

An Analysis of Community-led Superfast Broadband Initiatives in the UK and the Potential for Resilience

A thesis presented for the degree of Doctor of Philosophy at the University of Aberdeen



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DECLARATION

I confirm that the work undertaken and recorded in this thesis is my own and that it has not been accepted in any previous application for a degree. All quoted material is clearly distinguished by quotation marks and sources of information are specifically acknowledged.

Signed:

Date: August 10, 2015

ABSTRACT

Despite interest from policymakers and the telecommunications sector to deliver superfast broadband to the whole of the UK, rural areas remain underserved, decreasing their ability to benefit from broadband-enabled services. Public intervention, primarily structured as national subsidies, is active across the UK to respond to this rural market failure. Complementing such practices are local-level strategies framed as community-led broadband initiatives. Their inclusion within wider superfast broadband installation strategies has not yet been examined. This doctoral research examines two of these initiatives, their structure and impact on the community to develop an understanding of their potential as replicable rural broadband delivery mechanisms. I analyse both the process of installing superfast broadband technology from community-led perspective and the subsequent engagement with superfast broadband through a qualitative longitudinal approach. A conceptual framework of ‘social resilience’ is developed as a contemporary analytical tool for examining these individual and community processes.

The findings reveal an inherent complexity to rural community-led broadband provision. Community-led broadband reflects a ‘localism’ development approach, and this process has strengthened local rural identity. Following the adoption of superfast broadband, rural users experienced a growth in digital knowledge and individual resilience. However, the initiatives themselves are often discussed as ‘separate from’, or incompatible with, the telecommunications industry, as well as sitting outside the scope of current government interventions. In doing so, barriers to external networking and extra-local partnerships are built, limiting the opportunities for community-led broadband networks to become a substantive part of rural broadband delivery across the UK. Throughout the thesis, an understanding of these various tensions, impacting the success, use and replicability of rural community-led broadband, is developed and community-led broadband is shown to be another example of uneven rural development. I conclude by making recommendations for future digital policy interventions in the UK.

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ABBREVIATIONS

B4GAL	BROADBAND FOR GLENCAPLE AND LOWTHER
B4RN	BROADBAND FOR THE RURAL NORTH
BDUK	BROADBAND DELIVERY UNITED KINGDOM
BIS	BUSINESS, INNOVATION AND SKILLS
CBS	COMMUNITY BROADBAND SCOTLAND
DAE	DIGITAL AGENDA FOR EUROPE
DCMS	DEPARTMENT OF CULTURE, MEDIA AND SPORT
DEFRA	DEPARTMENT OF ENVIRONMENT, FOOD, AND RURAL AFFAIRS
ICT	INFORMATION COMMUNICATION TECHNOLOGIES
MBIT/s	MEGABIT PER SECOND (REFERRING TO BROADBAND SPEED)
NGA	NEXT GENERATION ACCESS
OfCOM	THE OFFICE OF COMMUNICATIONS
ONS	OFFICE OF NATIONAL STATISTICS
PAR	PARTICIPATORY ACTION RESEARCH
RCBF	RURAL COMMUNITY BROADBAND FUND
VoIP	VOICE OVER IP (INTERNET PROTOCOL)

1 INTRODUCTION

1.1 Introduction

In 2010, the United Kingdom government announced its ambition “to have the best superfast broadband network and connected society in Europe by 2015” (BIS, 2010a, p. 13). Superfast broadband services (Internet connections with line-speeds of at least thirty megabits per second¹) are often beneficially associated with individuals’ social activities, employment options, and overall community resilience (DCMS, 2011; Grimes, 2003; Ofcom, 2012b). The government commitment to superfast broadband connectivity was further cemented in a 2015 strategy on digital communications infrastructure: to make broadband of at least 100 megabits per second (Mbit/s) available to ‘nearly all UK premises’ (HM Treasury and DCMS, 2015). However, from a spatial perspective, it is broadly acknowledged that households in rural areas of the UK remain less likely to have access to superfast broadband than their urban counterparts², even with these ambitious nationwide policies in place (e.g. Reisdorf and Oostveen, 2015). This decreases the likelihood of broadband access and/or use having an impact on the development of rural social resilience.

