongoing, day-to-day activities where individuals involved could bring meaningful insights and lessons from ongoing CE participation to improve and engage in new activities. As learning is an ongoing process (Hamel, 1991), those with more exposure to the CE sector through organisational activities, engagement, and networking are better positioned to gain insights from interaction or learning by doing and through experience (Argote & Miron-Spektor, 2011).

Numerous examples were identified throughout the previous chapter pointing towards instances of integration. The primary examples, however, can be those around how CE organisations adapted to the pandemic. The findings suggest that incorporating digital tools and platforms that resulted in amendments to organisational activities, routines, and ownership structures strongly indicates how the host organisation's improvements and adaptations are integrated. These examples further support the concept that certain types of knowledge deemed relevant and important to the organisation would quickly be

absorbed by its recipients (Perez-Nordtvedt et al., 2008). In addition, several examples pointing towards ownership limits towards shares, amendments to share value, and constant changes towards community engagement activities further suggest that these forms of learning are incremental instead of transformational (Knight, 2002).

6.3.3 Considerations around the organisational level of learning

At the organisational level, this study found that processes of institutionalisation were reinforced through both the group and individual levels and their preceding learning processes, supporting the argument that learning is indeed a self-reinforcing process (Bapuji & Crossan, 2004; Botnis et al., 2002). Furthermore, OL processes were also found to be quickly institutionalised throughout CE organisations, and lessons deemed valuable to the respective organisation quickly became disseminated into organisational routines or its memory. This is primarily a result of the open and democratic organisational structures that CE organisations adopt that allows for easier communication and routine amendments within the organisation (Baumol, 1990).

Organisational structure is then regarded as an advantage of the CE approach due to its avoidance of unnecessary barriers to knowledge dissemination (Schilling & Kluge, 2009) as a result of internal bureaucratic considerations arising from rigid hierarchal structures (Burns & Stalker, 1961), a lack of communication channels between key personnel (Szulanski, 1996) within these settings and power relationship dynamics (Lawrence et al., 2005) which are known to influence learning processes and knowledge-based outcomes. The organic organisational structures adopted by CE organisations allow for more effective communication channels between the individuals in the organisation due to the ease of information flow within their organisational boundaries. Furthermore, as the levels of learning are significantly intertwined, specific barriers that restrict knowledge flow between the group and organisational levels (Balcombe et al., 2014; Schilling & Kluge, 2009) are disregarded.

An observed, statistically significant, negative correlation (-0.344) between the extracted variables from the PCA representing the group and organisational learning indicates that these processes are negatively linked. Combining these findings with interview data suggests an opportunity cost exists within the CE organisations due to their limited capacity to decide which processes they choose to focus on. Often, internal tension between different units and levels of learning and their associated processes were

observed, in direct contradiction to its previously put forward view that they cooccur (Castaneda & Rios, 2007; Crossan et al., 2011). In the CE case, day-to-day activities and routines at the group level represented the strongest processes and level within the OL domain. Although they are suggested to be self-reinforcing (Lawrence et al., 2005), learning processes were found to have a negative outcome on each other when crucial resources that form the basic building blocks of the learning framework are lacking (Cohen & Levinthal, 1990; Templeton et al., 2002), supporting the multidimensionality and self-reinforcing processes of learning within these settings only when the resources allow the organisation to achieve multidimensionality simultaneously in their learning processes (Crossan et al., 1999; Schilling & Kluge, 2009).

6.3.4 Considerations around the interorganisational level of learning

Interorganisational relationships were crucial in the CE sector due to the perceived benefits of collaboration consistent with preceding OL literature (Dyer & Singh, 1998; Lane & Lubatkin, 1998). The data showed that all the CE organisations that partook in this study maintained numerous interorganisational relationships with CE and non-CE organisations.

Moreover, interorganisational relationships were perceived as the most prominent learning-oriented interaction within the CE sector. Although it is difficult to ascertain the exact value of the outcomes achieved through interorganisational interactions, OL theory suggests that interorganisational learning can contribute to internal capacity building for efficient learning outcomes between organisations, capacity-based changes in the knowledge-receiving organisation are expected as a direct result of interaction with the knowledge provider (Argote et al., 2000; Argote & Ingram, 2000).

Considering the dynamics associated with interorganisational learning and the higher-level capabilities involved (Szulanski, 1996), it is suggested that a key motivator for interorganisational learning and ongoing collaboration includes organisations with similar targets and a shared long-term vision (Cremona et al., 2014). Previous literature suggested that interorganisational relationships within the CE sector significantly drive CE's advancement and overall growth (Berkhout & Westerhoff, 2013; Bird & Barnes, 2014; Seyfang et al., 2013).

Whilst instances of interorganisational interaction occur on an everyday basis for some CE organisations, they were found to be most prominent across two specific stages of organisational development. Firstly, interorganisational interactions were highly valued,

and individuals involved in the CE sector engaged in both the creation and sustenance of several interorganisational relationships prior to the establishment of the CE organisation. The interviews provided numerous examples where loosely structured groups of individuals approached established CE organisations to gain information and meaningful insights through learning-related interactions relating to best and worst practices, technological and technical considerations, and community-specific considerations relating to engagement and benefits activities. Together, these pieces of information gained prior to the inception of the organisation would act as important insights to allow them to realise how best to achieve their objectives through utilising best practices combined with their expertise.

Following this, interorganisational relationships were also prominent after the CE organisation gained the benefits of the network(s) with which they were affiliated. External relationships here mainly arise directly from the network itself, but the main difference between these interactions is that they are independent of the network setting. It is then suggested that CE organisations engage in network settings to utilise these networks to create new relationships with other members to engage in deeper forms of collaboration, such as joint initiatives and other partnership-based models (Capaldo, 2014). Relationships here were influenced by the perceived benefits that the organisations gain through their engagement, supporting previous literature that suggests that the resources provided by the network and its members are strong determinants in the wider collaborative setting (Gulati, 1999).

Interestingly, there appeared to be a divergence between the type of relationships, the parties with which these relationships were maintained, and how interorganisational relationships were retained between CE organisations within this study. These different learning spaces (Mozzato & Bitencourt, 2014) are essential as they can provide specialised knowledge from their specific niche.

Several types of relationships that resulted in a variety of learning spaces were consistent with previous CE literature (Berka, 2017; Goedkoop & Devine-Wright, 2016; Nolden et al., 2020) as well as considerations of the evolving partnership-based models currently being explored and adopted by the CE sector (CEE, 2020). Whilst some CE organisations are skewed towards localised relationships (Armstrong, 2015; Seyfang et al., 2013), such as with their local authorities (Bourdin & Nadou, 2020; Fudge et al., 2016) and other environmentally driven initiatives within the community, others appeared more attracted

to maintaining relationships with other CE organisations, intermediary network coordinators (Nochta & Skelcher, 2020) and energy-type non-CE organisations (Bird & Barnes, 2014). Indeed, the study identified two CE organisations that were established entirely based on sustaining these relationships; where one was established to assist its local authorities in delivering on their environmental commitments, and a second CE organisation was founded as a direct result of a joint-partnership venture between CE and non-CE actors operating within a shared locality.

Again, reasons for maintaining different interorganisational relationships were varied. However, they can be summed up across two main categories. A first group of CE organisations appeared to uphold their overarching ethos of collaboration in high regard and, therefore, intentionally ensure that they maintain external relationships for knowledge exchange and positive interactions. These organisations view the CE approach as a collective instead of a series of individual approaches, recognising that sharing resources may lead to more significant sectoral benefits than individual approaches (Gibb et al., 2017). This domain had much less of a knowledge provider/receiver format. Instead, the organisations appeared to be aware that they gained as much if not more, knowledge and meaningful lessons as their counterparts. Thus, the relationships appeared to be bi-directional on an ongoing basis.

On the other hand, a second minority group of CE organisations appeared to engage with their counterparts primarily due to necessity. Viewing the concept of interorganisational learning, and indeed ongoing collaboration, as a means of accounting for lacking internal capabilities and filling in knowledge gaps within their organisation (Gibb et al., 2017; Larsson et al., 1998). This view of engagement is perceived to alleviate internal shortcomings (Capaldo, 2014; Knight, 2002) in the recipient organisations' capacity, expertise and overall capabilities. Whilst both types of organisations seek to create and maintain collaborative relationships, those that fall within this category may be regarded as those only seeking these relationships for a specific purpose, whilst the latter appeared to engage in collaboration with its counterparts as part of a wider understanding that CE organisations require a sector-wide collective approach.

In terms of knowledge-providing organisations that fit into the '*collaborate out of necessity*' description, there was a consistent view that, as an organisation, they had already shared their lessons with others in some capacity. Furthermore, there was also a notion that these organisations already had an idea of the overall direction of how their CE

organisation would achieve its objectives. Thus, there appeared to be no perceived knowledge deficit within the organisation, and collaboration was deemed unnecessary. Throughout the interviews, evidence of this was mainly observed when the participants would suggest viewing their webpages, as opposed to others that explained that the relevant information could be found in academic articles, sectoral reports and mainly the CEE practitioners forum. The nature of CE business models and PPAs ensures that current revenue streams remain consistent for the foreseeable future (Nolden et al., 2020). It appeared that there was no obligation to engage their external environment apart from those engagements that fit within the main activities of the CE organisation.

However, it is important to note that these perceptions are derived due to the necessity of balancing the limited resources that the CE organisations must contend with. The evidence mentioned above relates to organisations that adopt the *'collaborate out of necessity'* approach do so to focus their resources and efforts towards their internal activities.

CE organisations approach multiple non-CE entities for various services, varying from consultations to procurement and, more recently, for alternative forms of finance (Fell et al., 2020). Whilst organisations operating within this sector are generally self-sufficient and rely only on internal forms of knowledge and expertise for their projects, it is noted that whenever an organisation may find themselves short of specific forms of knowledge and where other CE organisations either have not been approached or have not been able to provide solutions, relationships with private entities may fill this gap (Harnmeijer et al., 2013). Some obvious advantages of affiliations with the private sector to CE organisations reside in their capacities and capabilities (Julian & Oliver, 2014). Often, they can share skills and knowledge and create connections for CE organisations that bottom-down initiatives may not be able to access.

Although external relationships with other CE organisations, non-CE entities and network-level intermediaries existed, it was difficult to ascertain the degree of engagement between the CE organisation and these external bodies. From the evidence, this study suggests that there needs to be more consideration between parties operating within a shared locality towards the collective benefits of collaboration to both parties and, more importantly, towards the community in which they are situated. In addition, the evidence suggested that some organisations may be less enthusiastic about maintaining ongoing relationships and were found to interact when necessary. This is attributed to the resource limitations that inhibit activities such as networking, irrespective of their importance, from

being an active aspect of CE activities. It is, therefore, important to consider the intentions of the member organisations when entering a network setting (Hamel, 1991) and to recognise that learning outcomes and network interactions may differ between organisations entering these common settings with different intents.

6.4 Network level and cooperative learning processes.

Moving forward from the interorganisational view and considerations around dyadic interactions between organisations, findings and preceding discussions relating to network-level considerations and the cooperative learning processes between CE organisations in the sector are presented.

The application of an OL theory lens to explore network-level interactions within the CE sector in England was perceived as an incremental improvement upon a relatively small but increasingly growing strand of literature previously exploring the topic. Chapter 2 identified several articles that have attempted to better understand multiple facets of networking in the CE sector. Previous articles exploring networking within the CE sector focused on the role and requirements placed upon the network coordinating intermediary organisation (Bird & Barnes, 2014; Braunholtz-Speight et al., 2021; Hamilton et al., 2014; Hargreaves et al., 2013; Warbroek et al., 2019), with several articles arguing what these intermediaries represent and their duality of roles alongside their primary purpose as DNOs (Electricity Northwest, 2021; WPD, 2020), Local Authorities (Bourdin & Nadou, 2020; Fudge et al., 2016; Tingey & Webb, 2020) or CE organisations. Additionally, the SNA methods have gained prominence throughout CE network research, resulting in several network mapping articles focusing on interorganisational interactions within network spaces (Berkhout & Westerhoff, 2013; Hamilton et al., 2014; Nochta & Skelcher, 2020; Parag et al., 2013; Seyfang et al., 2013). This strand of literature has since grown to incorporate the types of interactions and their direction to gain a deeper insight into the individual players within these network settings and how intraorganisational developments may impact interorganisational and network-level considerations. Alongside these considerations, OL theory also specifies several concepts for consideration that may impact network learning that can be extended to apply to the CE sector, apart from the apparent considerations presented by the 4I learning framework extension towards learning spaces (Mozzato & Bitencourt, 2014) considerations of centrality (Tsai, 2001), cooperative behaviour (Bauwens et al., 2016; Dyer & Singh, 1998), network benefits (Gulati, 1999) and

network maturity (Holmqvist, 2003b) are also presented as they have all been argued to impact the ability of the network coordinator to collect, present and distribute knowledge through targeted learning based processes as well as the individual members to share and absorb valuable lessons (Easterby-Smith et al., 2008).

This study adopted a mixed methods approach to investigate CE networks and learning-related CE interactions within these settings. It utilised a combination of semi-structured interviews where questions focused on perceptions, experiences and examples relating to network affiliations, perceived benefits of network engagement and the role of the intermediary hub coordinator alongside quantitative methods to measure OL within CE networks. To visualise interactions between CE organisations within these networks, a series of sociograms were created to represent instances of exchange, further specifying the type of exchange (financial, knowledge, informal), its direction (provider/receiver format) and the type of organisation the exchange has occurred with (whether it is a CE or non-CE entity).

Through network mapping, knowledge-based interactions (303) were unsurprisingly found to be the most prominent form of interorganisational exchange within CE network settings. These exchanges mainly occurred through dyadic interactions between the network coordinator and member organisations, between network members, through structured networking events and lastly, from online repositories, databases and toolkits made available by the coordinating hub.

Although some financial interactions (62) were reported, they were found to be relatively small compared to their knowledge-based counterparts. They mostly flowed from local authorities to CE organisations, suggesting that CE organisations remained dependent on external financing and raising capital for their projects and ongoing costs. Additionally, whilst some financial interactions were observed between the intermediary network coordinators flowing to the CE organisations, these were also minimal, mostly in small financial amounts.

An alternative approach from the hub organisations coordinating network activities includes their involvement in creating, fostering and maintaining partnerships for the collective benefit of their members. This was previously suggested to be one of the essential forms of financial mediation (Hargreaves et al., 2013) due to the ability of the network coordinators to attract more prominent non-CE players involved in the energy

sector, which bring with them partnership and investment opportunities alongside financial and knowledge-based resources. These partnership-based models are increasingly viewed as more important (Goedkoop & Devine-Wright, 2016) to the CE sector due to the economic opportunities for the diversification of business models away from subsidies that they provide CE organisations (Braunholtz-Speight et al., 2021) and the overall legitimisation of the CE approach through its incorporation and integration in other areas of the energy sector.

The creation of these sociograms was attributed to the combined work of Berkhout & Westerhoff (2013) and Parag et al. (2013), who first introduced SNA mapping techniques to CE networks—in their SNA of 22 organisations in British Columbia, Berkhout and Westerhoff (2013) differentiated between 8 organisational entities varying from public governmental institutions to NGOs (representing CE in the locality). They further split interorganisational interactions into four categories: Knowledge, financial resources, technical support, and evaluation. However, they failed to specify the direction of the interaction, which resulted in several clusters of organisations representing the highest interactions within the network setting without a clear idea or indication of whether these organisations represent those providing resources throughout the network or those receiving resources from all other members.

Addressing the direction of exchange to gain a deeper understanding of the inter-network dynamics between providers and receivers, the SNA conducted by Parag et al. (2013) incorporates a slightly larger sample size (N=57, 30 of which are categorised as Low Carbon Community Groups, with further specifications relating to the organisation type, nature of the exchange and most importantly its direction. This resulted in similar findings relating to multiple identified clusters and interestingly shared clusters between different categories representing the nature of the exchanges. The step forward was their ability to differentiate between primary knowledge providers and recipients to gain insight into the seniority and leadership within the network between its members.

Again, whilst the study by Parag et al. (2013) provided several valuable insights into how CE organisations interact within network settings and provided important context into CE interactions within an English setting, their study also faced several drawbacks, which were improved upon in this study. Their study includes receiving financial resources, but not its provision. The provision of finances up to 2013 was grant-based (DBEIS, 2019) from sources external to those involved in the CE sector (Berka, 2017; Braunholtz-Speight et al.,

2021). Since then, however, several microgrants have been introduced within the sector from successful organisations wishing to assist their counterparts and joint initiatives in providing funding within specific CE networks (CEE,2020; MHCLG, 2021). As a step forward, this study includes both the provision and reception of financial resources throughout the interaction categories in addition to an informal category which allows respondents to specify between single-type exchanges and interactions without an existing relationship of if these exchanges were based on an ongoing collaborative relationship between the parties involved. Lastly, both articles mentioned above could not capture specific dynamics relating to these exchanges. It is noted that the diffusion process relating to knowledge represents the post-acquisition process involving the transformation of basic information, that in most cases is tacit, into explicit and replicable forms of knowledge. This is recognised as an arduous process to capture in the survey instrument and thus must be supplemented by qualitative data. Specific organisations that were observed to collaborate actively were also noted to consistently re-evaluate themselves, their peers, the networks they are affiliated with and most importantly, the different pieces of information they have obtained through these channels of interaction.

In their studies, Berkhout & Westerhoff (2013) and Parag et al. (2013) reported several clusters of actors representing a large proportion of the total interactions with several loose connections between the perceived 'non-core' members of the network setting. Furthermore, Parag et al. (2013) also suggested that hidden communication channels and information distribution exist within the network setting, which was also perceived to exist between some of the active members within the network that have since developed independent relationships. Additionally, both studies confirm that newly established CE organisations and newly affiliated members within the network had a stronger connection, identified through the number of interactions, with the hub coordinator instead of its members. This is consistent with network learning literature which suggests that new entrants into knowledge-sharing settings enter through a gatekeeping organisation facilitating their networking process (Easterby-Smith et al., 2008; Hamel, 1991) which in the case of CE is the network coordinator (Bird & Barnes, 2014; Holmqvist, 2003).

Confirming the findings mentioned above, mapping interorganisational interactions in a network setting in this study also revealed several clusters of edge-heavy organisations representing the highest concentration of interactions within these network settings. Interestingly, it is noted that a number of these actors were not initially perceived to fill

these roles when comparing them with their CE counterparts. Whilst some expected members were identified from the secondary data and were expected to function as lower-tier intermediaries, as previously suggested by Kanda et al. (2020) in the network setting, the findings of these clusters suggest that initial perceptions of the roles based solely on secondary data may be misleading, as shown by the SNA.

From these sociograms, two distinct groups of organisations were identified. An initial group of high-capability organisations constituting the primary cohort responsible for knowledge exchanges within the network setting. This group displayed multiple instances of knowledge exchanges, both in terms of them providing knowledge to the network intermediary and its members as well as recording multiple instances of knowledge reception supporting the notion that the purpose of these organisations to engage in network extends beyond immediate benefits and is viewed as a form of collective support, the specific direction of the interaction was an aspect that was not previously considered in the study by Berkhout & Westerhoff (2013). Organisations that fall within this subset supported notions of the overarching reasons in which organisations choose to collaborate within wider interorganisational and network settings, as previously explained by Lane & Lubatkin (1998) to be primarily as a result of shared knowledge base alongside a common underlying set of values between the organisations underpinning their ethos, culture and long-term vision of the CE sector as a whole.

Organisations with higher knowledge reception and low instances of knowledge provision represented a second subset of groups. Initially, the lack of knowledge provision was attributed to capacity-based deficiencies within the organisation (Tippins & Sohi, 2003; Tsai, 2001), such as those commonly associated with newly established initiatives or those seeking to diversify their portfolios through the uptake of activities with no previous experience. However, when crosschecking the data with secondary information relating to the CE organisations that reported these interactions, none of the above reasons was supported, leaving two final aspects for consideration. Either the organisations these respondents provide knowledge to were not captured in the survey instrument due to their interactions with non-responders and different network settings, or there is a specific type of knowledge for which these organisations are searching that they have not yet managed to achieve.

When examining the interactions captured through the survey instrument, it is apparent that the degree of centrality, emphasised by Tsai (2001), can be taken as a key metric to

represent the overall networking ability of each of the responding organisations. In their SNA of a CE network in

Oxfordshire, Parag et al. (2013) reported that CE network members with a higher observed degree of centrality were better positioned to capture information than their counterparts. Supporting both previously put forward articles, the results of this study also provided evidence to suggest that organisations which have gained a central position within the network setting were found to be better placed for knowledge reception and be the first to gain any knowledge flowing through the network itself. The centralised position of these organisations within the CE networks indicates these CE members' intention and willingness to participate in learning-related interactions (Easterby-Smith et al., 2008) coupled with their cooperative capabilities to share and disseminate knowledge (Gulati, 1999).

The evidence suggested that these organisations did not usually face significant barriers to their development and were often focused on larger goals relating to expanding their organisation with new projects, engaging in different partnership-based approaches with other members and offering mentoring opportunities, should funding allow (NextGeneration, 2021). Additionally, the interviews also showed that individuals affiliated with these centralised organisations were often the ones who were called upon to present in CE networking events and generally acted as examples for others throughout the sector to learn from and benefit from.

Networks are an integral feature of interorganisational learning due to their ability to create multiple simultaneous links that greatly outweigh dyadic interorganisational interactions outside these network settings (Knight & Pye, 2005). Interaction through these social spaces was indeed observed to synergise together into a much deeper level of collective learning (Mozzato & Bitencourt, 2014).