The market-led, neoliberal approach of the telecommunications industry has traditionally neglected rural broadband infrastructure development due to its lack of commercial viability (Simpson, 2010; Sutherland, 2015). Urban coverage, conversely, is relatively stable and continuously being improved. This is primarily because superfast broadband roll out is cheaper to deploy in higher density areas and has been prioritised by a telecommunications industry structured within the principles of neoliberalism (Briglauer and Gugler, 2013; Ofcom, 2013a; Simpson, 2010; Skerratt, 2010). Public intervention, primarily structured as national subsidies such as Broadband Delivery UK (BDUK), is active across the UK to respond to this rural market failure and decrease the related spatial ‘digital divide’. Complementing these subsidies are community-led broadband initiatives. These are locally based grassroots initiatives being developed to deliver broadband solutions to rural areas as a response to these prevalent market forces in the UK. Buneman and Hughes (2013, p. 1) noted that “There is a quiet revolution that is taking place in the provision of rural broadband. An increasing number of communities are building their own distribution networks...”. However, these ‘community-

¹ All relevant technical terms used in this thesis are defined in a Glossary, located in Appendix I. This definition of superfast broadband is consistent with Ofcom and the European Commission (Ofcom, 2013b, 2014a, 2014c). Alternative definitions included broadband speeds of at least 24 Mbit/s (Ofcom, 2012a).

² As of 2012, the start of this research, Ofcom reported that 65 percent of premises have access to superfast broadband in the total of the UK. However, rural coverage is limited to 19 percent (Ofcom, 2012a).

led' superfast broadband initiatives have not been considered in detail within the context of wider telecommunications infrastructure and superfast broadband delivery policy. Recent work by Wallace *et al.* (2015) examines community-led broadband initiatives in terms of their organisation, identifying common skills and resources that are necessary for those community initiatives to be successful. This thesis seeks to extend our understanding of these initiatives as part of the wider national telecommunications sector and policy agenda. Importantly, this thesis seeks to understand these community-led initiatives in the context of how they influence the social resilience, the ability to adapt and thrive, of the rural individuals and communities engaging with the process. As society and the economy become increasingly reliant on, and mediated by, digital tools and services (e.g. Galloway, 2007; Mandviwalla *et al.*, 2008; Townsend *et al.*, 2015), this thesis addresses the overall potential for community-led superfast broadband installation and use to play a role in enhancing social resilience. The social resilience context is relevant as it allows for analysis of transitional pathways of broadband impact, including how and if superfast broadband interaction leads to the building of individual and community adaptive capacities to support future community recovery and transformation.

This introductory Chapter serves to position this doctoral research project within the context of the major issues that motivate the research. It begins by outlining the research and policy context (Section 1.2). Social resilience, the chosen theoretical framework for this doctoral study, is outlined, identifying its usefulness for understanding individual and community processes such as superfast broadband installation (Section 1.2.1). The policy background for superfast broadband delivery is introduced. This is accompanied by arguments that highlight the ongoing challenge of rural broadband provision, and the requirement to enhance our understanding of alternative methods for broadband installation in rural regions (Section 1.2.2). The pivotal role of superfast broadband in societal and economic development is then presented. It is here that the need to better appreciate the impacts of broadband use upon and within rural communities is emphasised (Section 1.2.3). The aims and objectives of the doctoral study are presented (Section 1.3), prior to outlining the contribution this thesis makes to academic literature (Section 1.4). Finally, the structure of the thesis is outlined (Section 1.5).

1.2 Research and policy context

Oyana (2011) identified that, for researchers, there is a “need to spatially evaluate the availability and deployment of broadband communications, especially among rural communities” (p. 252). This study specifically focuses on the installation and use of fixed-line superfast broadband from a community-led perspective to contribute to the evaluation of

rural broadband communications. The major theoretical theme driving the analysis of this research, social resilience, is introduced (Section 1.2.1). This is followed by the introduction of the digital dimensions motivating this thesis, superfast broadband infrastructure policies and rural delivery mechanisms (Section 1.2.2) and superfast broadband use (Section 1.2.3).

1.2.1 Social resilience theory

There is a vast array of literature discussing and debating the term ‘resilience’. Ecologically, resilience refers to the development of ecosystems and their ability to absorb changes and maintain structure in times of disturbance. This definition emphasises speed and resistance, how fast a system can return to equilibrium and how resistant it is to such dynamic disturbance and shocks (Adger, 2000; Holling, 1973). Social-ecological resilience builds upon this understanding to represent the ability of a community to withstand shocks due to external, ecological factors (Adger, 2000). In recent literature the idea of ‘social resilience’ has evolved from this earlier research and can be understood to have a much broader scope, incorporating empowerment and development processes at the individual and related community scale (Skerratt and Steiner, 2013). As Folke (2006) discusses, it is evident that resilience of complex adaptive systems, like communities, is not simply about resisting change or conserving existing structures. Rather, resilience of communities considers adaptive capacity building and generates a dynamic relationship between sustaining and developing with change. For example, shocks commonly occurring within rural areas include depopulation, a loss of public services for small populations, economic deprivation and demographic ageing (e.g. Bosworth and Willett, 2011; Delfmann *et al.*, 2014; Malecki, 2003). These shocks require individuals and communities to be able to adapt and adopt new practices (i.e. be resilient) to address such changes to their community structure and livelihood. By being resilient, or having resilience characteristics, individuals and their respective communities can respond to such change in a proactive manner.

Social resilience is constructed as being a part of the evolving nature of evaluating community growth and transformation. As a concept, social resilience is cognisant of neoliberal policy agendas that often relegate development to the communities themselves and emphasise the ‘hyper-local’ (MacLeod and Emejulu, 2014). Social resilience is considered to be a multi-dimensional construct, where ‘resilience’ is a state of being, and ‘becoming more resilient’ is a proactive process of developing capacities at both the individual and community scale, reflecting local and extra-local interactions. It emphasises transformation or path creation in response to disturbances, whereby development does not follow a single path, but rather multiple pathways (Wilson, 2012b). Social resilience as a theory has the ability to act as an

analytical concept producing new insights and perspectives, and it can provide an alternative policy narrative for rural development practice (Scott, 2013). Both of these features are useful in contemporary geographical research.

The doctoral research presented herein has, informed by this social resilience literature, developed a conceptual framework of resilience to act as a transferable analytical tool for qualitative data. Through an evaluation of the resilience concept and its critiques, this research identifies four key dimensions of social resilience: 1) resources; 2) agency; 3) equity; and 4) sense of place. These four dimensions are used to formally analyse the qualitative data collected during the doctoral research. The framework represents a novel approach to analysing social resilience in an applied setting. With respect to the digital focus of this thesis, introduced in the following sections, the multifaceted approach of social resilience focusing on transitional pathways, capitals and capacities, provides a novel framework to identify the many intersecting and diverging pathways of superfast broadband impact.

1.2.2 Superfast broadband policies and delivery methods

Broadband delivery in the UK is stimulated by many layers of existing digital policy. Multiple policies exist to support broadband infrastructure development at the supranational level, including the *OECD Communications Outlook* (OECD, 2013), and the *Digital Agenda for Europe* (DAE) (European Commission, 2010). The state of broadband in the UK has been heavily influenced by these supranational policies, as well as its national and regional policy landscape. *Digital Britain 2009* represented an initial step towards achieving universal broadband access across the UK (BIS, 2009). *Britain's Superfast Future 2010* furthers this work, and lays out the UK's priorities for superfast broadband, mainly to spur economic growth and innovation (DCMS, 2010). The current stated aim of the UK Government is to provide 95 percent of premises in the UK with superfast broadband by 2017 (Ofcom, 2013a).

Alongside these overarching policy goals for wider superfast broadband diffusion, sits the ongoing challenge of rural broadband provision. Rural broadband provision is often aggravated by a lack of market presence due to smaller and more dispersed populations, and physical geography challenges, such as distance from exchanges, backhaul³ access points and fewer street cabinets (Skerratt *et al.*, 2012). Those in rural areas who do gain access to basic broadband tend to suffer from slow speeds and increased costs (Ofcom, 2012a). Public

³ Backhaul is the connection from the local network to the Internet core network (i.e. the rest of the world). There is no connection to the Internet without backhaul (Skerratt *et al.*, 2012). Again, all relevant technical terms are defined in a Glossary located in Appendix I.

intervention programmes, such as national subsidies, exist in the UK and have brought rural superfast broadband provision to the forefront of infrastructure development interest. Complementing these programmes are grassroots initiatives, rural community-led broadband initiatives that have emerged to respond to their lack of broadband connectivity in a local manner (Buneman and Hughes, 2013; Wallace *et al.*, 2015). In the neoliberal political context, these community-led broadband initiatives are a direct result of the lack of market intervention in rural broadband provision, representing what Hildreth (2011) terms ‘community localism’ development approaches. These initiatives align with the theoretical understanding that, in order to best realise the opportunities for general socio-economic change through broadband-enabled services, targeted approaches for different spaces and social groups must be considered, rather than a one-size fits all policy approach (Bunyan and Collins, 2013; Townsend *et al.*, 2013).

Recent literature from Wallace *et al.* (2015) begins the exploration into community broadband initiatives in the UK, identifying the need for human, technological, identity, and financial capitals for such initiatives to succeed. Overall, these community groups, as a method of superfast broadband installation, remain little understood in the context of wider telecommunications policy. Therefore, community-led superfast broadband initiatives serve as a digital focal point of this doctoral research within a social resilience context. The concept of social resilience provides a relevant and useful analytical method to understand the varied, but relevant, individual and community processes of community-led superfast broadband initiatives.