However, the responsibility falls onto each member organisation to ensure that it remains in a central position within the network with both a willingness and capability to absorb knowledge during network-level interactions. Supporting this, Hamel (1991) reports that organisations that enter network settings as knowledge recipients require the intention to learn and the organisational capabilities to allow receptivity of the knowledge being exchanged. When entering a learning-based network environment, an organisation's intention may influence these characteristics (Dyer & Singh, 1998; Easterby-Smith et al.,

2008; Hamel, 1991) when deciding to enter any form of a strategic alliance with learning-based outcomes as a motivation, assuming that organisations know their relative positions concerning each other. Consequently, organisations may enter these settings to become providers or receivers of knowledge and learning-based outcomes. This may lead to missed opportunities whereby organisations that enter these settings as providers may be reluctant to receive knowledge and vice versa.

The points mentioned above all point directly towards the dynamic nature of the cooperation process at the interorganisational and network levels between CE organisations. Within the cooperative process at the interorganisational and network levels, however, there appeared to be numerous types of cooperation between the organisations, each with varying degrees of intensity (Gibb et al., 2017; Knight, 2002), involving participants and perceived benefits.

Initially, the organisations were found to engage exclusively with other organisations around their locality. These connections were perceived to be important in allowing the CE organisation to become established and gain somewhat of a foothold within its locality. However, they were limited in their overall benefits and scope to allow the organisation to achieve their objectives and continue a growth-based trajectory.

The latter forms of interaction that occur through the networks appear to adopt a similar structure to those previously put forward by Dyer & Nobeoka (2000) in exploring the three stages of network maturity. Additionally, the different benefits associated with these interactions appear to follow the different levels of intermediation proposed by Kanda et al. (2020). At the first stage of network engagement, the sociograms and interviews confirmed that newly affiliated member organisations to the networks engaged exclusively with the intermediary coordinating hub instead of other members within the network setting. Interaction here was restricted to structured episodes of learning mainly through events.

Following this, organisations that have gained somewhat of a central position within the network were observed to develop numerous independent inter-organisational relationships with other members within the setting. This was confirmed by a negative relationship between extracted variables representing network maturity and its perceived benefits (-0.328). The negative relationship between the variables suggests that as these network members begin to build independent relationships with their counterparts, in

addition to gaining access to partnership and joint-venture opportunities with other parties, who themselves may be either CE, non-CE, or public entities, their engagement with the network is replaced by interorganisational engagement with the parties mentioned above due to the more immediate gains and commercial opportunities that they may present. It can be argued that during this stage, the network may have achieved its targets of 'networking' and 'intermediation' and provided the member organisation with the tools and opportunities necessary to ensure its long-term sustainability.

6.4.1 Role of the network coordinator and considerations around different network coordinators and intermediary organisations

Previous literature has classified the hub coordinators as network intermediaries (Bird & Barnes, 2014; Hargreaves et al., 2013; Kanda et al., 2020) and have framed the network spaces as well as the interactions within these settings as different forms of intermediation between the member organisations within a confined space (Hodson et al., 2013; Mozzato & Bitencourt, 2014).

Furthermore, the literature around network learning and specifically networking in the CE sector has also conceptualised different types of intermediaries within the CE sector, such as DNOs (WPD, 2020), Local Authorities (Bourdin & Nadou, 2020; Tingey & Webb, 2020), governmental institutions (Kivimaa, 2014; Tingey & Webb, 2020) and broader non-CE-specific network hubs with either energy or environmental strands of operation (Berkhout & Westerhoff, 2013; Nochta & Skelcher, 2020).

The literature has previously suggested that hub organisations must simultaneously play multiple roles to ensure that the network it coordinates may provide the most meaningful sources of knowledge and information and consistently deliver networking benefits to its members (Bird & Barnes, 2014; Hodson et al., 2013). This study finds supporting evidence confirming that some of the roles that these coordinators play include the assimilation of aggregated forms of knowledge (Bird & Barnes, 2014), their ability to create and sustain a knowledge-sharing platform that its members may utilise (Hargreaves et al., 2013), securing partnerships and joint development opportunities for its members (Hamilton et al., 2014) and sectoral support to the inception and establishment of new CE approaches within their locality (Berkhout & Westerhoff, 2013).

Regarding the knowledge-specific benefits and responsibilities the hub organisation is trying to achieve, it is important to divide these different forms of knowledge into sub-categories, specifying precisely the type of activity and form of knowledge being exchanged. This is important to identify as different types of knowledge require different prerequisites (Argote & Ingram, 2000) and entail variations in the intensity of the interaction between the provider and recipient (Templeton et al., 2002). For example, whilst a blog or a newsletter may benefit some organisations relating to a specific issue, they do not suffice or deliver the same technical knowledge as an emergent business model, research report or CE toolkit. Similarly, whilst the latter may provide ample technical knowledge, they do not address community-specific issues, social considerations and unique experiences relating to specific matters.

6.4.2 CE Networks

The findings in this study suggest that bottom-up networks established by CE organisations for CE organisations were perceived to be the most important networks and thus represented the most essential form of intermediation within the CE sector. These hub organisations are primarily founded by successful CE organisations as a means to separate intermediation and knowledge sharing with notions of place and were found to coordinate regional networking activities. At the regional level, these intermediaries focus on a geographically identifiable area such as 'Brighton', 'Manchester' or 'Oxford' or a specific region such as the 'Northwest' or 'Southeast' instead of having a technological or activity-type focus. There were multiple indications from the data that networks operating at this regional level were best suited to deliver current CE networking requirements due to their understanding of the region and location-based considerations and immediate abilities to connect CE organisations in close proximity to complement each other. However, similar to previous studies (CEE, 2020; Scene Connect, 2019), the regions appeared to differ in CE network representation.

At the national level, CEE acts as the primary representative of CE in England, with its counterparts CES and CEW filling the same role throughout the other devolved UK nations. The findings in this study indicated that CEE and its network acted as a central point of representation and sectoral connectivity for CE in England. As an established national network, it was observed to deliver multiple benefits to its members through its numerous channels and wider coordinative activities, suggesting numerous specialised sub-networks (Kogut, 2000). Some of these activities included representing CE and advocating on its

behalf to public bodies, fostering initial introductions between newly affiliated and established CE organisations to others in its locality, connecting CE organisations to appropriate regional channels and areas for resources, the publication of sectoral reports (which were used throughout this study), hosting numerous events to bring CE organisations together, share best practices and in the form of training based events, contribute to regional network development through the establishment of hub organisations and lastly the creation of a digital platform in the form of the practitioners' forum to allow for sector-wide exchanges and interaction within a single knowledge sharing setting.

6.4.3 Non-CE Networks

Inclusions of several non-CE intermediaries, such as DNOs, Local Authorities and the LEP Energy hubs, and larger organisations coordinating more general networking activities, such as Cooperatives UK and Regen, call for a distinction between them. However, the growth and establishment of these new bodies and the restructuring of others to incorporate CE organisations must be treated with caution due to the diverging and sometimes contradicting visions between the actors involved within these settings (Creamer et al., 2018). The CE sector has arrived at a relatively developed stage in sectoral life. Most regions throughout England and the UK now have CE representatives throughout their communities as well as access to intermediary coordinators and CE networks. Indeed, certain pockets in the English CE sector, mainly around the Southern regions and the Northwest, find their area of operation may be represented by multiple networks, both CE and non-CE.

Although overlapping, it was evident that intermediaries operating within shared regional pockets targeted different facets of CE development, where they were best able to contribute. For example, when comparing the two primary non-CE networks that were most cited by the interviewees and survey respondents alike, Cooperatives UK and Regen, it is clear that each of these hub organisations approaches and engages the CE sector with different intentions, assisting them to deliver and improve on different but interrelated fronts. Cooperatives UK mainly focused on CE's community and social aspects and the wider cooperative movement. In contrast, although a not-for-profit itself, Regen appeared to deliver technical knowledge to its members and had a stronger sense of focus on

achieving zero-carbon targets through different mediums of energy delivery, of which CE fell into as a potential avenue.

Even though this may be considered complementary, they can also be seen to compete for limited resources in addition to limited organisational affiliations due to the restricted resource base and overall networking capabilities (Knight, 2002), mostly as a consequence of time-based constraints of the CE organisation base (Berkhout & Westerhoff, 2013). The CE organisations were generally affiliated with more than one network and simultaneously had an ongoing dialogue with numerous intermediary bodies. CE organisations approach these relationships with different notions regarding the benefits gained and generally become more closely linked with those perceived to deliver the most benefits, suggesting that the immediate requirements of the CE organisation alongside the perceived resources of the network itself are strong determinants in network engagement (Gulati, 1999). Whilst some enter these settings for individual gain, others enter with a deeper intention of maintaining an ongoing relationship through engagement and participation with a greater goal of ongoing learning and knowledge-sharing opportunities. These dynamics, however, require constant reflection of the intermediaries' constantly shifting and changing roles to provide them with adequate resources to continue their growth and development effectively.

Overall, whilst barriers to CE development were minimal throughout the findings of this study, and indeed they were mostly situational and when explained, appeared to be new issues that needed further considerations and led to multiple uncertainties, which is to be expected with learning processes. These barriers mostly stemmed from interactions with non-CE entities into the CE sector. These may be mainly attributed to the ongoing learning processes faced by both parties.

6.4.3.1 DNOs as intermediaries

Although DNOs are increasingly associated with positive contributions towards the CE sector, evidence in this study also suggested that these same operators may also hinder CE projects and overall development.

Simonds & Hall (2013), who explore grid connectivity issues between CE projects and DNOs, note four distinct issues impacting CE development as a direct result of its DNOs. This was also observed in this study, where the same DNO was cited by different

participants, one for its proactive approach to their CE initiative and another for causing delays and misalignments between deadline commitments.

In their concluding remarks, Simonds & Hall (2013) suggest that the most crucial aspect is achieving consistency between DNOs regarding the deliverability and efficiency of their services. Furthering this point, it is suggested that multiple services impacting decentralised energy providers may be upgraded and standardised to allow best practices to dominate DNO routines (Simonds & Hall, 2013). Grid reinforcement (WPD, 2020) may also significantly impact CE development due to the excessive costs associated with this reinforcement process. Findings concerning a lack of consistency have also been observed in this study through the mixed responses of the participants when asked about the DNO. Although the study mentioned above (Simonds & Hall, 2013) was conducted a decade ago, the ramifications of the impacts of different commitments at the national level, in addition to changing government policies (Wilson, 2012), are believed to be key components in the maintained observed time lag in the services of several operators amongst their peers. Whilst it was challenging to determine aspects of grid capabilities of the DNOs due to the limited scope of this study in this domain, evidence was found supporting the argument towards a lack of favourable coordination efforts between energy sector institutions and policymakers.

Furthermore, uncertainties around DNO commitments towards the CE sector have been amplified during the FIT removal period (Braunholtz-Speight et al., 2021). The overarching consensus among the respondents who commented on this relationship indicates that whilst some DNOs appear innovative through their CE affiliations and financial contributions to the CE sector, they have yet to conduct a system-wide update of their practices to accommodate further changes and encourage further development.

6.4.3.2 Local Authorities as Intermediaries

Local authorities appeared to be much more involved in CE activities and the overall growth of the CE sector than initially perceived. There were multiple examples within the collected data to suggest that local authorities and the CE organisations operating in these localities already had an ongoing relationship. Further suggestions indicate closer collaboration in finance and knowledge sharing and joint initiatives (Braunholtz-Speight et al., 2021; Roby & Dibb, 2019).

Interviewee accounts and mapped interactions suggested that local authorities can be regarded as one of the most important non-CE entities engaged with the CE sector (Tingey & Webb, 2020). These relationships were found to take on many forms, and their benefits were bi-directional. Supporting previous literature, this study found that the central position of local authorities within their respective communities renders them a natural intermediary (Kivimaa, 2014) that may connect local stakeholders and facilitate relationships with other public bodies within the community (CEE, 2020; Bourdin & Nadou, 2020; Seyfang et al., 2013; Tingey & Webb, 2020).

As these local authorities own a large number of buildings and land within their locality (Braunholtz-Speight et al., 2021) and are responsible for the issue of planning permissions (Fudge et al., 2016), it is in the interest of the CE organisations operating within these localities to maintain a positive dialogue with these local authorities to assist them in realising their carbon targets through the joint development of potential generation sites (Armstrong, 2015; Foxon, 2011), most of which will be through solar PV. In addition, local authorities also have a unique insight into the crucial problems faced by their host communities and often have an idea of how best to address them.

However, the findings provided evidence to suggest that the local authorities themselves were not consistent in their capabilities and overall deliverability of benefits towards the CE sector. Certain local authorities in localities with a strong CE presence, such as London, the North-west and both South-eastern and South-western regions, appeared more active on the environmental front and were additionally more aware of how best to realise their targets and ensure deliverability of their zero-carbon commitments. Within these regions, however, there appeared to be additional variations between local authorities and their overall capabilities dictated by their relative size. For example, regional authorities, who generally have access to the largest resource base (Tingey & Webb, 2020) and most capable individuals, appeared to have the best working relationships with environmental bodies, bringing together CE organisations and public institutions and including CE organisations in their zero-carbon initiatives. On the other hand, smaller local authorities, such as parish councils, had limited resource bases to contend with, which often saw environmental concerns and commitments being relegated due to more immediate concerns demanding attention from these local authorities. These smaller public bodies appeared to benefit from the specialised experiences of CE organisations who could educate them and create realistic and economically viable (Braunholtz-Speight et al., 2021)

joint solutions or solutions incorporating the local authorities to assist them in realising their targets.

In their study that explores local authorities' role and current engagement in clean energy throughout the UK, Tingey & Webb (2020) provided some insight into how active local authorities were concerning their deliverability of zero-carbon targets. Initially, they categorised 434 local authorities regarding their engagement, suggesting that only 13% may be regarded as energy leaders and 18% were '*Yet to join*', indicating that they lacked an energy plan. In England, they reported similar patterns of local authority involvement, suggesting that lower-tier local authorities, such as district boroughs, had limited engagement. In comparison, upper-tier authorities had higher engagement and were more focused on their environmental targets overall. Although the role of local authorities concerning climate and zero-carbon energy targets is not the focus of this study, its intertwining nature with CE development provided some evidence to support the previous study put forward by Tingey & Webb (2020) to suggest that resource limitations strongly impede local authority capabilities in this domain.

Moreover, this study also supports the previously put forward notion that in some cases, these local authorities may be considered intermediaries in their own right due to their deliverability of knowledge-based benefits, creation of relationships between community organisations and utilisation of their powers to provide public goods and spaces for these initiatives to grow (Bourdin & Nadou, 2020; Fudge et al., 2016).

Overall, the findings in this study suggest that whilst there is a great deal of enthusiasm alongside initial commitments from local authorities towards supporting CE development in their localities as well as an understanding that co-development of CE organisations may also assist local authorities to develop their energy-strand, which they have no previous experience, is of collective benefit to all parties involved. There was a significant discrepancy between the local authorities due to variations between their capabilities, expertise, resources and commitments concerning broader environmental and energy-related concerns (Tingey & Webb, 2020).

6.4.3.3 LEP Energy Hubs as Intermediaries

Initially, it appeared that the LEP energy hubs would provide both the CE organisations and CE networks with a unique form of top-down intermediation (Kanda et al., 2020) to bring the joint development of CE more in line with governmental commitments and targets; this

was not observed to be the case in this study. Although the evidence was limited, this limitation due to a lack of mention by the interview participants in addition to a lack of recorded instances of interaction with the LEP energy hubs suggests that the LEP energy hubs are not proactive in their collaboration with CE organisations above their immediate objectives of managing the Rural and Urban Community Energy Fund grant schemes (Hempshall et al., 2021) and that their current engagement with the CE sector remained of limited value in terms of knowledge sharing, in comparison with bottom-up regional CE networks.

Indeed, the interview with the LEP energy hub representative suggested a stronger working collaborative relationship between the LEP energy hubs, acting as a top-down intermediary, and public institutions, such as local authorities. Whilst the LEP energy hubs have broader energy-related responsibilities (GSEZHZ, 2021; Tingey & Webb, 2020), it is expected that cross-regional collaboration between these intermediary hubs exists to amalgamate individual lessons from their stakeholders and to share best practices with both CE organisations and local authorities in their areas of operations.

Namely, the interviews and sociogram evidence suggests that relationships between the LEP energy hubs and the CE sector are underutilised and remain relatively underdeveloped. In the limited examples presented in Chapter 5, it was suggested that whilst the LEP energy hubs engaged in dialogue and assisted the CE organisations with their requests, they did not appear to proactively engage the sector, focusing these efforts on public bodies instead. This was later confirmed by the LEP energy representative, who cited the ease of interaction between their respective LEP energy hub and the various local authorities and public bodies situated in their area of operations.

6.5 Overall applicability of the 4I learning framework

For its investigation into learning in the CE sector, this study adopted the previously developed 4I framework by Crossan et al. (1999). To recap, the adopted extension to the 4I learning framework envisions the concept of OL through a series of interrelated and multi-levelled processes occurring within organisational settings and between organisations through networks (Crossan et al., 2011; Mozzato & Bitencourt, 2014).

The main reason for its adoption was its ability to incorporate multiple learning processes at several levels of learning simultaneously. This was perceived as being advantageous to a study of this nature as it would identify the levels and subsequent processes at which CE

organisations and individuals involved in the sector learn; the direction of learning and the intensity that these processes are observed are all revealing of the underlying learning-related mechanisms that CE organisations and the wider CE sector have thus far adopted.

One of the primary examples of the applicability of the 4I framework, which included all the intraorganisational learning processes and cooperative processes at the interorganisational level, was the example provided by **P3 (CE, NW, VOL)** relating to their selection of an appropriate generation asset. Throughout the interview, the participant explained how several interorganisational interactions and cooperating processes relating to gaining information and knowledge about different hydroelectric technologies resulted in others recommending an Archimedes screw design. However, previously acquired knowledge at the individual level by one of their core members contradicted this idea due to the nature of the stream and water flow considerations. The participant explained how the individual first interpreted this knowledge, came to a different solution, and later transmitted it from internalising at the individual level to externalising it to the group comprising the core members through positive dialogue. Following this, the concepts put forward were integrated into the organisational structure through purchasing this asset and later institutionalised into the routines of the CE organisation due to ongoing operations and maintenance. The example then illustrated all the stages involved in the 4I framework, as previously explained by Crossan et al. (1999). Multiple instances similar to the above example co-occur within CE settings involving pre-establishment decisions and experiential instances resulting in learning. Those deemed the most beneficial were found to be further shared through cooperation within network settings in the form of seminars, workshops and written reports such as blogs, newsletters and case studies. Although the extended 4I learning framework proved insightful in its ability to distinguish the process, levels and direction of learning, some of the model's shortcomings included its inability to differentiate between explicit and tacit forms of knowledge, which was deciphered interpretatively by the researcher.

The main exchanges between organisations in this study came in the form of interactions involving explicit knowledge (Nonaka, 1995) through experiential learning (Argote, 1999: 2005). Experiential learning is considered the most generic form of learning in OL theory (Easterby-Smith & Lyles, 2012) due to its simultaneous applicability at multiple levels and occurrence independent of intention or willingness to learn.

Furthermore, as the focus of the model itself is around the processes of learning (Castaneda & Rios, 2007), it is unable to provide insights into the value and usefulness of the lessons being shared either between individuals within organisational settings or at interorganisational and network levels, between organisations, which again was subjectively interpreted throughout the interviews but was unable to be further incorporated or specified throughout the quantitative methods. Whilst it does not directly address this issue, an early proposal of extending the 4I framework by Jenkin (2013) suggested incorporating “information sources and tools” into the processes to help facilitate between the processes themselves in addition to better understanding the type of tools and support that are necessary for different types of knowledge that unfold within organisational settings.

Although different iterations and extensions of the 4I framework have been proposed, the adopted model, which focuses on cooperation as an additional process at the network level, negates the external factors which strongly influence learning, such as the degree of maturity of the network itself (Dyer & Nobeoka, 2000) as well as the centrality of the organisation (Easterby-Smith et al., 2008; Parag et al., 2013; Tsai, 2001) concerning other members within the network setting. The incorporation and consideration of these concepts by this study provided meaningful insights into the underlying reasons behind why there was an observable difference between the strong concentration of CE networks that have developed in the Southeastern and Southwestern regions of England, namely throughout Devon, Oxfordshire and Sussex and less connected organisations in the Northern regions, where some form of networking activity was observed throughout the Northwest whilst minimal activity was observed in the Northeast.

Lastly, although it is recognised that one of the main considerations of theory development lies in its simplicity (Crossan et al., 2011; Prange, 1999; Schilling & Kluge, 2009), the amalgamation of different processes of learning through interorganisational and network interaction as a single “cooperation” process by Mozzato & Bitencourt (2014) oversimplifies an otherwise dynamic approach to the concept of OL through networks.

6.6 Summary and concluding remarks.

This chapter comprised the discussion where comments and implications relating to the previously presented findings concerning the previous literature are presented. Firstly, this chapter discussed background information on CE organisations, their ‘champion’ members

and the classification profile developed in this study. From comparing the individualised classification profiles alongside a series of categorisations, this study suggested that although some variations exist, CE organisations have much more in common than they are different. Notions of uniqueness are attributed to considerations of place and requirements, an aspect encountered by numerous specialist organisations wishing to conduct operations in a specific locality.

Following this, the chapter presented its discussion relating to the 4I learning framework through sections representing each level of learning and their associated processes. The individual level of learning was explained to be where members could utilise their own experiences, specialisations and networks to bring to the CE organisation. It is noted that one of the key advantages of the implementation of a mixed-methods approach was the ability to capture the important dynamics that unfold at this level of learning which was unobserved in the quantitative analysis. The quantitative analysis highlighted group-level learning processes that can feed into the organisational level and integrate into routines, structures and activities. The main reason for this was its representation of the day-to-day activities, which generally took the majority of the limited time of the volunteer workforce. Whilst the process of institutionalisation was limited in CE organisations, its restriction was mainly attributed to the slow pace of change in organisational activities that CE organisations were generally locked into over the medium to long term, mainly as a result of technological and contractual agreements, such as them benefitting from the FIT, PPA, or specific grant for energy efficiency activities. Therefore, learning processes were observed to occur incrementally as opposed to large transformational change within organisational settings.