1.2.3 Superfast broadband use in rural communities

Despite this overarching enthusiasm for superfast broadband infrastructure development from policymakers, little research has, to date, been conducted that explores the associated broadband benefits on communities in relation to older, slower Internet technologies. From an individual perspective, the adoption and subsequent use of superfast broadband is thought to contribute to individual social connections, education and government services accessibility. It can provide alternative means of access for ageing populations and remote households, which would otherwise be at a disadvantage. Businesses can connect for ease of everyday activities (i.e. limiting paper transactions, email, ordering supplies, and advertising) as well as creating additional avenues for growth (i.e. operating an online marketplace) and generating additional collaborations (e.g. DCMS, 2010). At the community level, broadband can be used for shared activities such as engaging in, or formulating, community-wide protests (i.e. for or against wind farms, pylons) or active citizenship activities (such as actively trying to retain

public services). Past research has analysed the progression from dial up to broadband services (e.g. Flamm and Chaudhuri, 2007; Papacharissi and Zaks, 2006), general economic impacts of broadband at a single point in time (Galloway, 2007; LaRose *et al.*, 2011), and general ICT impacts on community socio-economic development (Laudeman, 2005). More recently, Riddlesen and Singleton (2014) examined broadband speed variations across England and Wales, classifying the variation across a rural and urban spectrum using crowd sourced speed test data. Their work generated a limited speculative analysis of the impact such speeds had for rural users. Recent studies in Cornwall and Scotland have begun to address the impacts of superfast broadband use specifically in the rural business context (e.g. Laco  e and Phippen, 2013 and Townsend *et al.*, 2015 respectively). However, there is a relative paucity of in-depth literature in the field with respect to the relevance of the use of superfast broadband for rural communities overall.

This doctoral research applies the concept of social resilience to these digital domains. It analyses both community-led superfast broadband infrastructure development and the subsequent use of the superfast broadband service in rural communities in the UK to identify individual and community impacts.

1.3 Aims and objectives

Against a background of an increasingly digital society, this thesis addresses the potential for superfast broadband technology interaction to increase rural social resilience. It aims to investigate both the community-led broadband installation process, and subsequent role of superfast broadband use in rural communities in the UK. The corresponding objectives of the study are as follows:

1. To build and critically evaluate the *concept of social resilience*.
2. To develop and analyse the *potential relationship between social resilience and broadband technology*.
3. To identify and characterise *trajectories of community-led broadband initiatives* and investigate *the scalar relationships* that community-led broadband initiatives exploit to obtain services.
4. To elucidate how the processes of broadband acquisition are *contributing to the changing technological rural landscape* and how that may contribute to *individual and community resilience*.
5. To investigate what broadband *speeds are 'needed' in rural communities and for what purpose* and identify how they are contributing to *individual and community resilience*.

Broadly, this has led to the creation of two key research questions, which are contextualised within the current literature in Chapters Two and Three:

1. Does the process of acquiring superfast broadband technology in rural areas play a role in enhancing individual and community resilience?
2. Does the presence of superfast broadband technology infrastructure in rural areas play a role in enhancing individual and community resilience?

These questions will be addressed through a pre- and post-broadband installation study that adopts a qualitative approach and which emphasises longitudinal community research. This doctoral research builds upon the existing academic literature to develop a conceptual framework for social resilience, providing a process to adequately analyse individuals and their communities through these established research questions. The conceptual framework for social resilience represents a useful, relevant approach when considering how society and individual communities are faced with external events (such as technological changes) and are becoming 'left behind' if they do not respond. These questions remain relevant for understanding current telecommunications installation practices as well as providing a basis for developing future digital policy interventions incorporating community-led technology initiatives.

1.4 Thesis contribution

This doctoral research was funded under the RCUK Digital Economy Programme, which emphasised interdisciplinary research across the Theme. The need to be interdisciplinary in the case of this doctoral research has resulted in this thesis making three significant contributions to academic scholarship and our understanding of the transformational impact of digital technologies. It makes a theoretical contribution, a methodological contribution, and a technological contribution. The research presented in this doctoral thesis represents an interdisciplinary effort between the disciplines of human geography and computing science, identifying social impacts of computing infrastructure development and use.

This thesis considers the potential for superfast broadband to contribute to social resilience. The first substantive contribution this thesis makes to the literature is the furthering of the concept of 'resilience' in a social context. Over the duration of the doctoral project, social resilience has become more frequently present in social science literature, evidenced by works such as Brown (2014), Lyon (2014), Skerratt (2013) and Scott (2013). This thesis is structured

to sit within and enhance this recent research interest in resilience as a social theory, concept, and tool for community development. It effectively unpicks the growth and development of resilience as a concept, factoring in its use across multiple disciplines, creating a multidisciplinary understanding of social resilience. Its use in the context of technological impacts provides a unique case for reflection on the effectiveness of social resilience theory. This doctoral study ultimately demonstrates that social resilience thinking can unearth nuanced understandings of individual and community relationships with technology that would not have been discussed otherwise.

Using the foundation of past resilience and socio-technical studies, this thesis has built a formal analytical method to develop an understanding of resilience utilising qualitative data, rather than focussing on statistical analysis or quantitative measures. Building a conceptual framework and applying it through a qualitative coding process, ultimately leading to the creation of a network analysis between individual responses and resilience pathways, provides a first case of identifying resilience dimensions through a conceptual framework. Conducting this study as a pre- and post-broadband installation study represents a new shift in understanding resilience as a process, whereby data from one single point in time does not fully reflect that individual or community's resilience.

While this thesis has not developed new technological innovations for society, it provides the first qualitative study into the potential for broadband to enhance social resilience through a community-led installation method as part of wider rural broadband provision measures. It also provides a first account of what a significant increase of broadband speed (from generally 2Mbit/s or less) to superfast broadband (30Mbit/s and upwards) influences in terms of individual and community actions, opinions and satisfaction and their overarching resilience in times of uncertainty. These relationships between superfast broadband installation, use, and resilience have not yet been examined in academic literature. The results represent a new area of knowledge to feed into policy for technology installation in hard to reach locations, as well as informing the ongoing community-led broadband policy agenda.

1.5 Thesis structure

This thesis follows a traditional structure: Introduction, Literature Review, Research Methodology, Findings and Discussion, and Conclusion. The individual chapters of this thesis are summarised as follows:

Chapter 2 outlines the literature on resilience and resilience theory, and builds a conceptual

understanding that will be applied throughout the thesis. It seeks to situate understandings of social resilience within the wider, multidisciplinary literature, tracing its presence through ecology and physical systems research, psychology research and finally within social sciences research. The chapter places social resilience in the context of ‘community’ and addresses the most relevant critiques of the concept. Finally, it synthesises recent grey and academic literature about analysing social resilience, and concludes by identifying four key dimensions to a conceptualisation of ‘social resilience’.

Chapter 3 describes the digital dimensions driving this research. The chapter first identifies the common sociological constructs of broadband and sets out the relationship they have with resilience. It then outlines the potential influence of broadband on ‘social resilience’, building on the theoretical framing set out in Chapter Two. The chapter then discusses broadband in relation to ‘community’ and ‘rurality’, two concepts relevant to appropriately applying ‘social resilience’ in the rural broadband context. The chapter follows with an applied description of the state of broadband policy and technology in the United Kingdom. It outlines broadband installation methods currently in use to supply rural areas in both international and UK contexts. The chapter then gives an enhanced narrative of community-led broadband and localism approaches to telecommunications. Finally, it synthesises interplay between broadband technology and social resilience thinking into the two key research questions this thesis addresses.

Chapter 4 outlines the chosen research methodology. It firstly traces the philosophical context, situating the research within an interpretivist epistemology and theoretical frame of ‘social resilience’ guiding the research structure. Approaches adopted in earlier studies in both human geography and social science Internet research are then outlined. The selection of a qualitative, phased approach for the research is justified, relating directly to the theoretical framing and previous studies. The case studies, two community-led broadband initiatives, are profiled. They are Broadband for the Rural North (B4RN) based in England, and Broadband for Glencaple and Lowther (B4GAL) in Scotland. Their size and rural nature, socio-economic conditions, technological conditions, and the community broadband model being deployed within each region are described. The selection of the data collection method, semi-structured interviews, is summarised. These methods are then related to the longitudinal approach, represented by data collection at both pre- and post-broadband installation phases in B4RN and B4GAL. Finally, the chapter reviews the development of a ‘social resilience’ analysis, taking the conceptualisation developed in Chapter Two, and using it to establish a multi-

layered coding analysis and relationship building process, depicting a unique use of resilience theory in practice.

Chapter 5 sets out the baseline pre-installation phase findings, exploring the processes and practices of Internet technology use within rural communities. It discusses the key themes from semi-structured interviews held with key stakeholders and rural Internet users prior to the roll out of community-led superfast broadband in both case studies. The two research questions are queried: the influence of community-led installation processes, and the use and expectation of superfast broadband. This chapter then details the relationships between these and social resilience, presenting the first results of the links between resilience and superfast broadband.

Chapter 6 sets out findings from the post-installation phase, identifying both individual and community implications for resilience with respect to the use of community-led superfast broadband. It discusses the key themes that emerged from the post-installation semi-structured interviews held with the key stakeholders and rural broadband users. It first analyses the B4RN case study, discussing the evolution of broadband development and the implications of use for those that had received superfast broadband connections. It then forms a comparative analysis of the B4GAL case study, analysing the multi-scalar challenges the organisation has faced in broadband development and the implications that has for individual and community resilience.

Chapter 7 provides an overarching summary of the study. It firstly reviews the thesis aims and objectives, followed by a synthesis of thesis findings. This focusses on the application and enhancement of ‘resilience’ in rural geography, and the implications of technological advancement from a community-led perspective, including the presence of power and agency in broadband development and adoption. Finally, this chapter discusses the implications of the ‘need for speed’ and ‘future proofing’ broadband access in a rural context. It concludes by critiquing the research approach, including a review of the usefulness of the developed conceptual framework for social resilience, and identifying future research agendas.