Overall, it was explained that whilst CE organisations satisfied the presented 4I framework when the organisational capabilities were sufficient, they challenged the underlying assumptions of the framework as a direct result of their internal shortcomings as an organisation. For example, as opposed to learning being self-reinforcing (Crossan et al., 2011), there was often an opportunity cost associated with the different levels of learning in the CE case as a direct result of time (CEE, 2020). Focus on dynamics associated with intraorganisational learning often meant less focus on interorganisational learning, and learning at the network level often saw an opportunity cost between which networks to engage in.

Chapter 7 – Conclusion

7.1 Introduction

This study explored OL within the CE sector in England through an investigation of how different processes of learning unfold at various levels within CE organisations, between CE organisations and the impacts that networks have on OL.

The concluding chapter of this study is split into five sections. The first section reinstates the overarching aims and subsequent objectives put forward by this study alongside the steps undertaken to achieve them. Secondly, four main knowledge contributions achieved by the research process are presented and discussed. The third section of the chapter will present the practical, theoretical and policy implications of the findings and succeeding discussion. This is followed by a section focusing on the limitations encountered throughout the research process, their impact and the steps undertaken to address and minimise them. Lastly, the chapter is concluded by listing recommendations for further/future research alongside concluding remarks.

A learning approach, and the adoption of the 4I learning framework, provided an insightful avenue for exploring these dynamics in the CE context. Contrary to initial expectations put forward by the theory, this study found that the emergent levels of learning and their emergent processes were fluid and dynamic within CE settings due to differences in their internal capability and capacity. Multiple crossovers between organisational levels were observed due to the organic structures of CE organisations, emphasising the individual as a representative of multiple levels.

7.2 Addressing the Aims and Objectives

As previously noted, the overarching purpose of this study is to further our collective understanding of how collaborative learning occurs within England's CE sector. To achieve this, this study was guided by two primary aims (1) To understand how learning processes across multiple levels unfold within the CE sector both within and between CE organisations and (2) To investigate how CE networks contribute to these learning processes, from which a series of four objectives were derived.

- **Objective 1:**

The study's first objective was to; (1) **Identify the main characteristics of CE organisations and better understand how variations between these characteristics may impact their overall propensity to learn.**

To achieve this, this study provided a literature review in Chapter 2, exploring relevant CE and OL literature. From the literature, CE organisations were classified through three main facets with which they were commonly linked. These include the benefits, engagement and ownership from and of the organisation (Hoffman & High-Pippert, 2010; Walker & Devine-Wright, 2008; Walker et al., 2010). From this, seven characteristics were identified [(1) advocacy, (2) education, (3) engagement, (4) environmental, (5) democracy, (6) shareholder reward and (7) social impact] and incorporated into the survey instrument to create individualised classification profiles for each responding organisation. These classification profiles were created as a perceived improvement upon the previously put forward models of CE characterisation first proposed by Walker & Devine-Wright (2008) and later extended by Goedkoop & Devine-Wright (2016). Combining classification profiles alongside key pieces of descriptive information confirmed that the CE sector is highly diverse and is represented by countless interpretations of the CE term (Seyfang et al., 2013).

The results showed that although these combinations were unique and the characteristics were subject to shift when mapped across different categories, such as the period they were founded, their adopted legal structure, organisation size and location, these differences were minute when grouping the CE organisations. Instead, the study highlighted the commonalities between CE organisations, suggesting they were more alike than different. The differences here were attributed to circumstantial considerations around the necessities of the local community and immediate requirements of what the organisation intended to achieve.

However, contrary to previous recommendations that suggest that the defining label of CE remains broad to allow for its uptake in numerous ways (CEE, 2020; DECC, 2014a: 2015); Goedkoop & Devine-Wright, 2016; Walker & Devine-Wright, 2008). Although previous conditions and incorporative classifications have allowed for accelerated sectoral growth (Berka & Creamer, 2018), they must be treated cautiously considering the new business models involving multiple non-CE partners (Bauwens et al., 2022; CEE et al., 2022). It is essential that the CE approach is not reduced to a small element of CE within these partnerships and that the CE sector can maintain its impact (Bauwens et al., 2022). Explicit

conditions must then be created to differentiate between CE approaches, partnership-based models and corporate social responsibility forms that utilise CE partners to create social impact.

- **Objective 2:**

The second objective involved; **(2) operationalising and refining quantitative scales for measuring OL within and between CE organisations in England CE.** To achieve this, Chapter 2 presented the initially proposed 4I learning framework by Crossan et al. (1999) and offered an extension of the framework from Mozzato & Bitencourt (2014) that incorporated a fourth network level of learning and a fifth learning process dubbed cooperation.

The selected framework was then explored through a CE lens, where it was suggested that the organic organisational structure adopted by CE organisations as well as limitations in their organisational capacity, might lead to differences in how the 4I framework is upheld, as well as challenge the underlying assumptions of the framework itself.

To operationalise the selected 4I framework and achieve the put-forward objective, this study proposed a mixed-methods approach as the most appropriate approach to achieve its targets. The mixed-methods approach comprised semi-structured interviews to explore the constructs of the 4I learning framework, the inputs into the learning processes, the processes themselves and the interaction between the processes across different levels of learning.

Following this, the study adopted scales from the previously developed instrument put forward by Botnis et al. (2002) due to its common derivation from the 4I framework. Additionally, through combined information from network literature, previous scales targeting OL (Chiva et al., 2007; Templeton et al., 2002; Tippins & Sohi, 2003) and analysis of the interviews, additional scales were created to represent the constructs relating to interorganisational and network learning as well as the perceived benefits of network engagement.

For its distribution, two regional (RS) and national (GS) mailing lists were created to target CE members of a specific network and interactions between CE organisations and selected network coordinating intermediaries. The preliminary data processing of the collected responses saw a single scale targeting individual learning dropped due to its Cronbach α coefficient being below the minimum acceptance threshold of 0.7 (0.346 in this study),

indicating that the items did not measure its intended construct. All the other scales satisfied the data processing and preliminary steps to qualify it for a PCA.

- **Objective 3:**

The third objective proposed in this study involved; **(3) The development of further conceptual constructs of OL in the CE sector.** The second objective explained that relevant scales previously developed by Botnis et al. (2002) and self-developed scales were combined to create an instrument to measure OL in the CE sector.

Following the distribution, collection, processing and analysis of the quantitative results, the findings confirmed that the learning processes in the 4I framework were also observed within CE organisational settings. Interestingly, although the quantitative results rejected the individual learning scale, the interviews highlighted the individual level of learning and its related processes of intuition and interpretation as essential forms of learning occurring within CE settings. Moreover, the interviewees indicated that individuals were key to their organisations' network engagement and were often the only link between the CE organisation and the network itself.

The PCA resulted in a total of seven extracted factors representing (1) Group learning (GL), (2) Organisational learning (OL), (3) Feedback (FB), (4) Feedforward (FF), (5) Network maturity (NM), (6) Interorganisational relationships (INTER) and (7) Network benefit (NB). A correlation matrix between these factors showed five statistically significant correlations that challenged previous assumptions put forward by the 4I learning framework.

The results showed that capability deficiencies within CE organisations, mainly due to their voluntary workforce and limited resource base, did not allow learning to be a self-reinforcing process (Crossan et al., 1999) between the respective levels, as implied by the 4I learning framework. Within the organisational setting, CE organisations must be selective in which level of learning and associated processes they must engage in due to these limitations. A positive and strong relationship between group learning and feedforward suggests that most day-to-day activities occur at the group level. Most intraorganisational learning processes unfolded within CE settings at the group level, and learning can feed-forward and become integrated into the organisation.

At the interorganisational and network levels, the quantitative analysis in section 5.9 of the combined survey instrument, as presented in Appendix F4, showed the perceived benefits of CE networks to decrease as the network increases in maturity through a negative

correlation coefficient of -0.328. Combining these insights with the interviewee accounts, and anecdotal evidence relating to interorganisational cooperation suggested that CE organisations initially interacted with a minimal number of organisations at an interorganisational level. This would later be supplemented by network engagement through their affiliation with regional and national level networks. Initial engagement within CE network settings would primarily rely on dyadic interaction with the coordinative intermediary and limited interorganisational interaction through structured events within the network. Whilst a key component of CE networks includes the coordination and attempted development of independent, interorganisational relationships between its CE members, as these relationships develop and new opportunities the coordinator provides arise (Dyer & Nobeoka, 2000), they supplement network engagement for utilising these newly developed relationships and opportunities as they are perceived to provide more immediate benefits to the CE organisations. Simultaneously, whilst network engagement decreases, CE networks remain an important platform to keep their members informed to wider developments in the RE sector as well as acting as a central point for the combination and distribution of knowledge.

- **Objective 4:**

The final objective proposed in this study involved utilising SNA methods (Scott, 1988; Wasserman & Faust, 1994) to; **(4) Capture network-level interactions between CE respondents through mapping financial, informal and knowledge-based interactions within a network setting in England.** It was determined that a knowledge gap existed between network-level interactions within the CE setting and considerations of OL to inform and shed light on the learning-related processes and subsequent actions of these interactions (Seyfang et al., 2013).

Interviewee accounts supplemented by secondary research confirmed regional variability between interorganisational and network-level interaction throughout the CE sector. For example, in the Southern cohorts of England, SE, SW and London, CE appears relatively strong regarding its network capabilities. CE networks like the Bristol Energy Network, Community Energy South, Devon Community Energy Network and the Low Carbon Hub have existed for around a decade. They have collectively contributed towards incalculable learning episodes and creating and managing partnership arrangements. Throughout these cohorts, it will be important to ensure that CE can navigate between these independent actors and foster favourable partnerships to sustain and ensure outcomes of change

synonymous with the CE approach. CE organisations must not fold into partnership-based agreements that see them disadvantaged and suppress their contributions, leading to elements of CE as opposed to a CE-driven approach.

In contrast, in the Northern regions, especially in the Northeast of England, relatively weak interorganisational connections were observed. Similarly, the CE networks throughout these regions appeared weak and, in some cases, non-existent, limiting CE engagement to the interorganisational level and necessitating network engagement to non-CE networks. A combination of undeveloped networks coupled with unengaging organisations creates a sense of urgency for establishing CE bodies to coordinate these efforts. Limitations on the CE organisations themselves are understandable. They cannot be expected to establish network coordinating bodies as their Southern counterparts did a decade ago. Therefore, the increasing commitment upon already committed individuals creates a need for established bodies within the CE sector to create a similar approach to coordinate interorganisational learning activities between its constituents.

Following previous recommendations (Berkhout & Westerhoff, 2013; Gibb et al., 2017; Hargreaves et al., 2013; Nochta & Skelcher, 2020; Parag et al., 2013), multiple sociograms were created for the respondents representing knowledge exchanges separating knowledge providers and recipients, financial exchanges and informal relationships between CE organisations in CE networks. These were further supplemented through the interviews and corroborative discussion.

Mapping interorganisational exchanges confirmed the high intensity of interactions previously suggested to occur within these network settings. Although the interactions were mostly knowledge-based, numerous financial exchanges (especially those between CE organisations and local authorities) and informal interactions between CE network members were observed.

The results also confirmed the existence of clusters (Parag et al., 2013) representing a concentration of exchanges by highly centralised organisations within the network. Confirmation of these clusters suggests that members within these settings experience the cooperation process in different ways and that the degree of access to information and, subsequently, their derived benefits from network engagement are dependent on their degree of centrality, which improves their positionality within the network, giving them first-hand access to information and opportunities for engagement.

7.3 Contribution to Knowledge

This study attempted to contribute on multiple fronts by combining a learning approach guided by OL theory and, specifically, the 4I learning framework to explore network learning within the CE sector in England.

1. Firstly, this study extended the limited research on our understanding of learning, specifically network learning within the CE sector in England. This study remains the first to incorporate the 4I learning framework and apply its extension to investigating learning within the CE sector.
2. Secondly, as part of the objectives of this study and to better understand why specific organisations can learn and engage in networking better than their counterparts, this study created a unique classification profile to visualise and compare seven CE characteristics between different CE organisations. Further application of this concept into categorised organisations provided fruitful insights into the otherwise subtle differences between their underlying values.
3. Thirdly, to the best of the researcher's knowledge, no study has yet attempted to operationalise and extend the 4I learning framework to measure the interorganisational and network levels, respectively. Whilst the contribution on this front is limited in that the instrument could not capture the individual level of learning, the instrument itself proved to be adequate in extracting meaningful variables to represent learning constructs and examining the inter-item relationships between the variables themselves. Combined with the interviews and network analysis, these findings proved highly insightful in understanding how these organisations learn and the role that networks play in amalgamating, coordinating and ultimately accelerating these processes.
4. Fourthly, existing research on OL, specifically those focusing on the 4I learning framework, postulates that learning is a self-reinforcing process. The findings in this study presented a negative relationship between different levels of learning. This was confirmed to be a key barrier to engagement due to time-based limitations on the individuals operating within the organisational settings. This study suggests that learning is only self-reinforcing if the organisation has the capabilities to allow it to do so.

7.4 Practical and theoretical implications

As a sector, CE is approaching a crossroads in its sectoral development. Therefore, decisions taken at this stage of development are expected to have significant long-term effects on organisations operating within the CE space. The following section will list some practical and theoretical implications gained through this study.

As the CE sector continues its development path, from a niche level new market entrant that has been historically dependent on external sources of financing for its sustainability (Berka, 2017) towards a permanent player within the wider RE sector and zero-carbon transition through different business models incorporating new partners and novel approaches to energy management (Nolden et al., 2020), it will be necessary for the CE sector and government policy to make explicit conditions that allow for the fair adoption of the community label to these joint initiatives to ensure that the emphasis on 'Community' is not substituted by sole regard towards 'Energy'.

Regarding their organisational structure, the over-dependence on a voluntary workforce as a common aspect of the CE approach is criticised due to the unreasonable and unreflective requirements placed upon the individuals that volunteer in these organisations. The traditional perception that CE organisations are grassroots initiatives incepted from the bottom up has benefitted the government through the collective contributions of the CE sector towards zero-carbon commitments alongside other forms of social impact that are observed with initiatives of this nature. This, however, has come at the expense of minimal job creation within the sector, which has led to a lock-in effect of dependence.

On the one hand, CE organisations cannot be expected to compete within the wider RE sector alongside private enterprises without adequate organisational structures. On the other hand, the government cannot afford to sustain the CE approach alongside its other commitments to create inefficient paid roles that remain dependent on external forms of finance. Therefore, the next phase of CE development as a sector must consider how to incorporate the creation of more FTE roles into CE business models to allow for more effective and efficient growth and development, as the interviews noted that these elements were often crucial in its sustenance. This study demonstrated that this overdependence on a primarily voluntary workforce impeded interlevel learning processes and diminished their host CE organisations' overall interorganisational and networking capabilities due to the time-based limitations on the volunteers.

The diversification of CE business models to incorporate elements targeting demand reduction and increased efficiency measures were all found to have multiple interlinked activities that may be simultaneously targeted to allow for alternative business models to offset potential losses that will undoubtedly arise due to a changing policy landscape. Furthermore, as these activities are linked with different forms of social impact, it is recommended that CE organisations become more familiar with these activities and become more involved in operationalising these activities as they may be utilised to generate a revenue stream in addition to simultaneously satisfying different forms of community engagement and social impact.

7.5 Limitations

This study suffered from several limitations and shortcomings, which have hindered the overall research processes and led to several amendments in the research design and data collection methods. This section will present these limitations, how they impacted the study, and the steps taken to circumvent the issues and not compromise the data and subsequent discussion.

One of the critical limitations of the study was its low response rate to the survey instrument (N=38) which undoubtedly diminishes the overall quality and generalisability of the quantitative findings (Hogarty et al., 2005; Watkins, 2018). This is attributed to the inconvenient timing of the data collection that was initially delayed due to the Covid pandemic and later coincided with sectoral data collection for industry reports and accumulated workloads for CE organisations, carried on from the lockdown period. Although the quantitative data was collected after the lockdown period, it was confirmed by several participating individuals that a backlog of other commitments by the already time-short organisations and volunteers reduced their commitments elsewhere.

Whilst several steps were taken to avoid the issue in the first place, such as securing commitments from two CE intermediaries responsible for coordinating network activities in their regions as well as building an initial connection with multiple CE organisations through attending network events and making them aware of the research process, the failure of one intermediary to fulfil its commitments due to unprecedented issues saw the second mailing list to incorporate CE members of the CEE mailing list and focus on interactions with different intermediaries, as it was deemed too excessive to list all other

members, resulted in several insights relating to CE relationships with DNOS, LEP energy Hubs and local authorities that were not previously the intention of this study.

Additionally, whilst the quantitative limitations were evident when undertaking the steps towards a PCA, mainly with the failure of the individual scale of learning to satisfy pre-PCA tests of adequacy as well as the extracted factors later failing to yield any meaningful results through multivariate analysis, the resulting correlation coefficients that emerged from the inter-item correlation matrix from the extracted variables in combination with the interview findings provided insights into why there was an observed negative relationship between group learning and organisational learning, they provided evidence to suggest that the perceived network benefits diminish over time as the organisations develop relationships with other network members.

This study reports having secured most of its participants in terms of distributed representation of CE throughout England. Survey respondents from areas with a more robust CE presence than those in it could not secure participants. Overall, this study reports that the geographic regions that were strongly represented, from which the findings may be generalised to these areas, include both the Southeastern and Southwestern regions of England, followed by the Northwest. Additionally, this study reports that CE organisations hosting wind turbine technologies were unrepresented from the sample. Most respondents reported having Solar PV systems, and a minority represented by hydro scale systems.

Mapping interorganisational interactions within CE network settings and its analysis through established SNA methods represented a considerable proportion of the findings and subsequent discussion. Although limitations relating to the survey instrument were recognised due to the limited responses, the final question representing the SNA mapping data resulted in 477 interactions between the general (266) and regional (211) mailing lists.

Additionally, including network members in the regional mailing list and different intermediaries in the general mailing list provided helpful insights into interactions with other organisations that did not respond to the survey. Correcting for non-responder bias, all nodes that denoted non-responders were separated from those representing responders who commented on each other. These were recognised throughout the analysis, and the sociograms further denoted these by including labels for responders whilst not including any labels for non-responders. One consideration of this network

mapping technique is that although it allowed for limited two-directional exchanges from independent sources, as previously recommended by Tsai (2001) when mapping interorganisational interactions, the categories proposed by Parag et al. (2013) allowed for a single organisation to indicate both provision and reception of knowledge and finance.

However, one of the main criticisms of the SNA and network mapping techniques was its limited insights into the usefulness of exchanging knowledge and the number of shared financial resources. Interactions, irrespective of their monetary or knowledge-based value, were all denoted as being equal through a common edge strength value of 1.

The interviews showed that the number of exchanges between organisations does not necessarily translate into quality information. Furthermore, as the survey only captures a limited number of the total interactions of an organisation, these only reflect a responding sample in an artificially bounded setting, leading to difficulties in the generalisability of the findings.

An improvement on this front may be to further classify the usefulness of knowledge through categories such as Berkhout & Westerhoff (2013) or perceived value through a Likert scale to better account for the temporal and spatial dimensions that may encourage or hinder CE collaboration.

Lastly, the final discussion as a form of corroboration is also criticised due to its limited sample selection. Again, although multiple individuals were identified through snowball sampling techniques (Bryman, 2016) by direct recommendations from other participants, the resulting discussion period was only able to secure one individual for participation. Although the individual appeared to understand their role as a verifier of the findings, the two-person dynamic of the discussion period was more reminiscent of the semi-structured interviews rather than a corroborative conversation. Nonetheless, the corroborator was well aware of their role. Hence, the study benefitted from their seniority within the CE sector and numerous affiliations over their prolonged engagement with different facets of the CE sector to provide additional context and meaningful insights into the findings.

7.6 Recommendations for future research

In light of the research conducted, as well as the lessons learned throughout the research process, a series of six recommendations for future studies attempting to investigate the CE sector through an OL theory-informed lens to incorporate are presented below.

1. A longitudinal approach to examining change within CE organisations.

One of the contributions of this study was the creation of a classification profile to enable better characterisation of CE organisations. Overall, the individualised profiles provided valuable insights into how certain principles underpinned the values upheld by the organisations collectively shared between the individuals and how these values were then interpreted and achieved through CE activities. Furthermore, comparing differences in the average weights of these characteristics through combined profiles measured against certain organisational traits, specific time periods, and regions also provided some information into the differences, but mostly the similarities shared between organisations operating within the CE sector.

A step forward in this domain would be to follow these CE organisations over a prolonged period of at least a couple of years to examine how their evolution as an organisation would impact their characteristics. A longitudinal approach targeting either a single CE organisation, several CE organisations, or even a CE network intermediary to examine how its characteristics, values and overriding vision change and shift over time and as a response to the external environment in which they are situated.

2. A comparative approach to CE networks

Initially, this study intended to compare different regional CE networks to understand better how geographical differences and the resulting differences in CE's evolution and sectoral development have impacted the emergent networks, communication channels and interactions between organisations. However, this approach was curtailed due to sampling limitations because no agreement with any network coordinator to participate and share the survey instrument throughout their network. The findings in this study do point towards differences between different CE networks, suggesting that it is an area of worthwhile exploration. A comparative regional approach to network learning may expand on several avenues introduced in this study, such as regional dynamics, the historical development of CE, and its impacts on learning. An investigation in this domain would support cross-regional collaboration between CE networks and their respective intermediary coordinators due to it providing insights into the key activities and forms of knowledge that the networks should focus on depending on their region as well as identifying critical pieces of information that regional pockets of CE may require.

3. Focusing on certain levels within the 4I framework with a CE focus

Chapter 2 recognised that the 4I learning framework had become a small yet standalone niche avenue in OL research. The literature review notes that various streams within the 4I learning framework have emerged, focusing on the framework's levels, processes and premises. Additionally, several articles have attempted to extend the 4I framework by incorporating different learning processes or extending the framework to include the interorganisational and network levels of learning. Whilst this study attempted to provide an all-encompassing approach to the 4I learning framework by adopting it in its entirety, the findings showed that CE organisations placed greater emphasis on certain levels of learning, such as the individual level, internally.

One recommendation in this domain would be to focus on a single level or interplay between two levels instead of incorporating the framework in its entirety. This would prove highly valuable, especially at the individual level, considering that the level was much more dynamic and had unclear boundaries due to how individuals operate within CE organisations.

Specifically, this study could not quantitatively include scales for individual learning due to them not satisfying preliminary statistical acceptance thresholds. However, in direct contradiction, the interviews suggested that individual learning and the process of intuition was a crucial aspect that more often led to crucial decisions being taken at the organisational level.

4. Incorporating the usefulness of knowledge or wider exchange

A proposed improvement on the 4I learning framework may be to incorporate some aspect of the usefulness of the knowledge being exchanged through the learning processes could have further ramifications to inform how useful each of the associated processes and levels of learning is perceived as having the most value and if the processes themselves remain consistent regardless of the quality of exchanges taking place. This is even more important in settings such as CE organisations due to limited resources and volunteer-dependent time-based constraints.

5. Cross-regional interactions, and relationships between network coordinators within the CE sector

At the network level, desk-top research by the researcher revealed that numerous intermediaries responsible for coordinating their own regional or national networks

interacted with each other to support collective CE growth. Indeed, the primary research also revealed that these intermediaries did not only interact but also supported each other on an ongoing basis. Some findings in this study even showed developed intermediaries with strong regional networks venturing to other regions to assist them with establishing their intermediaries to coordinate regional networks suggesting that the CE approach did not yet suffer from any form of competition between them and remained collaborative even when extended to a national level.

The findings here confirmed two points. Firstly, there is ample secondary information relating to interactions between CE organisations and their respective network intermediaries which may be incorporated into any study that seeks to map these exchanges. This information is readily available and easily accessible through online searches of CE network activities, academic articles, and sectoral reports.

Secondly, cross-regional interactions between the intermediaries (Nochta & Skelcher, 2020) can also provide insights into how regional hub coordinators and their national-level counterparts interact for the collective benefit of their member organisations and the wider CE sector.

Hopefully, this study can contribute towards an increased notion of cross-regional coordination between network-coordinating intermediary organisations and share best regional practices and networking techniques amongst the various CE networks throughout England. With stronger coordination between these bodies, ample and underutilised resources await to be explored and later exploited by CE, contributing to its independent development whilst creating and sustaining community-driven change.

6. Policy implications of the Local Electricity Bill on CE development and changing nature of knowledge in the sector

Lastly, the Local Electricity Bill (LEB) is expected to offer renewed policy support to enable small-scale RE generators, such as CE organisations, to supply their electricity locally. Given the magnitude of opportunities, this would entail substantial learning-based opportunities, processes and outcomes are expected to follow. Therefore, it is recommended that future

approaches should consider the ramifications of the LEB if it does indeed gain traction⁶⁰ and moves forward to be incorporated into energy policy.

7.7 Concluding remarks.

The CE sector has grown remarkably over the past two decades (Nolden et al., 2020). Previous literature and, indeed, the literature review of this study have attributed this growth to favourable policy mechanisms (Nolden et al., 2020) and increasing partnership-based models (Bauwens et al., 2022; CEE, 2020; Goedkoop & Devine-Wright, 2016). However, credit for sectoral growth thus far should be given to the individuals that dedicate hours beyond measure and significant financial resources to ensure the CE approach's continued growth and long-term sustainability. These individuals are the heart and soul of the CE approach, acting as the primary vehicles responsible for all CE development, growth and learning.

At a governmental level, the removal of primary supporting mechanisms (Tingey & Webb, 2020) and their lack of an adequate replacement (CEE et al., 2019) suggests that the initial interest, from an energy policy standpoint, in CE development has faded. Furthermore, continued neglect of the CE sector from subsequent policy mechanisms has led to stakeholders' panic, creating a deeper gap rooted in scepticism between CE and governmental bodies.

A CE presence in COP26 (CEE, 2021a) marks an important benchmark for the sector. However, it remains unclear whether its inclusion to be presented on an international stage is a means of presenting diverse representatives of the UK's energy sector towards its zero-carbon targets, a result of ongoing advocacy from CEE representatives for inclusion, or a genuine attempt to integrate the CE sector into the wider energy sector. Nonetheless, the inclusion of CE and its many successful initiatives will inevitably increase its popularity and lead to further opportunities for its development.

Although policy mechanisms targeting CE were only temporary solutions to encourage initial sectoral development (DECC, 2014b:2015) and the accelerated sectoral growth of CE

⁶⁰ As of March 2023, the Local Electricity Bill has only approached its second reading in the House of Commons as part of its passage. Further information relating to the bill and its ongoing process can be tracked through the following link: <https://bills.parliament.uk/bills/3039>

over the preceding period can be interpreted as the successful delivery of these mechanisms working together.

Therefore, it is not unreasonable to assume that these policy mechanisms are not a permanent revenue mechanism. The CE sector must ultimately deliver a self-sustaining and subsidy-free solution to energy management to ensure their continued survival and confirm their position as a bottom-up, citizen-led approach to our zero-carbon futures.

Devolved governmental bodies, such as local authorities, were observed to suffer from several shortcomings that were found to impede CE development. These include their lack of adequate skillsets and specialised experiences arising from more profound issues of underfunding and the precedence of other issues that these bodies must tend to. Inconsistencies between local authorities regarding their capabilities and capacity to deliver on RE and zero-carbon targets have resulted in incoherent regional and local policies, support initiatives and cooperation between local public bodies and the respective CE organisations operating within its parameters.

Despite this and through the persistence and combined efforts of these individuals and their CE organisations, specific cohorts within the CE sector have since developed strong networks that are coordinated by intermediaries that are now able better to represent their members to governmental and public bodies, amalgamate, consolidate and disseminate valuable lessons between through their channels and create new economic opportunities and joint enterprises between their members with other stakeholders involved in the energy sector.

Differences in CE development throughout England and its subsequent impacts on CE networks entail that representative intermediary bodies coordinating developed CE networks must recognise that the sector is in a new stage in its development. Therefore, cross-regional support is essential to ensure that current differences are subdued and not extrapolated onto the long term. The benefits of CE development present joint opportunities to public bodies, such as LEP energy hubs and local authorities, to jointly deliver towards achieving their climate and energy-related targets. A potential avenue for joint partnerships between CE organisations and their respective local authorities, mediated through the LEP energy hubs, is a clear avenue for joint success.

This study concludes that the CE approach has gained a foothold within the wider RE sector and cemented its place within the nation's commitment to a zero-carbon future through

meaningful exchanges between involved CE organisations. However, it is essential to recognise that CE has reached an important benchmark in its sectoral growth. Inconsistencies between regional channels for effective interorganisational learning due to limited network capabilities strongly limit the reach and impact of CE. However, this study concludes that the CE sector does not lack knowledge or, indeed, has a skills deficit impeding its development. Rather, there is a shortage of cross-regional network-level capabilities that foster knowledge-exchange processes that stifle CE's potential to create sustained impact.

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Appendices

Appendix A – Identification of CE networks

Name:	Est:	Key information as of 2021:
Centre for Sustainable Energy (CSE)	1979	<p>Objective: Wide knowledge-sharing network focused on engaging individuals, developing practices, disseminating and presenting useful information, and advocating for zero carbon transition.</p> <p>Size: 90 team members and 14 voluntary trustees with approximately 68 partnerships with different organisations, government departments, universities etc... engages on average 80-100 separate projects at any given time.</p> <p>It is funded by: Various national and local governmental bodies and other industry and charity-based stakeholders.</p>
Community Energy England (CEE)	2014	<p>Objective: National representative of CE in England. It also provides a platform for learning-based interactions and sharing explicit knowledge.</p> <p>Size: 6 team members and 10 board members with collaborations across 28 networks and 12 advisory groups. Over 270 community energy organisations and wider sustainability-driven stakeholders are involved with the CEE network.</p> <p>It is funded by: Charitable organisation grants, membership fees and sponsorships.</p>
Co-operatives UK (Co-ops UK)	1869	<p>Objective: Central membership organisation for cooperative organisations in the UK, engaged primarily in advocacy, development and bridge-building between these organisations.</p> <p>Size: Around 40 team members in addition to 10 board members. Collaborations across thousands of cooperations, government departments, and private sector stakeholders.</p> <p>Funded by: Ministry of Housing, Communities & Local Government</p>
Energy for All (E4A)	2002	<p>Objective: Develop CE projects by aiding in engagement, funding, technical expertise and asset management.</p>

		<p>Size: 19 team members with 4 main partner organisations supporting 30 CE organisations. They report approximately 16,880 individual member affiliates.</p> <p>Co-development funds it through management/membership fees.</p>
Energy Saving Trust (EST)	1992	<p>Objective: A network of partnerships between prominent energy sector organisations which aims to address the main shortcomings of the sector, including fuel poverty, providing different forms of knowledge and financial-based support to individuals and organisations.</p> <p>Size: 386 team members and 13 board members. Affiliated with over 36 different networks and partnerships, although it is unclear which are networks and which are partnerships.</p> <p>Funded by: Government</p>
Power to Change (P2C)	2015	<p>Objective: Support the overall development of community businesses, provide funding and expertise in several sectors, and integrate community approaches into wider networks. It also provides funding and space for the exploration of innovative approaches.</p> <p>Size: 42 team members in addition to 9 trustees. Wide networks with various local authorities, knowledge-based institutions and other community business stakeholders and close ties with a further 9 community-based networks.</p> <p>It is funded by: Community fund grant through the National Lottery.</p>
Pure Leapfrog (PLF)	2005	<p>Objective: A network of service organisations which provide financial, legal and technical support for developing CE. It is generally viewed as a key source of financial access for community energy organisations.</p> <p>Size: 7 team members in addition to 5 trustees. The organisation itself is founded due to close ties between two parent organisations; however, it works closely with 11 partners in innovation-related activities.</p> <p>Funded by: N/A Private Limited Company</p>
Regen (REG)	2001	<p>Objective: Knowledge hub focused on industry research, publication of technical reports and expert advice supporting the overall energy transition.</p>

		<p>Size: 31 team members in addition to 3 associates and 9 trustees. Affiliated with approximately 170 organisations within the renewable energy sector, around 24 are direct community energy stakeholders such as organisations and networks.</p> <p>Funded by: N/A Private Limited Company</p>
Bristol Energy Network (BEN)	2016	<p>Objective: Umbrella organisation representing CE within the region, information, knowledge and finance sharing activities, and fuel poverty alleviation.</p> <p>Size: The team consists of 3 individuals and 9 board members. The network comprises approximately 30 associations ranging from community energy organisations to other wider energy and sustainability-concerned initiatives throughout the Bristol area.</p> <p>Maturity: Although the network itself has provided evidence of surpassing the initial formation stage due to its age and relatively high number of member affiliations. Reaching the stage of maturity is difficult to determine due to a lack of available secondary information on the network website.</p> <p>Overall, there is a strong indication of event coordination and joint project development, which may hint at cooperation between network members. It can also indicate a high degree of centrality of the coordinating organisation which in turn suggests weak independent relationships between its member organisations. This is an indication of a network not yet having achieved maturity.</p>
Community Energy London (CEL)	2016	<p>Objective: Supporting the development of CE in London through providing knowledge and finance-sharing platforms, lobbying, and forming new organisations.</p> <p>Size: The team consists of 8 individuals, two main sponsors, and two main partners with affiliations of 26 community energy organisations across London.</p>

Community Energy South (CES)	2013	<p>Objective: To act as a hub coordinator representing the development of community energy in Southeast England. CES coordinates resource-sharing activities comprising finance sharing but predominantly knowledge sharing across the region. In addition, several forms of digital resources exist and are available to access at the network level.</p> <p>Size: Team comprising 12 individuals, with 8 interorganisational partnerships engaging in 7 primary projects between them. A further 3 organisations were mentioned due to their perceived financial contribution and funding provided—45 member groups, of which 34 are deemed CE.</p>
Devon Community Energy Network (DCN)	2018	<p>Objective: Informal regional hub organisation created to coordinate efforts and promote collective action among its member groups in the Devon area. It is primarily focused on coordinating resource-sharing efforts and joint project delivery. Further activities include several energy-saving activities and, finally, acting as a unified body for advocacy and engagement with wider authorities and other local, regional and national intermediaries.</p> <p>Size: it is not clear the number of members who are directly involved in this organisation’s day-to-day activities. The hub organisation, however, reports 32 different affiliations split between community energy groups (10), wider sustainability-driven organisations (11), local authorities (10) and other intermediaries (1). It has also been found that the member organisations do not have a direct connection with the intermediaries and therefore rely on the network hub for information to spill over from these sources.</p>
Low Carbon Hub (LCH)	2014	<p>Objective: Jointly developing community-owned renewable energy projects throughout Oxfordshire to contribute to zero carbon transition. Creates partnerships in addition to the circulation of funding for project inceptions.</p> <p>Size: Large office team comprised 19 members and a comparatively large board of directors. Furthermore, 26 members were identified, and 16 were confirmed CE organisations.</p>
Zero Carbon Yorkshire (ZCY)	2020	<p>Objective: Newley incepted a network aiming to fill the regional hub community energy-based role within Yorkshire. Not much information exists currently, but this is expected to grow.</p>

		Size: N/A
Local Energy Northwest Hub (LENWH)	2018	Objective: Public sector promotion of energy-related support through 5 key activities Partnerships: 5 LEPs
Northeast and Yorkshire Energy Hub (NE&YEH)	2018	Objective: Public, private and voluntary sector development of decentralised energy projects listed in 13 different activities. Partnerships: 6 LEPs
Midlands Energy Hub (MEH)	2018	Objective: Public and community sector development of energy projects with a specific focus on replicability. Partnerships: City council
Greater Southeast Energy (GSEEH)	2018	Objective: Public and community sector development, high promotion of RCEF. Partnerships: 11 Local authorities and LEPs
Southwest Energy Hub (SWEH)	2018	Objective: Public and community sector development, also sourcing project financing through the private sector. Partnerships: 7 LEPs

Appendix B – Semi-structured interview transcript

1. Please tell me how your organisation was founded and your current operations.
2. How have your past and present experiences and knowledge as an individual or individuals contributed towards the organisation and its members?
3. How would you describe your relationship with other community energy organisations?
4. Can you share your organisational experiences regarding how you have had to adapt to the Covid-19 pandemic?
5. Can you describe a situation where your organisation was able to learn something externally which led it to function in a more efficient way?
6. How has joining a network contributed towards your organisation?
7. How has joining a network allowed your organisation to contribute to the wider community energy sector?
8. Overall, how would you describe the impact of joining a network on your organisations' ability to learn and remain competitive?
9. How would you describe the role of the network coordinator?
10. Finally, what do you perceive as the biggest barrier to interorganisational and network learning within the sector, and how best do you think these barriers may be addressed?

Appendix C –Information sheet, sample ethics consent form and data protection

An Exploration of Interorganisational Learning in the Community Energy Sector in England

Participant Information sheet

Hello, I am Mohamed AlZarouni, A PhD student from the School of the Built Environment at the University of Reading. My research focuses on community energy organisations in England, I am trying to investigate how organisational learning unfolds in community energy organisations. Specifically, I am interested in the role that cooperative networks play in this learning process.

I would like to kindly request your participation in a semi-structured interview of about 45 minutes. Due to COVID-19, all interviews will take place online. The interview will comprise three main sections, which focus on some general information regarding the organisation, the underlying drivers and instances of learning and finally on the role and the contribution of wider networks and cooperation between the community energy sector and its impacts on how knowledge is shared and manifested throughout the sector.

Please note that this is a voluntary request. You may choose to withdraw from the study at any time. Furthermore, your identity and the identity of any organisation(s) or network(s) you mention will remain confidential within the written transcript. The only people who will have access to this data will be my supervisor and I. Any data obtained in this study will only be used for academic purposes. Copies of any outputs, such as resulting academic articles, data sets, or the final study, will be available upon request.

Should you have any further questions or concerns, please contact either myself m.m.a.alzarouni@pgr.reading.ac.uk or my supervisor f.phua@reading.ac.uk

This project has been subject to ethical review, according to the procedure specified by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Signed: Mohamed AlZarouni

Date: DD/MM/YYYY

Sample consent form

Please mark your initials in the box after each statement to confirm it has been read and agreed to.

1. I have read and had explained to me by Mohamed AlZarouni the accompanying Information Sheet relating to the project on **“Exploring Interorganisational Learning in Community Energy Networks.”**

2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

3. I have had explained to me what information will be collected about me, what it will be used for, who it may be shared with, how it will be kept safe, and my rights in relation to my data.

4. I understand that participation is entirely voluntary and that I have the right to withdraw from the project at any time, which will be without detriment.

5 (a). I understand that the data collected from me in this study will be preserved and made available in anonymised form so that they can be consulted and re-used by others.

5 (b). I understand that the data collected from me in this study will be preserved and, subject to safeguards, will be made available to other authenticated researchers. *

6. This project has been reviewed by the University Research Ethics Committee and National Research Ethics Committee where relevant and has been given a favourable ethical opinion for conduct.

7. I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name:

Signed:

Date:

I am happy to be included on a register of research participants for the purposes of being contacted about further studies by **Mohamed AlZarouni** Please mark with your initials (optional)

Data protection for information sheets

The organisation responsible for protecting your personal information is the University of Reading (the Data Controller). Queries regarding data protection and your rights should be directed to the University Data Protection Officer at imps@reading.ac.uk or in writing to the University of Reading, Information Management & Policy Services, Whiteknights House, Pepper Lane, Whiteknights, Reading, RG6 6UR, UK.

The University of Reading collects, analyses, uses, shares, and retains personal data for the purposes of research in the public interest. Under data protection law, we must inform you that this use of the personal data we may hold about you is on the lawful basis of being a public task in the public interest and where it is necessary for scientific or historical research purposes. If you withdraw from a research study, which processes your personal data, depending on the withdrawal stage, we may still rely on this lawful basis to continue using your data if your withdrawal would be of significant detriment to the research study aims. We will always have appropriate safeguards in place to protect your personal data.

If we have included any additional requests for the use of your data, for example, adding you to a registration list for the purposes of inviting you to take part in future studies, this will be done only with your consent where you have provided it to us and should you wish to be removed from the register at a later date, you should contact m.m.a.alzarouni@pgr.reading.ac.uk

You have certain rights under data protection law, which are:

- Withdraw your consent, for example, if you opted to be added to a participant register.
- Access your personal data or ask for a copy.
- Rectify inaccuracies in personal data that we hold about you.
- Be forgotten, that is, your details to be removed from our systems to process your personal data.
- Restrict uses of your data
- Object to uses of your data, for example, retention after you have withdrawn from a study

Some **restrictions** apply to the above rights where data is collected and used for research purposes.

You can learn more about your rights on the Information Commissioners Office (ICO) website at <https://ico.org.uk>.

You also have a right to complain to the ICO if you are unhappy with how your data has been handled. Please contact the University Data Protection Officer in the first instance.

The details of the existence of automated decision-making, including profiling (if applicable – more information on whether this would apply to your study can be found here: <https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/individual-rights/rights-related-to-automated-decision-making-including-profiling/>

Appendix D – Final questionnaire instrument

An exploration of interorganisational learning in the community energy sector in England

Learning in the Community Energy sector

What is this survey about? To collect information on how knowledge is shared and adapted between community energy organisations, and the influence of networks on these exchanges.

Why am I being asked? The information provided will be used to identify barriers as well as success factors to knowledge sharing and draw recommendations to create more effective channels of interorganisational learning.

How will my data be stored/used? All information provided will be anonymized and treated with complete confidentiality. All the data provided will only be used for academic purposes.

Please note that participation is voluntary, and you can stop at any time. **By completing and returning this survey you understand that you are giving consent** for your responses to be used for the purposes of this research project.

If you wish to be informed on the progression of this study, require the final (Anonymised) data set or have any other questions or inquiries, feel free to drop me an email at **m.m.a.alzarouni@pgr.reading.ac.uk** for any further information.