2 RESILIENCE: BUILDING A CONCEPTUAL UNDERSTANDING

2.1 Introduction

Officially named *Time* magazine's buzzword of the year in 2013 (Brown, 2014), 'resilience' has become an increasingly popular term in both academic and policy literature as well as popular media. Definitions of resilience are highly dependent on academic discipline, authorship and audience and are constantly evolving, even in independent fields. Ecologically, resilience refers to the development of ecosystems and their ability to absorb changes and maintain structure in times of disturbance (Holling, 1973). These traits also describe resilience in the context of physical materials (Gordon, 1978). Within governance structures across Europe, including the United Kingdom, the concept of resilience is often found in strategies and policies as part of emergency planning (Scottish Government, 2012b). Psychological resilience provides parallel lessons concerning resilience as a social process, and highlights the centrality of human agency and decision-making (Skerratt, 2013). Thus, the complexity of the term 'resilience', coupled with the wide range of potential uses, poses challenges to using it as a framework of social systems (Walker *et al.*, 2004). This chapter builds our understanding of social resilience and contextualises the current literature in order to address it as a framework for social science research. It seeks to situate our understanding of social resilience within the wider, multi-disciplinary literature, tracing its presence in ecology and physical systems, psychology and, finally, within the social sciences. It places resilience in the context of its scalability, addressing 'individual' and 'community', and the most relevant critiques of the concept. The resultant conceptual framework of social resilience captures four dimensions of resilience including the availability and development of resources, the ability to proactively engage and exercise human agency, equitability across resources, and place based characteristics such as previous community engagement.

Three areas of academic and policy research provide a meaningful background for understanding social resilience. These are: 1) the literature on origins of resilience; 2) the literature on resilience theory development and the identification of 'social resilience'; and 3) the relationship of social resilience to other concepts. These themes are considered in Sections 2.2, 2.3, and 2.4 respectively. The final sections of this chapter synthesise recent literature on resilience in a social context, and conclude by identifying the four key dimensions to a conceptual framework of social resilience (Sections 2.5 and 2.6 respectively).

2.2 Framing the concept of ‘resilience’

Resilience, as a technical term, is generally understood to have originated from Holling (1973), in his work in ecology (Carpenter *et al.*, 2001; Folke *et al.*, 2010; Norris *et al.*, 2008; Skerratt, 2013). The term resilience within an ecological context is described as the development of ecosystems and their ability to absorb changes and maintain structures in times of disturbance, often referred to as their ability to ‘bounce back’. Resilience is directly linked to the idea of ‘systems’, including environmental, such as predator-prey systems, and so on (e.g. McDaniels *et al.*, 2008). The key features of a system in this context are that of speed and resistance, how *fast* it can return to equilibrium and how *resistant* it is to such dynamic disturbance and shocks (Adger, 2000). Holling’s definition, still prevalent in contemporary academic research, ultimately revolves around the tenet of ‘persistence’. Resilience places emphasis on the extent of disturbance that a system could tolerate and still *persist*, stressing “those characteristics that enabled the system to live with disturbance and instability and which promoted its inherent flexibility and strengths that would increase its chances of persistence” (Keck and Sakdapolrak, 2013, p. 7). Table 2 - 1 provides key definitions concerning ecological resilience that stem from this thinking.

Table 2 - 1 Ecological definitions of resilience

Author	Definition
Holling, 1973	The persistence of relationships within a system; a measure of the ability of systems to absorb changes of state variables, driving variables, and parameters, and still persist
Waller, 2001	Positive adaptation in response to adversity; it is not the absence of vulnerability, not an inherent characteristic, and not static
Resilience Alliance, 2002	The capacity to absorb disturbances, to be changed and then to re-organise and still have the same identity (retain the same basic structure and ways of functioning)
Klein <i>et al.</i> 2003	The amount of disturbance a system can absorb and still remain within the same state or domain of attraction and the degree to which the system is capable of self-organisation
Longstaff, 2005	The ability by an individual, group, or organisation to continue its existence (or remain more or less stable) in the face of some sort of surprise. Resilience is found in systems that are highly adaptable (not locked into specific strategies) and have diverse resources

Source: Norris *et al.* (2008).

Since Holling’s (1973) introduction of the concept, ecological resilience has evolved considerably in itself (Walker *et al.*, 2004). The ability of a system to absorb changes, rather than simply ‘bounce back’ and persist is included by Klein *et al.* (2003) and Resilience Alliance (2002) in their work. Waller (2001) and Longstaff (2005) similarly identify that resilience of a system is the ability to respond positively to adversity, identifying the potential for *adaptability* alongside persistence within resilience. Ecological resilience then is not static, and not locked

into specific reactive strategies. The Resilience Alliance (2002) also discuss that during times of change, the system can *learn* from the disturbance, to then respond to change in the future more effectively. Finally, Waller (2001) states resilience theory does not presume the absence of vulnerability. This acknowledges that no one system can be perfectly '*resilient*', but rather it is how the system responds during times of change that reflects *resilience*.