1. General Information:

Organisation name?	<input type="text"/>
Year founded?	<input type="text"/>
Number of full time equivalent (FTE) staff?	<input type="text"/>
Number of Volunteers?	<input type="text"/>
Legal structure?	<input type="text"/>

2. Which category best describes your main business activity?

- Demand side (Energy efficiency, demand reduction etc...)
- Supply side (Energy generation)
- Community consultation
- Other (please specify)

3. Please select the activities that apply to your organisation:

	Actively	Sometimes	Never	We have in the past
Educational events (Energy café, school and university events)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Efficient lighting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electricity generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy audits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy switching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Energy performance services (EPS) & survey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fuel poverty reduction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Funding & project financing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heat generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low carbon transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training & workshops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Please rank the statements below in terms of applicability to your organisation (1 being most applicable and 5 least applicable), your staff and volunteers backgrounds are:

- ☰ Within the energy sector, working on energy related activities (Engineer, technician etc..)
- ☰ Within the energy sector, working on non-energy related activities (HR, marketing, legal in energy company etc..)
- ☰ Non-energy sector, working on energy related activities (Energy manager, system operator in a non-energy related organisation etc..)
- ☰ Non-energy sector, working on non-energy related activities (Teacher at school etc..)
- ☰ Community/social work

5. How much importance does your organisation place on the following?

	Not important	Slightly important	Moderately important	Important	Very important
Advocacy on behalf of the sector (With parish and city councils etc...)	<input type="radio"/>				
Community engagement (e.g. Community building, organising community based events)	<input type="radio"/>				
Democratic decision making (Regarding internal organisational decisions)	<input type="radio"/>				
Education & raising awareness	<input type="radio"/>				
Ensuring a zero-carbon future	<input type="radio"/>				
Financially reward shareholders with higher payments	<input type="radio"/>				
Social impact (e.g. Addressing fuel poverty)	<input type="radio"/>				

6. The following question relates to intuitive perceptions, to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Roles in community energy organisations have allowed our members to view the future of the energy sector in a new and different way	<input type="radio"/>				
We feel a sense of pride in our work	<input type="radio"/>				
Each of our members is the most suited person for their role within the organisation	<input type="radio"/>				
We are aware of the critical issues that affect our work	<input type="radio"/>				

7. The following question relates to group interaction when working on a specific project (This could be in partnership with another organisation) to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
We have effective conflict resolution when working in groups	<input type="radio"/>				
We encourage different points of view during group work	<input type="radio"/>				
We are prepared to rethink decisions when new information arises	<input type="radio"/>				
Our groups often have the right people involved for addressing a specific issue	<input type="radio"/>				

8. The following question relates to an overview of the organisation, to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
We have a long term strategy in place	<input type="radio"/>				
Our structure supports our strategic direction	<input type="radio"/>				
Our structure allows us to work efficiently	<input type="radio"/>				
We have standard routines that we follow for our day to day activities	<input type="radio"/>				
The organisation stores detailed information for guiding operations	<input type="radio"/>				

9. The following question relates to how learning may lead to organisational change (Feed forward), to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Individuals have an input into the overall organisational strategy	<input type="radio"/>				
Lessons learnt by an individual/group are actively shared with others within the organisation	<input type="radio"/>				
Results from an individual/group are used to improve our practices	<input type="radio"/>				

10. The following question relates to how organisational change may impact learning (Feedback), to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Our policies and routines aid individual work	<input type="radio"/>				
Our communication tools provide the necessary platform to do our work	<input type="radio"/>				
Our files and databases provide the necessary information to do our work	<input type="radio"/>				

11. The following question relates to the nature of cooperation between your organisation and the wider community energy sector, to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
We are a key contributor of knowledge to our wider network	<input type="radio"/>				
We are a key contributor of finance to our wider network	<input type="radio"/>				
We are a recipient of knowledge from our wider network	<input type="radio"/>				
We are a recipient of finance from our wider network	<input type="radio"/>				

12. Please name the community energy network(s) your organisation is a member of:

Regional network

National network

Noteworthy non-community energy network (can be a large partnership project etc...)

13. From question 12 above, please rank these networks in terms of value to you as an organisation (1 being of most value and 3 lowest value)

Regional network	^	v
National network	^	v
Noteworthy non-community energy network (can be a large partnership project etc...)	^	v

14. Thinking of the network you ranked in first place, the following question relates to the tools and channels which the network provides its members.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The hub/umbrella organisation plays a vital role in coordinating network activities	<input type="radio"/>				
Sub networks exist to further enhance collaboration and interaction between members	<input type="radio"/>				
Network wide training and workshops are a common occurrence	<input type="radio"/>				
The network provides us with a platform to interact and share knowledge with other community energy organisations	<input type="radio"/>				
We now have access to several tools such as financial models/methods of funding etc.. through our network and its members	<input type="radio"/>				

15. The following question relates to the benefits of network engagement, to what extent do you agree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Network engagement has greatly benefitted our long-term development as an organisation	<input type="radio"/>				
Network engagement has aided our financial performance	<input type="radio"/>				
Our overall performance has improved as a direct result of network engagement	<input type="radio"/>				
We are able to develop independent relationships with other community energy organisations as a direct result of network engagement	<input type="radio"/>				
We are more attractive to shareholders because we are part of a wider network	<input type="radio"/>				
We have taken part in new partnerships and projects with other community energy organisations as a direct result of network engagement	<input type="radio"/>				

16. The following series of questions examine current and future outlook of community energy networks, please answer the following, to your best knowledge:

What has been the most important aspect of being part of a community energy network

What role do you think community energy networks will play

Can you share an example of a situation where your organisation has 'learned' something from a community energy network (Please also state the network name)

What is the biggest barrier to knowledge sharing & interorganisational learning in community energy networks

17. The following question examines the internal relationships between network members. From the list of organisations below, please select the relevant checkboxes:

	Provided knowledge	Provided finances	Received knowledge	Received finances	Informal interaction/relationship	No interaction
Barcombe Energy Group	<input type="checkbox"/>	<input type="checkbox"/>				
Basingstoke Energy Services Co-op	<input type="checkbox"/>	<input type="checkbox"/>				
Brighton & Hove Energy Services Co-operative (BHESCO)	<input type="checkbox"/>	<input type="checkbox"/>				
Brighton Energy Cooperative	<input type="checkbox"/>	<input type="checkbox"/>				
Community Energy England	<input type="checkbox"/>	<input type="checkbox"/>				
Community Energy South	<input type="checkbox"/>	<input type="checkbox"/>				
CREW	<input type="checkbox"/>	<input type="checkbox"/>				
Cuckmere Community Solar Company	<input type="checkbox"/>	<input type="checkbox"/>				
E4A	<input type="checkbox"/>	<input type="checkbox"/>				
Eastbourne Community Energy	<input type="checkbox"/>	<input type="checkbox"/>				
Energise South	<input type="checkbox"/>	<input type="checkbox"/>				
Energise Sussex Coast	<input type="checkbox"/>	<input type="checkbox"/>				
Energy Alton	<input type="checkbox"/>	<input type="checkbox"/>				
Energy Garden	<input type="checkbox"/>	<input type="checkbox"/>				
Ferry Farm Community Solar	<input type="checkbox"/>	<input type="checkbox"/>				
Forest Row Energy	<input type="checkbox"/>	<input type="checkbox"/>				
Greening Steyning, Bramber & Beeding	<input type="checkbox"/>	<input type="checkbox"/>				
Hampshire Renewable Energy Co-operative	<input type="checkbox"/>	<input type="checkbox"/>				
HKD Energy	<input type="checkbox"/>	<input type="checkbox"/>				
Kent Community Energy	<input type="checkbox"/>	<input type="checkbox"/>				
Maidenergy	<input type="checkbox"/>	<input type="checkbox"/>				
Marlow Energy Group	<input type="checkbox"/>	<input type="checkbox"/>				

Meadow Blue Community Energy	<input type="checkbox"/>					
Orchard Community Energy	<input type="checkbox"/>					
Our Community Enerprise CIC	<input type="checkbox"/>					
Ouse Valley Energy Services Company LTD (OVESCO)	<input type="checkbox"/>					
PeCAN	<input type="checkbox"/>					
Reading Community Energy	<input type="checkbox"/>					
Repower Balcombe	<input type="checkbox"/>					
Regen	<input type="checkbox"/>					
Saffron Walden Community Energy	<input type="checkbox"/>					
Solesco	<input type="checkbox"/>					
Sustainable Overton	<input type="checkbox"/>					
The Countryside Charity	<input type="checkbox"/>					
The Schools' Energy Co-operative Limited	<input type="checkbox"/>					
Transition Town Lewes	<input type="checkbox"/>					
Transition Town Worthing	<input type="checkbox"/>					
West Solent Solar Co-operative Limited	<input type="checkbox"/>					
Wey Valley Solar Schools Energy Co-operative	<input type="checkbox"/>					
Wight Community Energy	<input type="checkbox"/>					
Win ACC	<input type="checkbox"/>					

17. The following question examines relationships with knowledge intermediaries. From the list of organisations below, please select the relevant checkboxes: 

	We have provided them with knowledge	We have provided them with finances	They have provided us with knowledge	They have provided us with finances	Informal interaction/relationship	No interaction
Bristol Energy Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Centre for Sustainable Energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Energy England	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Energy London	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Energy South	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Co-operatives UK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Council that covers your area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Devon Community Energy Network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DNO that covers your area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy4All	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greater South East Energy Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local Energy North West Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low Carbon Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Midlands Energy Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
North East, Yorkshire and Humber Energy Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power to Change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pure Leapfrog	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SCENE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
South West Energy Hub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zero Carbon Yorkshire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. If there are other knowledge intermediaries you have interacted with and are not listed above, Please state the name of the organisation as well as the type of interaction below: 

19. If you would like the final anonymised dataset, please leave your email in the Textbox. Thank you very much for your participation. 

Done

Appendix E – Frequencies & descriptive information

E1 – Frequency of responses

Frequency of responses of individual items based on Likert-scale:						
Scale:	Item:	1	2	3	4	5
Individual learning	Insight	0	0	4	26	8
	Pride	0	0	0	11	27
	Role	0	1	15	17	5
	Awareness	0	0	3	24	11
Group learning	Conflict resolution	0	1	16	18	3
	Diverse views	0	3	2	25	8
	Rethink decisions	0	1	3	22	12
	Adaptable group	0	2	11	20	5
Organisational learning	Long term vision	0	1	4	28	5
	Structure/Strategy	0	2	7	23	6
	Structure/work	0	1	13	16	8
	Routines	1	2	18	13	4
	Memory	0	6	19	11	2
Feedforward	Interpretation	0	1	2	24	11
	Integration	0	0	3	25	10
	Institutionalisation	0	0	5	24	9
Feedback	Dissemination	0	4	9	22	3
	Capabilities	0	2	12	17	7
	Information	0	3	11	19	5
Exchange flows	Provide knowledge	1	1	8	17	11
	Provide finance	11	8	12	6	1
	Receive knowledge	0	1	4	19	14
	Receive finance	3	6	12	15	2
Network maturity	Coordination	2	0	7	17	12
	Sub- Network	3	3	6	22	4
	Training	7	3	6	15	7
	Platform	2	2	5	18	11
	Tools	2	4	10	15	7
Network benefit	Development	0	2	6	18	12
	Financial	1	6	11	12	8
	Performance	0	2	13	16	8
	Relationships	0	0	10	14	14
	Attractive	6	5	14	9	4
	Partnerships	0	3	5	22	7

E2 – Descriptive statistics

Descriptive Statistics:						
Item	Mean	Median	Mode	Std Dev	Variance	Range
Established	2011.92	2012.00	2011	4.103	16.831	23
Fulltime	2.079	0.000	0.0	4.1305	17.061	16.0
Volunteers	10.63	8.00	8	10.904	118.888	65
Demand	0.32	0.00	0	0.471	0.222	1
Supply	0.79	1.00	1	0.413	0.171	1
Consultation	0.05	0.00	0	0.226	0.051	1
Educational	1.66	2.00	2	0.938	0.880	3
Lighting	0.84	0.00	0	1.128	1.272	3
Electricity generation	2.55	3.00	3	0.921	0.849	3
Audits	1.16	1.00	0	1.197	1.434	3
Switching	0.89	0.00	0	1.158	1.340	3
EPS	0.87	0.00	0	1.119	1.252	3
Fuel poverty alleviation	1.13	0.50	0	1.277	1.631	3
Financing	1.84	2.00	2 ^a	1.103	1.218	3
Heat generation	0.45	0.00	0	0.860	0.740	3
Insulation	0.89	0.00	0	1.085	1.178	3
LCT	0.63	0.00	0	1.051	1.104	3
Training and workshops	1.29	1.50	0	1.228	1.509	3
Energy, energy	3.53	4.00	5	1.782	3.175	5
Energy, non- energy	1.68	2.00	2	1.472	2.168	5
Non energy, energy	1.45	1.00	0	1.483	2.200	5
Non energy, non- energy	2.74	3.00	4	1.826	3.334	5
Social	3.24	3.00	3	1.240	1.537	5
Advocacy	2.26	2.50	3	1.329	1.767	4
Engagement	3.21	3.50	4	0.963	0.927	3
Democracy	3.18	3.00	4	0.982	0.965	4
Education	3.13	3.00	4	0.991	0.982	4
Environmental	3.74	4.00	4	0.724	0.523	3
Shareholder	1.18	1.00	1	0.926	0.857	3
Social impact	2.50	2.00	2	1.157	1.338	4
Insight	4.11	4.00	4	0.559	0.313	2
Pride	4.71	5.00	5	0.460	0.211	1
Role	3.68	4.00	4	0.739	0.546	3

Awareness	4.21	4.00	4	0.577	0.333	2
Conflict resolution	3.61	4.00	4	0.679	0.462	3
Diverse views	4.00	4.00	4	0.771	0.595	3
Rethink decisions	4.18	4.00	4	0.692	0.479	3
Adaptable group	3.74	4.00	4	0.760	0.578	3
Long-term vision	3.97	4.00	4	0.592	0.351	3
Structure strategy	3.87	4.00	4	0.741	0.550	3
Structure work	3.82	4.00	4	0.801	0.641	3
Routines	3.45	3.00	3	0.860	0.740	4
Memory	3.24	3.00	3	0.786	0.618	3
Interpretation	4.18	4.00	4	0.652	0.425	3
Integration	4.18	4.00	4	0.563	0.317	2
Institutionalisation	4.11	4.00	4	0.606	0.367	2
Dissemination	3.63	4.00	4	0.786	0.617	3
Capabilities	3.76	4.00	4	0.820	0.672	3
Information	3.68	4.00	4	0.809	0.654	3
Provide knowledge	3.95	4.00	4	0.928	0.862	4
Provide finance	2.42	2.50	3	1.154	1.331	4
Receive knowledge	4.21	4.00	4	0.741	0.549	3
Receive finance	3.18	3.00	4	1.036	1.073	4
Coordination	3.97	4.00	4	1.000	0.999	4
Subnetwork	3.55	4.00	4	1.058	1.119	4
Training	3.32	4.00	4	1.378	1.898	4
Platform	3.89	4.00	4	1.060	1.124	4
Tools	3.55	4.00	4	1.083	1.173	4
Development	4.05	4.00	4	0.837	0.700	3
Financial	3.53	4.00	4	1.084	1.175	4
Performance	3.79	4.00	4	0.843	0.711	3
Relationships	4.11	4.00	4 ^a	0.798	0.637	2
Attractive	3.00	3.00	3	1.208	1.459	4
Partnerships	3.84	4.00	4	0.855	0.731	3

a. Multiple modes exist. The smallest value is shown

Appendix F – Inter-item correlation matrices

F1 –CE activities inter-item correlation matrix

	Audits	Educational	Egen	EPS	Financing	Fuel poverty	Hgen	Insulation	LCT	Lighting	Switching	Training
Audits	1											
Educational	0.163	1										
Egen	-0.009	-0.131	1									
EPS	.415**	0.061	-0.032	1								
Financing	0.135	0.238	0.164	0.233	1							
Fuel poverty	.481**	0.164	-0.157	0.319	-0.061	1						
Hgen	0.080	0.057	0.076	0.022	0.222	-0.131	1					
Insulation	.405*	0.121	-0.138	.340*	0.109	.349*	0.208	1				
LCT	0.104	-0.030	-0.172	0.120	0.103	0.050	0.239	.671**	1			
Lighting	.451**	-0.003	0.026	.466**	0.229	0.176	0.203	.425**	.344*	1		
Switching	.568**	0.082	-.341*	.545**	0.131	.621**	0.016	.455**	.331*	.356*	1	
Training	.374*	0.169	-0.238	0.265	.360*	0.201	0.152	.348*	0.105	0.196	.344*	1

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

F2 – CE characteristics inter-item correlation matrix

	Advocacy	Democracy	Education	Engagement	Environmental	Shareholder	Social
Advocacy	1						
Democracy	0.211	1					
Education	.338*	-0.154	1				
Engagement	.348*	0.002	.510**	1			
Environmental	0.23	-0.234	.395*	0.298	1		
Shareholder	-0.133	0.188	-0.271	-.321*	-0.246	1	
Social	0.172	-0.031	0.02	.345*	.429**	-0.095	1

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

F3 – Inter-item correlation matrix for learning and network scales

	IL1	IL2	IL3	IL4	GL1	GL2	GL3	GL4	OL1	OL2
IL1	1									
IL2	0.226	1								
IL3	0.227	0.17	1							
IL4	-0.157	0.14	0.173	1						
GL1	.403*	0.047	0.304	0.316	1					
GL2	.551**	0.101	.357*	0.097	.512**	1				
GL3	.404*	0.313	.433**	.364*	.499**	.642**	1			
GL4	.370*	0.288	.337*	0.168	0.18	0.255	.485**	1		
OL1	0.097	.329*	0.302	0.288	0.147	0.092	.490**	.322*	1	
OL2	.340*	.471**	.518**	0.033	0.239	0.156	0.287	.451**	.322*	1
OL3	0.282	.427**	.397*	0.222	0.223	0.164	0.294	0.283	0.211	.496**
OL4	-0.02	0.175	.408*	0.109	0.158	0.086	0.285	0.089	.459**	.422**
OL5	0.018	0.034	0.027	0.103	0.197	0.171	0.294	0.139	0.302	0.213
FF1	0.09	-0.081	0.185	-0.118	-0.083	0.19	0.105	0.077	0.195	-0.187
FF2	-0.066	0.2	0.233	-0.175	-0.178	0.062	0.177	0.029	0.162	0.094
FF3	0.197	0.213	.323*	0.189	0.17	.354*	0.31	0.184	0.18	0.206
FB1	.338*	0.265	.323*	0.078	.438**	.574**	.611**	0.239	0.236	0.147
FB2	.496**	0.246	.354*	0.016	.335*	.480**	.481**	.378*	0.261	0.262
FB3	0.06	.399*	0.239	0.194	0.232	0.204	.502**	.371*	.334*	0.296
NM1	0.095	-0.017	0.16	-0.129	-0.094	-0.041	-0.16	0.088	0.065	0.181
NM2	-0.071	-0.062	0.069	0.041	0.089	-0.081	-0.152	-0.015	-0.002	0.282
NM3	0.031	-0.003	0.1	0.11	0.131	-0.143	-0.088	0.085	-0.042	0.278
NM4	0.105	0.097	-0.199	-0.079	0.25	0.08	-0.11	-0.135	-.379*	0.033
NM5	0.001	-0.102	0.037	-0.011	-0.053	-0.034	-0.171	-0.008	-0.284	-0.008
NB1	0.12	-0.063	-0.16	0.098	-0.031	0.25	0.15	-0.176	0.207	-0.164
NB2	0.08	-0.238	0.194	-0.032	0.098	0.164	0.136	-0.012	0.062	0.094
NB3	0.172	-0.096	0.081	0.095	0.277	.429**	0.253	0.055	0.13	-0.1
NB4	.510**	-0.068	0.239	-0.171	0.108	.388*	0.137	0.046	0.002	0.01
NB5	0.045	0.025	-0.187	0.108	-0.035	-0.069	-0.119	-0.146	0.187	-0.111
NB6	.322*	-0.151	0.108	-0.057	.333*	.382*	0.262	-0.155	0.067	-0.173

	OL3	OL4	OL5	FF1	FF2	FF3	FB1	FB2	FB3	NM1
OL3	1									
OL4	.392*	1								
OL5	0.252	.581**	1							
FF1	-0.038	-0.067	0.187	1						
FF2	0.12	0.052	0.236	.609**	1					
FF3	.439**	0.144	.340*	.386*	.511**	1				
FB1	0.304	0.283	.367*	.326*	0.228	0.187	1			
FB2	0.316	.432**	.429**	0.189	0.173	0.229	.493**	1		
FB3	.382*	.526**	.532**	0.12	0.178	0.277	.572**	.524**	1	
NM1	-0.1	0.026	-0.034	0.188	-0.051	-0.151	-0.095	0.015	0.028	1
NM2	0.159	0.105	0.048	-0.142	-0.251	-0.02	-0.088	-0.315	-0.007	.501**
NM3	0.147	-0.107	-0.155	-0.08	-0.232	0.046	-0.163	-0.217	0.03	.524**
NM4	-0.072	-0.24	-0.181	-0.258	-0.249	-0.116	-0.191	-0.156	-0.065	.446**
NM5	0.038	-0.116	-0.152	-0.066	-0.288	-0.096	-0.241	-0.098	-0.029	.582**
NB1	-0.011	-0.084	0.028	0.08	-0.075	0.055	0.003	-0.087	-0.108	.358*
NB2	0.044	0.034	0.164	0.126	-0.144	0.143	0.054	-0.148	-0.053	.451**
NB3	-0.013	-0.184	0.158	.442**	0.03	0.201	.335*	0.103	0.136	0.182
NB4	0.03	-0.102	-0.126	0.095	-0.014	0.033	0.2	0.089	-0.048	.327*
NB5	-0.04	-0.077	0.148	-0.157	-0.255	-0.108	-0.122	-0.102	-0.075	0.239
NB6	-0.126	-0.023	-0.085	0.038	-0.028	-0.143	0.18	.323*	-0.005	0.201

	NM2	NM3	NM4	NM5	NB1	NB2	NB3	NB4	NB5	NB6
NM2	1									
NM3	.680**	1								
NM4	.481**	.494**	1							
NM5	.443**	.587**	.550**	1						
NB1	0.186	0.287	.323*	0.266	1					
NB2	.446**	.459**	0.293	0.282	.550**	1				
NB3	0.158	0.303	0.048	0.133	.473**	.465**	1			
NB4	0.198	0.115	0.148	0.171	.411*	.330*	0.263	1		
NB5	0.133	0.273	0.091	0.269	.396*	0.191	0.18	0.236	1	
NB6	0.032	0.007	0.303	0.165	.329*	0.094	0.119	.535**	0.138	1

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

F4 – Inter-item correlation matrix for extracted variables from PCA.

	Group learning	Organisational learning	Feedback	Feedforward	Network maturity	Interorganisational relationships	Network benefit
Group learning	1						
Organisational learning	-.344*	1					
Feedback	0.161	-0.247	1				
Feedforward	.648**	-.644**	.337*	1			
Network maturity	-0.007	0.075	-0.146	-0.078	1		
Interorganisational relationships	-0.089	-0.286	0.131	0.118	0.157	1	
Network benefit	-0.006	0.29	-0.174	-0.047	-.328*	-0.224	1

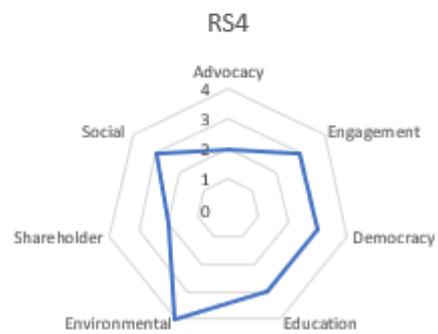
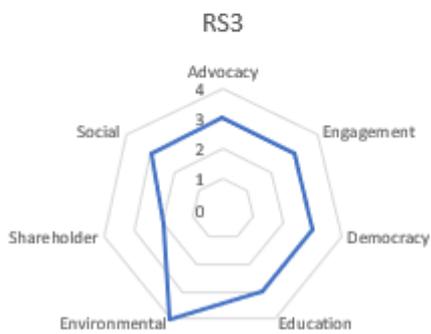
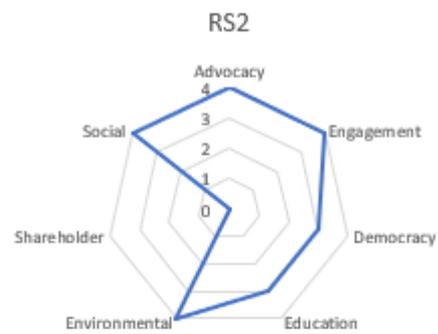
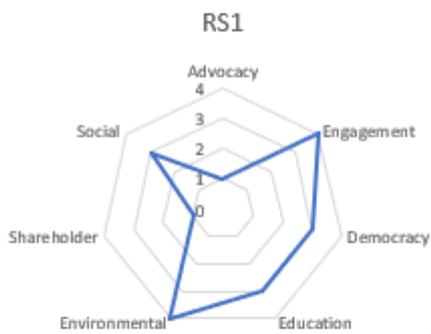
* Correlation is significant at the 0.05 level (2-tailed).

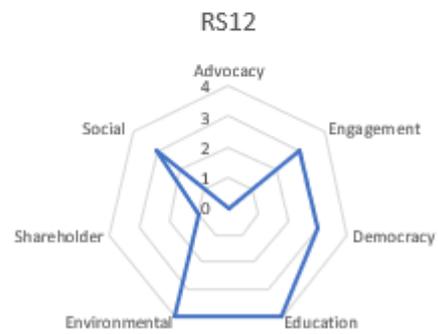
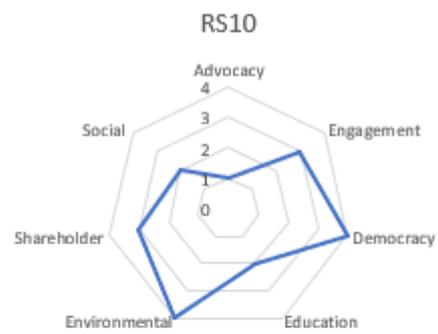
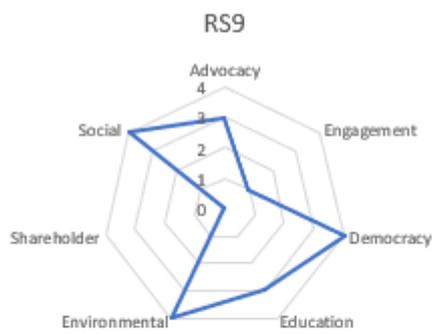
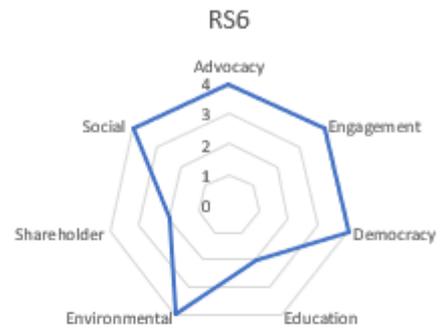
** Correlation is significant at the 0.01 level (2-tailed).

Appendix G – Individualised classification profiles of CE characteristics

Where: 0= Not important, 1= Slightly important, 2= Moderately important, 3= Important, 4= Very important.

G1 – Regional survey respondents (RS) individualised classification profiles





G2- National survey respondents (GS) individualised classification profiles





GS17



GS18



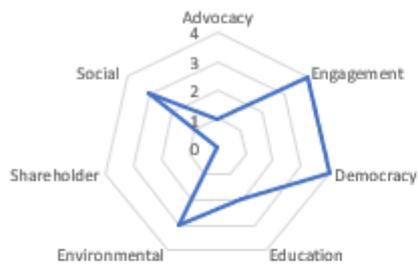
GS19



GS20



GS21



GS22



GS23



Appendix H – Reliability analysis

H1 – Reliability analysis for individual scales

Item-total statistics individualised scales						
		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Individual learning	Insight	12.61	1.381	0.147	0.133	0.315*
	Pride	12	1.405	0.248	0.082	0.228*
	Role	13.03	0.945	0.275	0.085	0.14*
	Awareness	12.5	1.446	0.078	0.088	0.39*
Group learning	Conflict resolution	11.92	2.994	0.525	0.355	0.673
	Diverse views	11.53	2.634	0.583	0.47	0.636
	Rethink decisions	11.34	2.555	0.748	0.572	0.541*
	Adaptable group	11.79	3.306	0.291	0.177	0.804
Organisational learning	Long term vision	14.37	5.536	0.434	0.216	0.719
	Structure/Strategy	14.47	4.851	0.519	0.331	0.687
	Structure/work	14.53	4.905	0.437	0.24	0.719
	Routines	14.89	4.043	0.668	0.487	0.621
	Memory	15.11	4.853	0.469	0.32	0.707
Feedforward	Interpretation	8.29	1.022	0.573	0.352	0.662
	Integration	8.29	1.13	0.631	0.402	0.599*
	Institutionalisation	8.37	1.158	0.519	0.278	0.72
Feedback	Dissemination	7.45	1.984	0.568	0.323	0.663
	Capabilities	7.32	1.898	0.571	0.326	0.66
	Information	7.39	1.921	0.572	0.327	0.658
Network maturity	Coordination	14.32	15.411	0.753	0.596	0.874
	Sub- Network	14.74	14.956	0.763	0.617	0.87
	Training	14.97	12.945	0.754	0.615	0.879
	Platform	14.39	15.164	0.731	0.551	0.877
	Tools	14.74	14.794	0.763	0.604	0.87
Network benefit	Development	18.26	9.118	0.658	0.461	0.604
	Financial	18.79	8.819	0.489	0.404	0.649
	Organisational performance	18.53	10.04	0.447	0.277	0.664
	Relationships	18.21	9.9	0.518	0.398	0.647
	Attractive	19.32	9.249	0.331	0.167	0.716
	Partnerships	18.47	10.851	0.277	0.314	0.711

H2 – Reliability analysis for combined scales

Item Statistics				Item-Total Statistics			
	Mean	Std. Deviation	N	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Insight	4.11	0.559	38	110.63	94.293	0.425	0.806
Pride	4.71	0.46	38	110.03	97.324	0.187	0.812
Role	3.68	0.739	38	111.05	92.7	0.42	0.805
Awareness	4.21	0.577	38	110.53	97.716	0.103	0.815
Conflict resolution	3.61	0.679	38	111.13	92.82	0.454	0.804
Diverse views	4	0.771	38	110.74	91.929	0.453	0.804
Rethink decisions	4.18	0.692	38	110.55	93.119	0.422	0.805
Adaptable group	3.74	0.76	38	111	95.081	0.241	0.811
Long term vision	3.97	0.592	38	110.76	95.05	0.331	0.809
Structure/Strategy	3.87	0.741	38	110.87	92.712	0.418	0.805
Structure/work	3.82	0.801	38	110.92	92.669	0.384	0.806
Routines	3.45	0.86	38	111.29	94.427	0.243	0.811
Memory	3.24	0.786	38	111.5	94.257	0.285	0.81
Interpretation	4.18	0.652	38	110.55	96.686	0.165	0.813
Integration	4.18	0.563	38	110.55	99.119	-0.019	0.818
Institutionalisation	4.11	0.606	38	110.63	95.32	0.299	0.809
Dissemination	3.63	0.786	38	111.11	92.962	0.373	0.806
Capabilities	3.76	0.82	38	110.97	93.486	0.32	0.808
Information	3.68	0.809	38	111.05	92.484	0.391	0.806
Coordination	3.97	1	38	110.76	90.348	0.415	0.804
Sub- Network	3.55	1.058	38	111.18	89.181	0.447	0.803
Training	3.32	1.378	38	111.42	86.25	0.433	0.804
Platform	3.89	1.06	38	110.84	92.461	0.277	0.811
Tools	3.55	1.083	38	111.18	91.668	0.308	0.81
Development	4.05	0.837	38	110.68	93.465	0.313	0.809
Financial	3.53	1.084	38	111.21	88.927	0.446	0.803
Organisational performance	3.79	0.843	38	110.95	91.24	0.452	0.803
Relationships	4.11	0.798	38	110.63	92.725	0.381	0.806
Attractive	3	1.208	38	111.74	94.794	0.126	0.82
Partnerships	3.84	0.855	38	110.89	94.313	0.252	0.811

Appendix I – Communalities for individual and combined scales

Item	Individual	Combined	Total
Conflict resolution	0.591	0.654	0.715
Diverse views	0.678	0.775	0.814
Rethink decisions	0.801	0.801	0.766
Adaptable group	0.237	0.765	0.828
Long term vision	0.404	0.440	0.777
Structure strategy	0.506	0.672	0.747
Structure work	0.402	0.431	0.759
Routines	0.701	0.818	0.819
Memory	0.453	0.691	0.790
Interpretation	0.670	0.696	0.830
Integration	0.726	0.726	0.788
Institutionalisation	0.602	0.586	0.819
Dissemination	0.659	0.642	0.736
Capabilities	0.662	0.667	0.738
Information	0.664	0.680	0.672
Coordination	0.723	0.737	0.906
Subnetwork	0.720	0.725	0.771
Training	0.716	0.781	0.825
Platform	0.693	0.739	0.808
Tools	0.729	0.733	0.718
Development	0.696	0.660	0.746
Financial	0.679	0.671	0.648
Organisational performance	0.547	0.599	0.775
Relationships	0.746	0.725	0.753
Attractive	0.285	0.309	0.714
Partnerships	0.833	0.828	0.823

*Extraction Method: Principal Component Analysis.

Appendix J – Total variance explained for extracted factor loadings
from PCA.

	Initial Eigenvalues				Extraction sums ² loadings			Rotation
	Comp	Total	% VAR	% Cum	Total	Sum ² Var	Load Cum %	Sum ² Loading's total
Group learning	1	2.307	57.673	57.673	2.307	57.673	57.673	
	2	0.907	22.669	80.343				
	3	0.495	12.384	92.727				
	4	0.291	7.273	100				
Group learning with removed adaptable item. (#4)	1	2.159	71.978	71.978	2.159	71.978	71.978	
	2	0.504	16.796	88.773				
	3	0.337	11.227	100				
Organisational learning	1	2.465	49.29	49.29	2.465	49.29	49.29	
	2	0.915	18.3	67.59				
	3	0.714	14.286	81.876				
	4	0.545	10.905	92.782				
	5	0.361	7.218	100				
Learning combined	1	3.279	36.431	36.431	3.279	36.431	36.431	2.426
	2	1.649	18.324	54.755	1.649	18.324	54.755	2.424
	3	1.12	12.447	67.203	1.12	12.447	67.203	2.134
	4	0.866	9.626	76.829				
	5	0.6	6.668	83.497				
	6	0.563	6.253	89.749				
	7	0.439	4.876	94.626				
	8	0.269	2.992	97.618				
	9	0.214	2.382	100				
Learning combined with removed items	1	3.051	38.136	38.136	3.051	38.136	38.136	2.703
	2	1.648	20.605	58.741	1.648	20.605	58.741	2.38
	3	0.915	11.443	70.185				
	4	0.768	9.605	79.789				
	5	0.575	7.187	86.976				
	6	0.459	5.736	92.712				
	7	0.345	4.311	97.023				
	8	0.238	2.977	100				
Feedforward	1	1.998	66.605	66.605	1.998	66.605	66.605	
	2	0.581	19.382	85.987				
	3	0.42	14.013	100				
Feedback	1	1.985	66.18	66.18	1.985	66.18	66.18	
	2	0.51	17.011	83.192				

	3	0.504	16.808	100				
Strategic renewal	1	2.544	42.396	42.396	2.544	42.396	42.396	2.15
	2	1.453	24.222	66.618	1.453	24.222	66.618	2.139
	3	0.643	10.717	77.335				
	4	0.517	8.61	85.945				
	5	0.463	7.724	93.669				
	6	0.38	6.331	100				
Network maturity	1	3.582	71.634	71.634	3.582	71.634	71.634	
	2	0.492	9.837	81.471				
	3	0.354	7.075	88.546				
	4	0.345	6.895	95.441				
	5	0.228	4.559	100				
Network benefit	1	2.578	42.969	42.969	2.578	42.969	42.969	2.384
	2	1.208	20.126	63.095	1.208	20.126	63.095	1.736
	3	0.865	14.414	77.509				
	4	0.551	9.175	86.684				
	5	0.435	7.248	93.932				
	6	0.364	6.068	100				
Network benefit (Component 1 items)	1	2.181	54.516	54.516	2.181	54.516	54.516	
	2	0.87	21.746	76.262				
	3	0.55	13.75	90.012				
	4	0.4	9.988	100				
Network benefit (Component 2 items)	1	1.54	76.987	76.987	1.54	76.987	76.987	
	2	0.46	23.013	100				
Network benefit (Attractiveness dropped)	1	2.397	47.932	47.932	2.397	47.932	47.932	2.166
	2	1.202	24.032	71.964	1.202	24.032	71.964	1.72
	3	0.574	11.479	83.443				
	4	0.443	8.868	92.311				
	5	0.384	7.689	100				
Network dynamics	1	4.491	40.824	40.824	4.491	40.824	40.824	4.025
	2	1.761	16.01	56.834	1.761	16.01	56.834	2.885
	3	1.256	11.419	68.252	1.256	11.419	68.252	1.746
	4	0.903	8.21	76.463				
	5	0.593	5.393	81.855				
	6	0.549	4.993	86.848				
	7	0.395	3.589	90.437				
	8	0.363	3.304	93.741				
	9	0.284	2.585	96.327				
	10	0.217	1.975	98.302				
	11	0.187	1.698	100				
	1	4.384	43.844	43.844	4.384	43.844	43.844	3.994
	2	1.693	16.93	60.775	1.693	16.93	60.775	1.783

Network dynamics (Attractiveness dropped)	3	1.239	12.389	73.163	1.239	12.389	73.163	2.644
	4	0.615	6.146	79.31				
	5	0.549	5.494	84.804				
	6	0.397	3.969	88.773				
	7	0.371	3.707	92.48				
	8	0.329	3.287	95.767				
	9	0.22	2.198	97.965				
	10	0.204	2.035	100				

Appendix K – Factor Loadings & rotation.

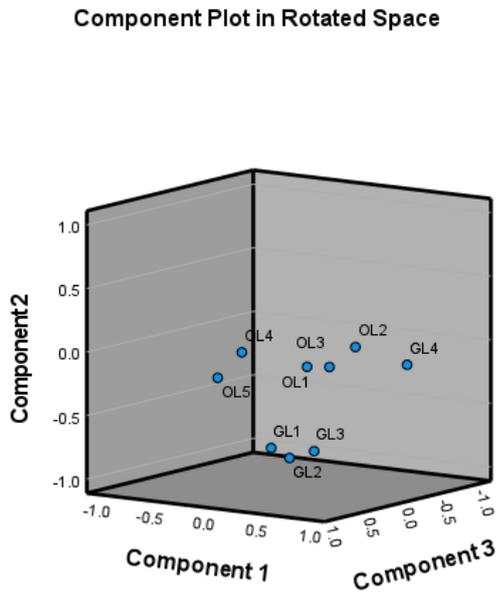
Scale:	Item	Component			Component Score Coefficient			Pattern			Structure		
		1	2	3	1	2	3	1	2	3	1	2	3
Group learning	Conflict resolution	0.769			0.333								
	Diverse views	0.823			0.357								
	Rethink decisions	0.895			0.388								
	Adaptable group	0.486			0.211								
Group learning with removed adaptable item.	Conflict resolution	0.807			0.374								
	Diverse views	0.858			0.397								
	Rethink decisions	0.878			0.407								
Organisational learning	Long term vision	0.635			0.258								
	Structure/Strategy	0.711			0.289								
	Structure/work	0.634			0.257								
	Routines	0.837			0.34								
	Memory	0.673			0.273								
Learning combined	Conflict resolution	0.601	-0.473		-0.067	-0.37	0.083		-0.787			-0.795	
	Diverse views	0.515	-0.698		-0.06	-0.427	-0.064		-0.903			-0.87	
	Rethink decisions	0.74	-0.502		0.096	-0.37	-0.024		-0.805			0.444	-0.866
	Adaptable group	0.551		-0.678	0.483	-0.021	-0.237	0.883				0.817	
	Long term vision	0.608			0.203	-0.013	0.184	0.429				0.555	0.504
	Structure/Strategy	0.642			0.394	0.074	0.068	0.762				0.794	0.406
	Structure/work	0.601			0.265	-0.017	0.091	0.532				0.616	
	Routines	0.599	0.578		0.037	0.057	0.482			0.857			0.89
	Memory	0.547		0.526	-0.101	-0.061	0.475			0.823			0.819
Learning combined with removed items	Conflict resolution	0.628	-0.484		0.032	-0.352			-0.764			-0.789	
	Diverse views	0.526	-0.706		-0.064	-0.421			-0.911			-0.868	
	Rethink decisions	0.728	-0.507		0.054	-0.385			-0.836			-0.877	
	Long term vision	0.595			0.247	-0.032		0.624				0.645	
	Structure/Strategy	0.605			0.281	0.009		0.709				0.705	
	Structure/work	0.6			0.228	-0.063		0.575				0.615	
	Routines	0.65	0.564		0.355	0.083		0.893				0.845	
	Memory	0.589			0.266	-0.003		0.67				0.673	

Feedforward	Interpretation	0.819			0.41								
	Integration	0.852			0.427								
	Institutionalisation	0.776			0.388								
Feedback	Dissemination	0.812			0.409								
	Capabilities	0.814			0.41								
	Information	0.815			0.41								
Strategic renewal	Interpretation	0.621	-0.557		0.425	-0.04		0.851				0.831	
	Integration	0.679	-0.514		0.426	-0.004		0.853				0.852	
	Institutionalisation	0.662			0.367	0.045		0.735				0.76	
	Dissemination	0.68	0.424		0.038	0.39			0.776			0.797	
	Capabilities	0.633	0.516		-0.015	0.414			0.823			0.816	
	Information	0.63	0.533		-0.022	0.419			0.835			0.824	
Network maturity	Coordination	0.85			0.237								
	Sub- Network	0.849			0.237								
	Training	0.846			0.236								
	Platform	0.833			0.232								
	Tools	0.854			0.238								
Network benefit	Development	0.815			0.348	0.083		0.779				0.821	
	Financial	0.72	-0.401		0.384	-0.087		0.847				0.818	
	Organisational performance	0.656			0.342	-0.064		0.757				0.737	
	Relationships	0.693	0.516		0.088	0.502			0.77			0.448	0.835
	Attractive	0.517			0.226	0.04		0.507				0.528	
	Partnerships	0.466	0.785		-0.077	0.622			0.94			0.904	
Network benefit (Component 1 items)	Development	0.84			0.385								
	Financial	0.802			0.368								
	Organisational performance	0.724			0.332								
	Attractive	0.554			0.254								
Network benefit (Component 2 items)	Relationships	0.877			0.57								
	Partnerships	0.877			0.57								

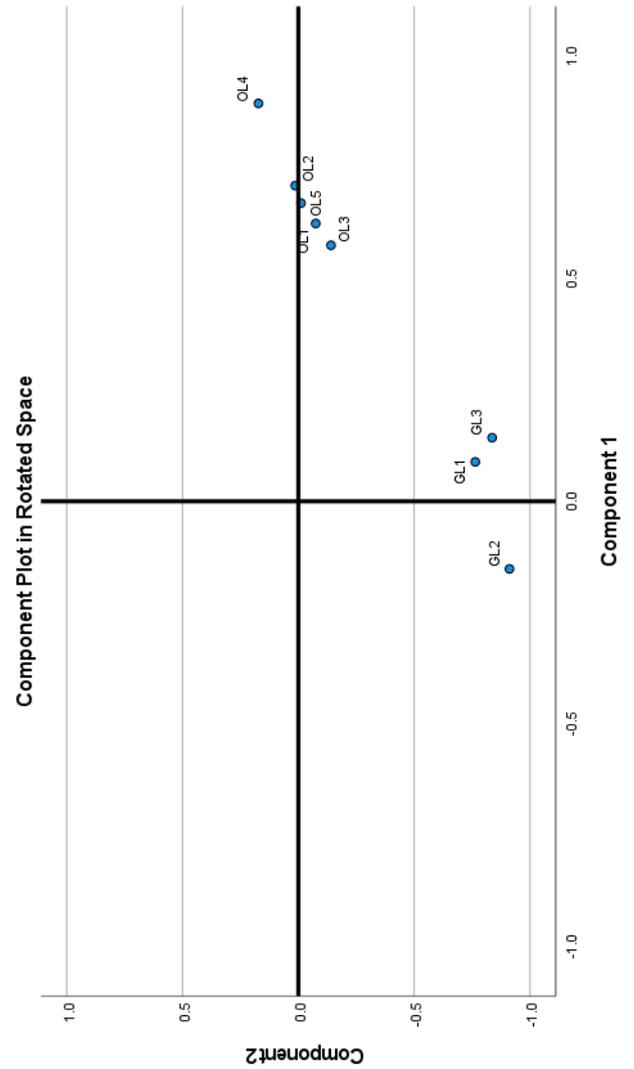
Network benefit (Attractiveness dropped)	Development	0.798			0.367	0.103		0.749		0.798		
	Financial	0.736	-0.438		0.436	-0.072		0.873		0.854		
	Organisational performance	0.68			0.395	-0.053		0.791		0.779		
	Relationships	0.714	0.492		0.088	0.504			0.783	0.426	0.841	
	Partnerships	0.496	0.766		-0.094	0.616			0.938		0.903	
Network dynamics	Coordination	0.805			0.235	-0.021	0.06	0.832		0.852		
	Sub- Network	0.776			0.237	0.001	-0.063	0.839		0.847		
	Training	0.819			0.206	0.117	-0.153	0.755		0.827	0.503	
	Platform	0.749			0.25	-0.094	0.091	0.869		0.843		
	Tools	0.762			0.249	-0.058	0.016	0.871		0.854		
	Development	0.62	0.494		-0.001	0.319	0.109		0.711		0.78	
	Financial	0.672			0.042	0.333	-0.091		0.726	0.466	0.786	
	Organisational performance	0.446	0.451	-0.444	-0.052	0.381	-0.071	0.809			0.767	
	Relationships	0.437	0.612		-0.01	0.106	0.474			0.74	0.443	0.799
	Attractive				-0.026	0.251	0.025		0.546		0.551	
Partnerships		0.498	0.714	0.01	-0.077	0.606			0.917		0.907	
Network dynamics (Attractiveness dropped)	Coordination	0.816						0.827		0.851		
	Sub- Network	0.794						0.823		0.841		
	Training	0.819						0.767		0.828	-0.492	
	Platform	0.766						0.864		0.843		
	Tools	0.767						0.89		0.859		
	Development	0.597	0.483						-0.667		-0.744	
	Financial	0.669		-0.449					-0.769	0.46	-0.83	
	Organisational performance	0.438	0.469	-0.523					-0.862		-0.82	
	Relationships	0.425	0.662					0.761		0.811	-0.414	
Partnerships		0.564	0.664				0.918		0.904			
*Extraction method: Principal component analysis												
* Rotation method: Oblimin with Kaiser normalization												

Appendix L – Extracted factor components rotation plots.