Much of the research concerned with ecological, or physical, resilience look at specific types of shocks to systems, mainly the risk of natural disasters – such as the Christchurch earthquake of 2010 (Wilson, 2013), or Hurricane Katrina in New Orleans in 2005 (Scott, 2013). The intention of that area of research is to utilise our understanding of resilience and “...move away from disaster recovery to hazard prediction, disaster prevention, and preparedness” (Klein *et al.*, 2003, p. 35). It is important here to highlight the focus on a location and its characteristics when working with resilience thinking: resilience is inherently spatially oriented.

This straightforward use of resilience thinking is also reminiscent of its use in other physical settings. For example, resilience has been discussed as the ability of a material to store strain energy and deflect elastically under a load without breaking or being deformed (Gordon, 1978). More recently, resilience acts as a component of mathematical stability analyses, which can be applied to the design of infrastructure (Bodin and Wiman, 2004). In this physical context, resilience is quite literally presented in relation to physical materials' ability to bend and bounce back, rather than break, a relatively limited use of the concept. Computing network resilience, for example, spawned from these ideas and has become a key aspect of physical information infrastructure. Network resilience acts as a probabilistic measure, identifying the expected number of failures a network can sustain while maintaining an acceptable level of service. These failures can be due to factors such as malicious attacks, software and hardware faults, or human error (Najjar and Gaudiot, 1990; Smith *et al.* 2011). Resilience, in terms of a computing-related physical network, is viewed as providing and maintaining a backbone for information infrastructures during times of malfunction or external disturbance.

When considering the transferability of resilience theory from its position within physical systems to social systems, a number of critiques emerge. The disaster recovery literature uses resilience in a very straightforward sense, or as a metaphor, which does not provide any benefit as an analytical concept producing new insights for social systems (Berkes and Ross,

2013). Resilience, as a measure of a physical system's ability to cope, reflects a relatively limited theoretical scope. Another critique stems from the definition of physical resilience itself: is the ability to absorb or accommodate disturbances without experiencing changes to the system really the preferred option when related social systems? In this regard existing inequalities would remain entrenched in the system – for example, in the Hurricane Katrina disaster, the so-called equilibrium was heavily laden with socio-spatial inequalities and vulnerability to the disaster was defined on the basis of class and race (Scott, 2013). Armitage *et al.* (2012) echoes this, highlighting that resilience can be a 'good' and a 'bad', and this remains a conceptual challenge for researchers.

However, there has been an evolution of the physical resilience concept. This evolution introduces interplay between social and ecological systems and is useful when reflecting on resilience in a social context (Adger, 2000). Adaptability of a system has been placed central to physical resilience thinking, as well as the system's ability to self-organise and learn from disturbances (Keck and Sakdapolrak, 2013). For example, Bodin and Wiman (2004) identify that, "systems not only change, they also change *how* they change" (p. 39). McDaniels *et al.* (2008) finally identify that resilience of a community (a spatial entity) reflects not only the physical vulnerabilities and capacities of that space, but also the actions of the individuals within it. This firmly ties together both physical and social responses in relation to the potential for resilience. The following section will introduce psychological resilience, a second component relating directly to individual action, to continue to develop a holistic understanding of resilience in a social context.

2.2.1 Psychological resilience

Although the origins of resilience as a technical term are almost exclusively identified within the ecological and physical sciences, the social sciences, psychology in particular, offer another relevant view of resilience in relation to personal development. First analysed in the 1940s, resilience took hold as a psychological concept in the 1970s in the context of schizophrenia and the presence of adaptive behaviour during the illness (Kaplan, 1999; Luthar *et al.*, 2000; Zigler and Glick, 1986). Throughout that decade, work on multiple adverse conditions, including socioeconomic disadvantage, parental mental illness, and community violence, occurred in the field, expanding the use of resilience within psychology (e.g. Luthar and Cicchetti, 2000; Masten, 2001). The central points from this literature about resilience include linking the concept to the presence of adversity, or risk, and the resultant relationship with positive life adaptation (Hegney *et al.*, 2007). Later work by Garmezy (1987) identifies two components of psychological resilience: the situation of adversity and a person's capacities and

skills, both of which may in turn influence positive life adaptation. However, as Luthar and Cicchetti (2000) state, resilience is not necessarily a personality trait; rather it is a ‘two-dimensional construct’ implying the changing nature of persons’ adversity and capacities over time. Psychological resilience thinking does not assume that resilience in individuals is constant. Sometimes individuals may react positively and others not (Kaplan, 1999), which echoes wider community-based resilience literature (Skerratt, 2013). Rutter (1993) highlights this, identifying resilience as a process: “...we must get away from thinking in terms of characteristics that are always risky or protective in their effects and instead, focus on the specific processes...” (p. 627). This is echoed again by Benard (1996) who discusses resilience as a process of ‘interconnectedness’. This idea of resilience as a temporal, cumulative, and ameliorative process is critical when addressing social systems (Kaplan, 1999), and complements the developed physical understanding of resilience, illustrated in Section 2.2.