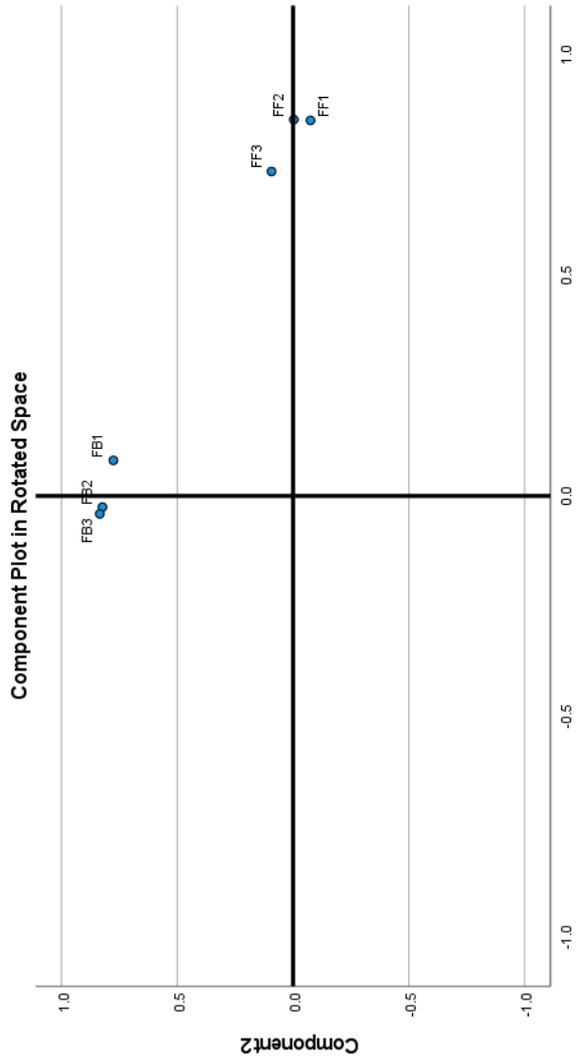
L 1: Learning combined plot before removing adaptability scale, 3-factor component plot.



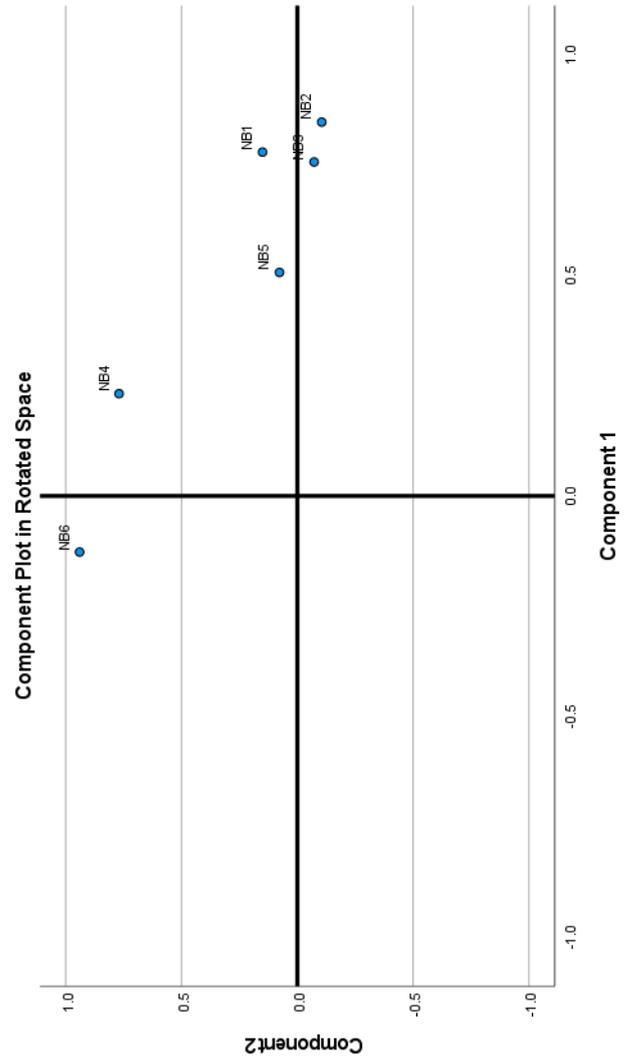
L 2: Learning combined plot after removing adaptability scale, 2-factor component plot.



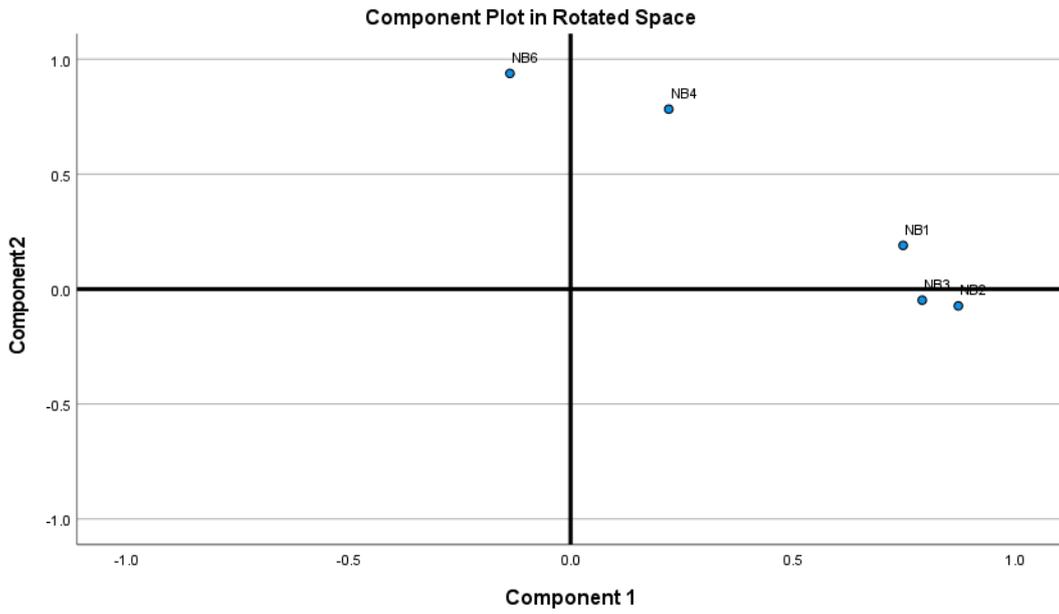
L 3: Strategic renewal combined plot, 2-factor component plot.



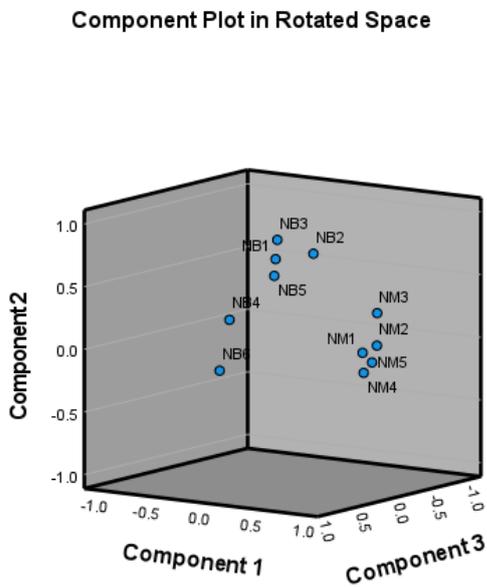
L 4: Network dynamics plot, 2-factor component plot.



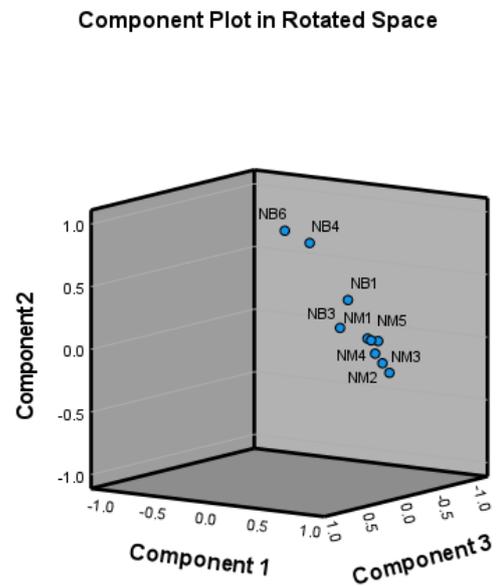
L 5: Network benefit plot, 2-factor component plot.



L 6: Combined scale network dynamics plot, 3-factor component plot.



L 7: Combined scale network dynamics plot after removing attractiveness, 3-factor component plot.



Appendix M – Interorganisational interactions raw data

M1- Regional questionnaire responses to interorganisational interactions within a network setting (RS, Q17).

ID:	Res ID:	RS 1	RS 2	RS 3	RS 4	RS 5	RS 6	RS 7	RS 8	RS 9	RS 10	RS 11	RS 12	RS 13	RS 14
RS1	PK				1							1			
	PF									1					
	RK		1		1		1			1		1	1		
	RF														
	INF			1					1	1	1			1	
	NR					1		1							
RS2	PK	1			1							1			
	PF														
	RK				1										
	RF														
	INF								1						1
	NR	1		1		1	1	1		1	1		1	1	
RS3	PK	1									1	1			
	PF														
	RK														
	RF														
	INF	1						1	1		1	1			
	NR		1		1	1	1			1			1	1	
RS4	PK	1									1	1	1		
	PF														
	RK	1										1	1		
	RF														
	INF								1		1				1
	NR		1	1		1	1	1		1				1	
RS5	PK														
	PF														
	RK														
	RF														
	INF														
	NR														
RS6	PK	1													
	PF									1					
	RK		1												
	RF														
	INF							1		1					
	NR			1	1	1			1		1	1	1	1	
RS7	PK			1									350		

	PF														
	RK														
	RF														
	INF	1								1					
	NR		1		1	1	1		1	1		1	1	1	
RS8	PK	1											1		
	PF												1		
	RK	1											1	1	
	RF													1	
	INF				1							1			1
	NR		1	1		1	1	1		1	1				
RS9	PK														
	PF														
	RK														
	RF														
	INF														1
	NR														
RS10	PK														
	PF														
	RK			1										1	
	RF														
	INF	1		1	1			1		1					
	NR		1			1	1		1			1	1		
RS11	PK	1			1										
	PF									1					
	RK	1	1		1				1	1				1	
	RF														
	INF			1					1						
	NR					1	1	1				1		1	
RS12	PK				1										
	PF														
	RK				1										
	RF								1						
	INF														
	NR	1	1	1		1	1	1		1	1	1		1	
RS13	PK			1				1							
	PF														
	RK														
	RF														
	INF										1				
	NR	1	1		1	1	1		1	1		1	1		
RS14	PK														
	PF														
	RK														
	RF														
	INF	1		1				1	1					1	
	NR		1		1	1	1			1	1	1	1		
CE1	PK							1		1					

	PF														
	RK										1				
	RF														
	INF											1			
	NR	1	1	1	1	1	1	1		1			1	1	
CE2	PK											1			
	PF														
	RK											1			
	RF														
	INF								1		1		1		
NR	1	1	1	1	1	1	1		1				1		
CE3	PK														
	PF														
	RK														
	RF														
	INF														
NR															
CE4	PK														
	PF														
	RK														
	RF														
	INF														
NR															
CE5	PK														
	PF														
	RK														
	RF														
	INF														
NR															
CE6	PK														
	PF														
	RK														
	RF														
	INF								1			1			
NR	1	1	1	1	1	1	1		1	1		1	1		
CE7	PK														
	PF														
	RK														
	RF														
	INF								1			1			
NR	1	1	1	1	1	1	1	1	1	1		1	1		
CE8	PK				1										
	PF														
	RK	1			1										
	RF														
	INF								1						
NR		1	1		1	1	1		1	1	1	1	1		
CE9	PK														

	PF													
	RK													
	RF													
	INF								1					
	NR	1	1	1	1	1	1	1		1	1	1	1	1
CE10	PK													
	PF													
	RK													
	RF													
	INF				1									
NR	1	1	1		1	1	1	1	1	1	1	1	1	
CE11	PK			1										
	PF													
	RK													
	RF													
	INF											1		
NR	1	1		1	1	1	1	1	1	1	1		1	
CE12	PK		1											
	PF													
	RK		1											
	RF													
	INF		1						1					
NR	1		1	1	1	1	1		1	1	1	1	1	
CE13	PK			1										
	PF			1										
	RK			1										
	RF			1										
	INF													
NR	1	1		1	1	1	1	1	1	1	1	1	1	
CE14	PK			1										
	PF													
	RK							1						
	RF													
	INF								1					
NR	1	1		1	1	1			1	1	1	1	1	
CE15	PK													
	PF													
	RK													
	RF													
	INF													
NR														
CE16	PK				1									
	PF													
	RK				1	1								
	RF													
	INF			1					1					
NR	1	1					1	1		1	1	1	1	
CE17	PK			1										

	PF														
	RK														
	RF														
	INF														
	NR	1	1		1	1	1	1	1	1	1	1	1	1	
CE18	PK														
	PF														
	RK														
	RF														
	INF														
CE19	PK				1										
	PF														
	RK				1										
	RF														
	INF			1							1				
NR	1	1			1	1	1	1	1		1	1	1		
CE20	PK														
	PF														
	RK														
	RF														
	INF														
CE21	PK														
	PF														
	RK														
	RF														
	INF	1	1		1							1		1	
NR			1		1	1	1	1	1	1		1			
CE22	PK								1						
	PF								1						
	RK								1						
	RF								1						
	INF														
NR	1	1	1	1	1	1	1		1	1	1	1	1		
M1	PK	1								1					
	PF														
	RK											1			
	RF														
	INF				1					1	1				1
NR		1	1		1	1	1				1		1		
M2	PK	1								1					
	PF														
	RK														
	RF														
	INF									1					
NR		1	1	1	1	1	1				1	1	1	1	
M3	PK														

	PF														
	RK														
	RF														
	INF							1							
	NR	1	1	1	1	1	1	1		1	1	1	1	1	
M4	PK														
	PF														
	RK														
	RF														
	INF														
M5	PK			1											
	PF														
	RK			1											
	RF														
	INF							1					1		
M6	NR	1	1		1	1	1		1	1	1	1		1	
	PK								1						
	PF								1						
	RK								1						
	RF								1						
M7	INF	1							1					1	
	NR		1	1	1	1	1	1		1	1	1	1		
	PK														
	PF														
	RK														
M8	RF														
	INF			1				1				1			
	NR		1			1	1		1	1	1		1	1	
	PK	1			1								1		
	PF												1		
M9	RK				1										
	RF														
	INF			1		1					1				
	NR		1				1	1	1	1				1	1
	PK	1			1								1		
NAT1	PF														
	RK	1	1	1	1	1	1	1	1	1	1	1	1	1	
	RF														
	INF							1	1						
	NR														
NAT2	PK														

	PF														
	RK	1									1				
	RF														
	INF														
	NR		1	1	1	1	1	1	1	1		1	1	1	
NAT5	PK				1										
	PF				1										
	RK				1										
	RF				1										
	INF					1									
NR	1	1	1			1	1	1		1	1	1	1		
INT1	PK	1		1					1	1	1	1	1		
	PF	1									1				
	RK		1	1		1	1	1	1	1	1	1	1	1	
	RF							1			1	1	1	1	
	INF								1	1					
NR				1											

M2(i) – National questionnaire responses to interorganisational interactions (GS1-GS12)

ID:	Res ID:	GS1	GS2	GS3	INT6	INT7	GS6	GS7	GS8	GS9	GS10	GS11	GS12
DNO	PK		1			1		1				1	
	PF					1							
	RK		1		1	1		1	1	1	1	1	
	RF			1		1					1		
	INF	1					1			1			
	NR												1
INT1	PK												
	PF												
	RK						1				1		
	RF												
	INF												
	NR	1	1	1	1	1		1	1			1	1
INT2	PK					1							
	PF												
	RK					1							
	RF												
	INF					1							
	NR	1	1	1	1		1	1		1	1	1	1
INT3	PK												
	PF												
	RK										1		
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1			1	1
INT4	PK										1		
	PF												
	RK										1		
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1	1		1	1
INT5	PK												
	PF												
	RK												
	RF												
	INF												
	NR												
INT6	PK				1					1			
	PF												
	RK									1			
	RF												
	INF												
	NR	1	1	1		1	1	1	1		1	1	1
INT7	PK		1								1	1	1
	PF												
	RK			1					1		1	1	1

	RF		1										1
	INF						1	1					1
	NR	1			1					1			
INT8	PK												
	PF												
	RK												
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1	1	1	1	1
LA	PK		1			1		1		1	1	1	1
	PF												
	RK		1			1		1			1	1	1
	RF		1	1		1					1		1
	INF						1		1			1	1
	NR	1			1								
LEPEH 1	PK					1							
	PF												
	RK					1			1				
	RF												
	INF												
	NR	1	1	1	1		1	1		1	1	1	1
LEPEH 2	PK												
	PF												
	RK												
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1	1	1	1	1
LEPEH 3	PK							1					
	PF												
	RK							1					
	RF			1				1					
	INF												
	NR	1	1		1	1	1		1	1	1	1	1
LEPEH 4	PK												
	PF												
	RK												
	RF												
	INF	1											
	NR		1	1	1	1	1	1	1	1	1	1	1
LEPEH 5	PK										1		
	PF												
	RK										1		
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1	1		1	1
NAT1	PK				1	1					1		
	PF					1							
	RK					1	1	1	1	1	1	1	
	RF												

	INF	1		1						1			
	NR		1										1
NAT2	PK							1			1		
	PF												
	RK					1		1	1	1	1		
	RF												
	INF			1									
	NR	1	1		1		1						1
NAT3	PK												
	PF												
	RK					1			1	1	1		
	RF									1			
	INF	1					1						1
	NR		1	1	1			1				1	
NAT4	PK					1							
	PF												
	RK					1			1		1	1	
	RF		1			1							
	INF			1		1	1				1		
	NR	1			1			1		1			1
NAT5	PK						1						
	PF						1						
	RK						1						
	RF										1		
	INF					1							
	NR	1	1	1	1			1	1			1	1
NAT6	PK					1							
	PF												
	RK												
	RF	1				1				1	1		
	INF							1					
	NR		1	1	1		1		1			1	1
NAT7	PK					1						1	
	PF												
	RK					1			1			1	
	RF										1		
	INF												
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M2(ii) – National questionnaire responses to interorganisational interactions (GS13-GS24)

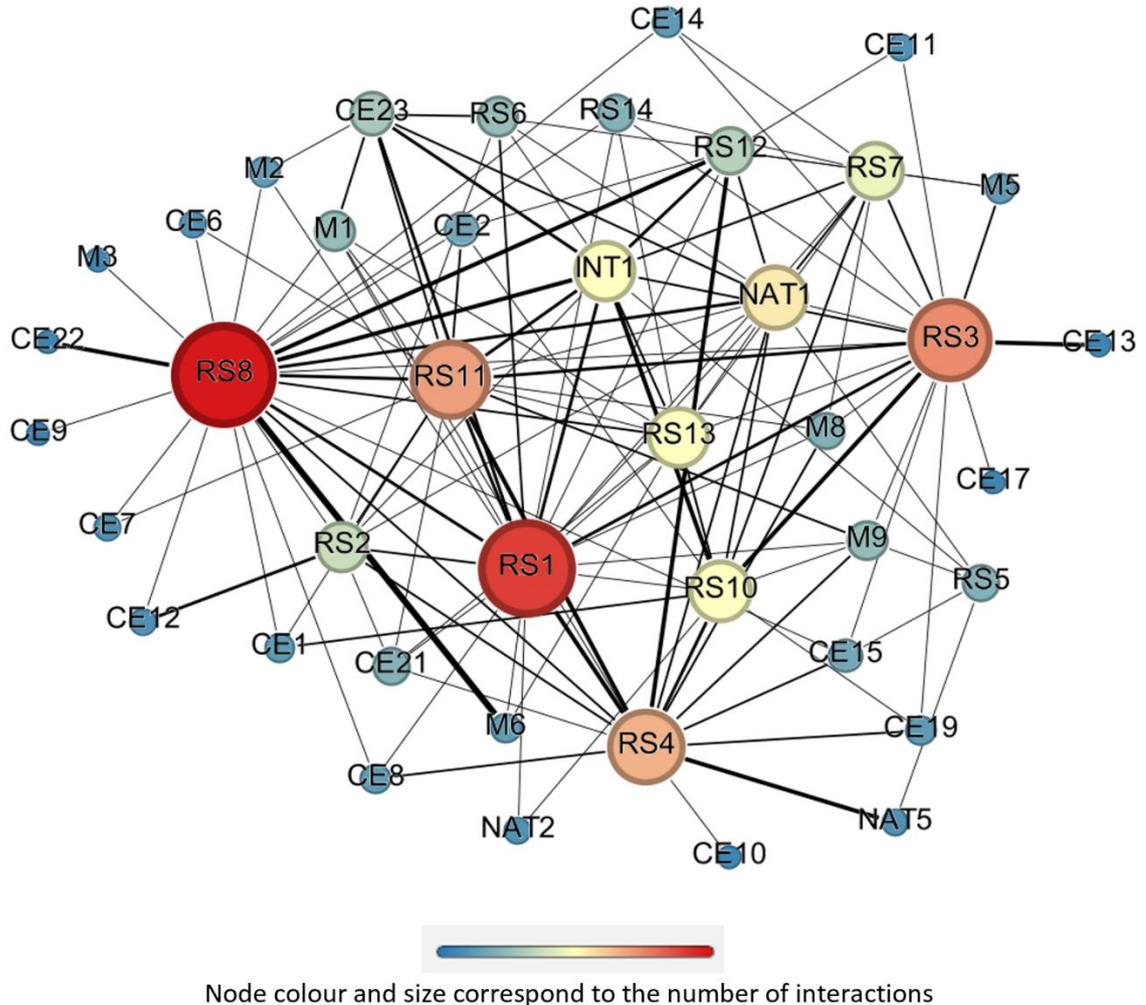
ID:	Res ID:	GS13	GS14	GS15	GS16	GS17	GS18	GS19	GS20	GS21	GS22	GS23	GS24
DNO	PK							1					
	PF												
	RK		1	1				1	1	1		1	
	RF												
	INF						1				1		
	NR	1			1	1	1						
INT1	PK			1									
	PF												
	RK			1									
	RF												
	INF							1					
	NR	1	1		1	1	1	1		1	1	1	1
INT2	PK											1	
	PF												
	RK											1	
	RF												
	INF		1										
	NR	1		1	1	1	1	1	1	1	1		
INT3	PK			1				1					
	PF			1				1					
	RK			1				1					
	RF			1									
	INF												
	NR	1	1		1	1	1		1	1	1	1	1
INT4	PK		1		1								
	PF												
	RK		1		1								
	RF												
	INF											1	
	NR	1		1		1	1	1	1	1	1		1
INT5	PK												
	PF												
	RK												
	RF												
	INF												
	NR												
INT6	PK												
	PF												
	RK												
	RF												
	INF												
	NR	1	1	1	1	1	1	1	1	1	1	1	1
INT7	PK												
	PF												
	RK			1									

	RF												
	INF												
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INT8	PK												
	PF												
	RK			1									
	RF												
	INF						1		1	1			
LA	NR	1	1		1	1		1			1	1	1
	PK	1	1	1	1			1	1		1	1	
	PF												
	RK										1	1	
	RF		1	1							1	1	
	INF	1			1	1		1		1			1
LEP1	NR						1						
	PK												
	PF												
	RK			1									
	RF												
	INF							1					
LEP2	NR	1	1		1	1	1		1	1	1	1	1
	PK						1						
	PF												
	RK			1			1		1	1			
	RF												
	INF					1							
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	PK												1
	PF												
	RK			1									1
	RF												
	INF												
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	PK												
	PF												
	RK			1									
	RF												
	INF												
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	PF												
	RK												
	RF												
	INF		1								1		
NAT1	NR	1		1	1	1	1	1	1	1			1
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	RF												

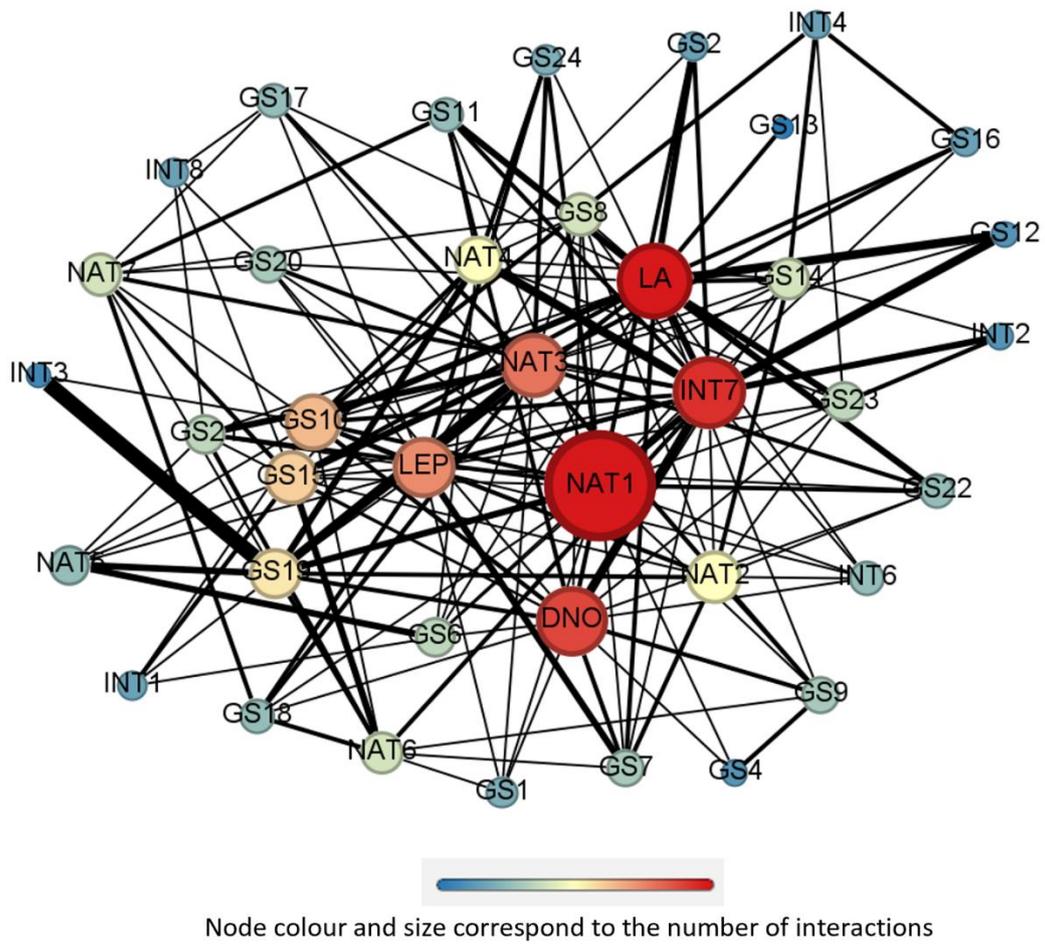
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	NR	1											
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	NR	1			1	1	1		1	1			1
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	PF												
	RK		1	1	1	1	1	1	1	1	1		1
	RF			1			1	1	1	1			1
	INF							1					
	NR	1										1	
NAT4	PK							1				1	1
	PF												
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	RF												
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	PF												
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	RF												
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	PF												
	RK			1			1			1			
	RF			1					1				
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	NR	1	1		1	1					1	1	1
NAT7	PK						1						
	PF												
	RK			1			1	1	1				
	RF			1		1							
	INF												
	NR	1	1		1					1	1	1	1

Appendix N – Combined sociograms for all relationships

N1 – Regional survey respondents combined sociogram for all relationship types (RS).



N2 – National survey respondents combined sociogram for all relationship types (GS).



Appendix O – Multivariate regressions

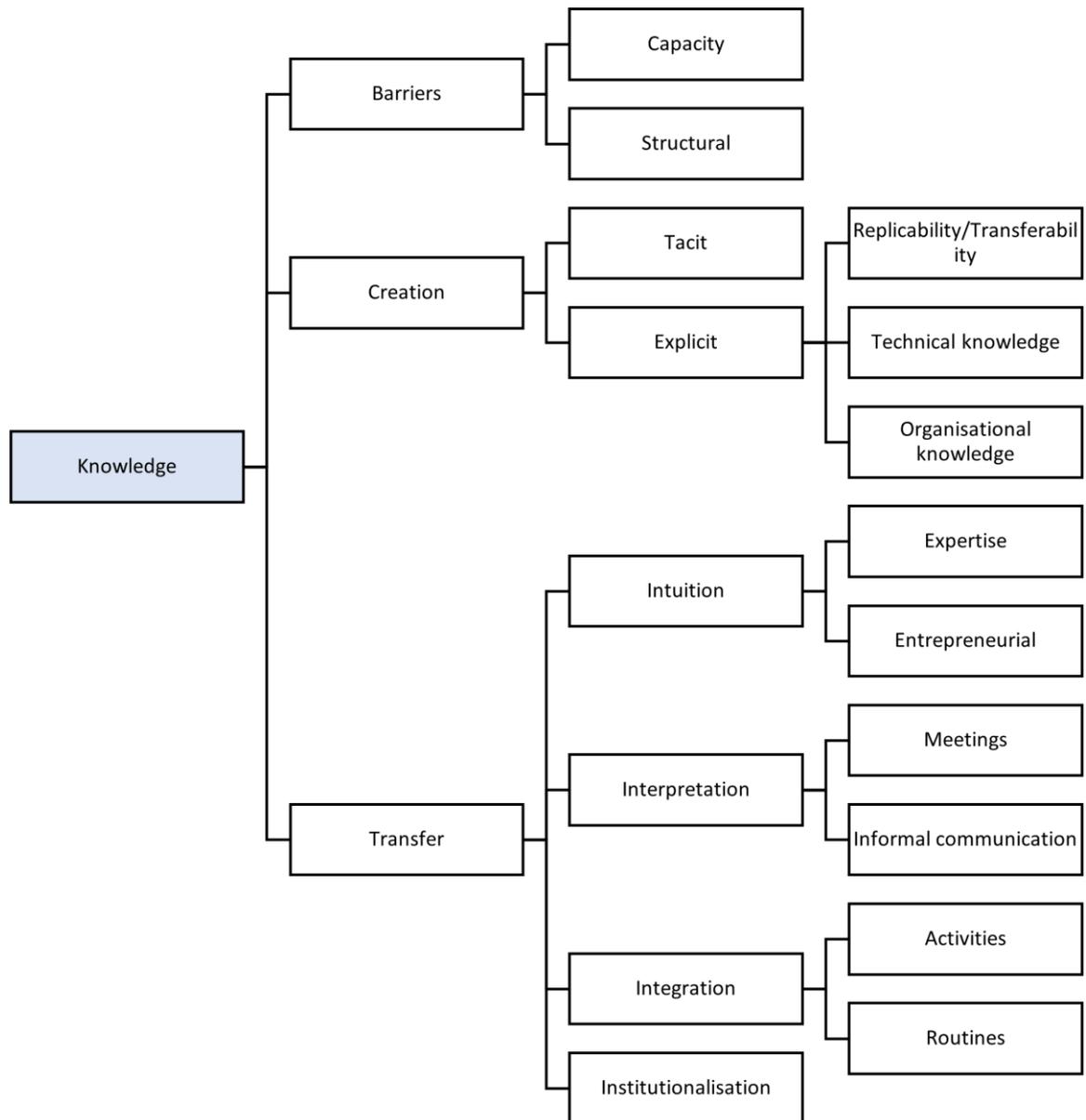
O1- ANOVA regressions for extracted variables from PCA.

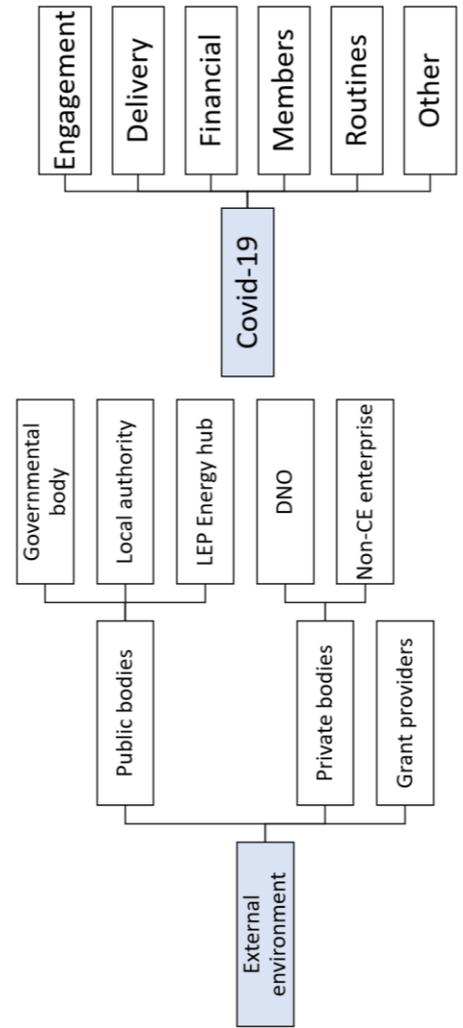
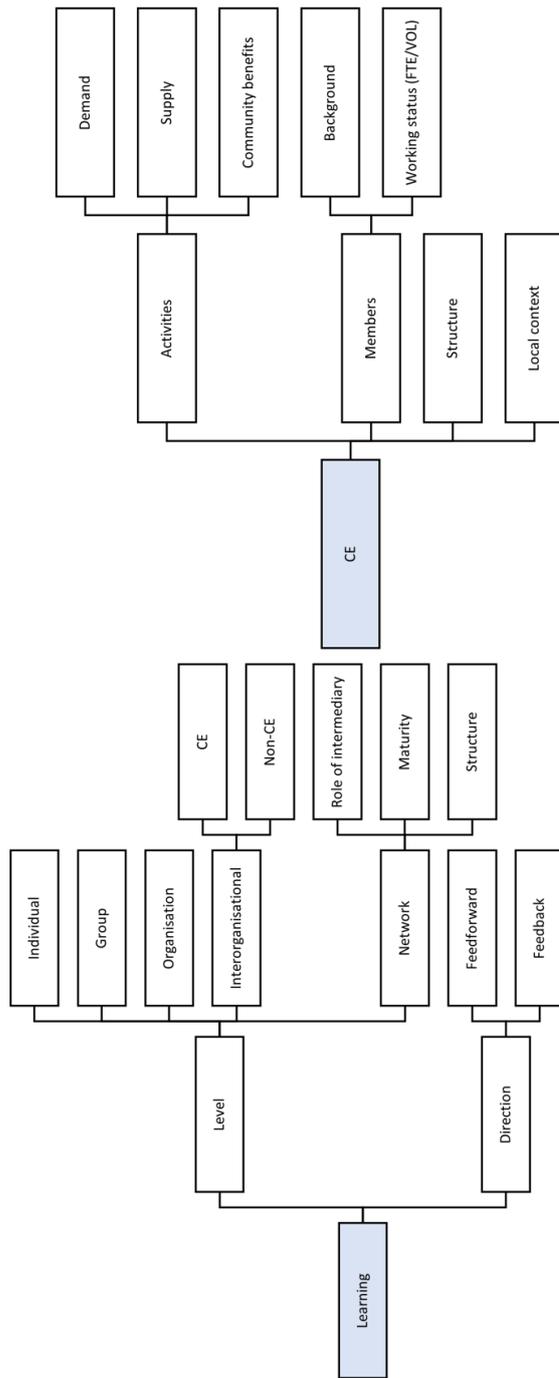
Model		ANOVA				
		Sum of Sq	df	Mean Sq	F	Sig
1	Regression	12.322	2	6.161	8.738	.001 ^b
	Residual	24.678	35	0.705		
	Total	37.000	37			
2	Regression	3.119	2	1.560	1.611	.214 ^b
	Residual	33.881	35	0.968		
	Total	37.000	37			
3	Regression	13.308	2	6.654	9.830	.000 ^b
	Residual	23.692	35	0.677		
	Total	37.000	37			
4	Regression	4.255	2	2.128	2.274	.118 ^b
	Residual	32.745	35	0.936		
	Total	37.000	37			
5	Regression	1.498	2	0.749	0.738	.485 ^b
	Residual	35.502	35	1.014		
	Total	37.000	37			
6	Regression	4.815	2	2.408	2.618	.087 ^b
	Residual	32.185	35	0.920		
	Total	37.000	37			
7	Regression	4.467	2	2.234	2.403	.105 ^b
	Residual	32.533	35	0.930		
	Total	37.000	37			
8	Regression	6.758	4	1.690	1.844	.144 ^b
	Residual	30.242	33	0.916		
	Total	37.000	37			

O2 – ANOVA regression coefficients for attempted models

		Coefficients			
Model		Std Er	B	t	Sig.
1	C	0.136		0.000	1.000
	OL	0.172	0.091	0.530	0.599
	FF	0.172	0.627	3.647	0.001
2	C	0.160		0.000	1.000
	OL	0.166	-0.266	-1.604	0.118
	FB	0.166	0.071	0.427	0.672
3	C	0.133		0.000	1.000
	GL	0.165	0.087	0.530	0.599
	FF	0.165	-0.646	-3.913	0.000
4	C	0.157		0.000	1.000
	GL	0.160	-0.257	-1.604	0.118
	FB	0.160	-0.190	-1.185	0.244
5	C	-1.340E-16	0.163		0.000
	NB	-0.146	0.176	-0.146	-0.831
	NM	0.098	0.176	0.098	0.556
6	C	0.156		0.000	1.000
	NM	0.159	-0.317	-1.987	0.055
	INT	0.159	-0.132	-0.831	0.412
7	C	0.156		0.000	1.000
	NB	0.161	-0.320	-1.987	0.055
	INT	0.161	0.090	0.556	0.582
8	C	0.155		0.000	1.000
	L	0.198	0.122	0.617	0.542
	ST	0.204	-0.141	-0.694	0.493
	NM	0.166	-0.363	-2.192	0.036
	INT	0.161	-0.097	-0.600	0.553

Appendix P –NVIVO themes and subsequent codes





Appendix Q – Items and scales breakdown

Scale	Item	Question
Individual learning	Insight	Roles in community energy organisations have allowed our members to view the future of the energy sector in a new and different way.
	Pride	We feel a sense of pride in our work.
	Role	Each of our members is the most suited person for their role within the organisation
	Awareness	We are aware of the critical issues that affect our work.
Group learning	Conflict resolution	We have effective conflict resolution when working in groups
	Diverse views	We encourage different points of view during group work.
	Rethink decisions	We are prepared to rethink decisions when new information arises.
	Adaptable group	Our groups often have the right people involved in addressing a specific issue.
Organisational learning	Long term vision	We have a long-term strategy in place
	Structure/Strategy	Our structure supports our strategic direction.
	Structure/work	Our structure allows us to work efficiently.
	Routines	We have standard routines that we follow for our day-to-day activities.
	Memory	The organisation stores detailed information for guiding operations.
Feedforward	Interpretation	Individuals have an input into the overall organisational strategy
	Integration	Lessons learnt by an individual/group are actively shared with others within the organisation.

	Institutionalisation	Results from an individual/group are used to improve our practices.
Feedback	Dissemination	Our policies and routines aid individual work
	Capabilities	Our communication tools provide the necessary platform to do our work.
	Information	Our files and databases provide the necessary information to do our work.
Network maturity	Coordination	The hub/umbrella organisation plays a vital role in coordinating network activities.
	Sub- Network	Subnetworks exist to further enhance collaboration and interaction between members.
	Training	Network-wide training and workshops are a common occurrence.
	Platform	The network provides a platform to interact and share knowledge with other community energy organisations.
	Tools	We now have access to several tools, such as financial models/methods of funding etc. through our network and its members.
Network benefit	Development	Network engagement has greatly benefitted our long-term development as an organisation.
	Financial	Network engagement has aided our financial performance.
	Organisational performance	Our overall performance has improved as a direct result of network engagement.
	Relationships	We can develop independent relationships with other community energy organisations directly from network engagement.
	Attractive	We are more attractive to shareholders because we are part of a wider network.
	Partnerships	We have participated in new partnerships and projects with other community energy organisations as a direct result of network engagement.