Some psychological research aims to more directly identify and operationalise attributes of resilience for personal development. Benard (1995) provided specifics to enable children to become what she termed ‘resilient’. She believes we are born with an innate *capacity* for resilience (not necessarily that we are born resilient), by which we are able to develop social competence, problem-solving skills, a critical consciousness, autonomy and a sense of purpose, all of which can be developed to exhibit resilience in times of disturbance. Grotberg’s (1995) framework of resilience takes another approach and identifies three sources of resilience features, labelled *I have, I am, I can*. The three facets are presented in Table 2 - 2.

Table 2 - 2 Grotberg’s sources of resilience

I HAVE	I AM	I CAN
People around me I trust and who love me, no matter what	A person people can like and love	Talk to others about things that frighten me or bother me
People who set limits for me so I know when to stop before there is danger or trouble	Glad to do nice things for others and show my concern	Find ways to solve problems that I face
People who show me how to do things right by the way they do things	Respectful of myself and others	Control myself when I feel like doing something that is not right or dangerous
People who want me to learn to do things on my own	Willing to be responsible for what I do	Figure out when it is a good time to talk to someone or to take action
People who help me when I am sick, in danger or need to learn	Sure things will be all right	Find someone to help me when I need it

Source: Grotberg (1995).

Grotberg (1995) identifies that children, in order to be resilient, do not need to possess all of his attributes. However, possessing one is not enough to ensure resiliency. The more

interaction between his three sources of resilience the more individuals will be able to cope and adapt to adversity. Kearns and McArdle (2012) utilise Grotberg's framework in their work on newly qualified adult social workers, an age group which they acknowledge is often ignored in the psychological context of resilience. Their work synthesises that developing personal psychological resilience is a process, a multi-dimensional construct, and it is not simply for coping or toughening of individuals, but for positive growth through adaptation. Resilience thinking therefore reflects adaptive capacity building and the dynamic interplay between sustaining and transforming *with* change.

Resilience is also being used in public policy in a manner that mirrors this operational psychological thinking. In Wales, the Government has adopted a resilience perspective to tackling disadvantage in communities, stating "...a priority of the Welsh Government to help develop the resilience and capability of our communities in Wales to cope so they hold up under the strain of welfare reform and continue to grow and thrive" (Welsh Government, 2013, p. 3). This ultimately emphasises the importance of individual actions and capacities, as reflected upon by McDaniels *et al.* (2008) to contribute to community level resilience.

Although psychological resilience lacks presence in the traditional social or socio-ecological resilience literature, it provides a nuanced understanding of human capacity and development that continues to be relevant when analysing complex social systems. The discussion of resilience as a process, a multi-dimensional construct, and relating to both the external situation of an individual as well as that persons internal capacity complements the discussion of system-wide resilience. The following section will now directly consider 'social resilience' using the developed foundation of ecological, physical and psychological resilience theory.

2.3 Social resilience

The progression of resilience theory into the social realm is commonly linked to the direct relationship between social and ecological systems. This has generated resilience research focussing on the two phenomena, often at the community scale. Early work in this field looked at the dependence of human communities on ecosystems for their livelihood. An example used in this context was that of coastal communities in Vietnam, which relied on mangroves for fishing and coastal protection. The conversion of mangroves for agriculture, human settlement, as well as degradation through pollution, was the source of change, and resilience in the face of change was heavily reliant on institutional norms and rules and behaviour that governed the use of natural resources. This emphasised that social practices in combination with an ecological system contributed to the resilience of that community

(Adger, 2000). This outcome reflects common ideas underpinning the theory of social-ecological resilience, including capacity, complexity, connectedness, adaptation and feedbacks (Brown, 2014). Folke (2006) reflects these ideas by arguing that resilience of complex adaptive systems, like communities, is not simply about resistance to change or conservation of existing structures, as originally presented in the ecological context. Rather, it is about the “opportunities that disturbance opens up in terms of recombination of evolved structures and processes, renewal of the system and emergence of new trajectories” (Folke, 2006, p. 259). Norris *et al.* (2008) continue in this vein, identifying ‘social’ resilience as both a reactionary and proactive process: “A process linking a set of adaptive capacities to a positive trajectory of function and adaptation after a disturbance” (p. 131). This links psychological thinking about processes and individual adaptation to the progression of social-ecological resilience. Folke (2006) finally discusses that, in a way, resilience is an approach, a way of thinking that presents a perspective for guiding and organising thought. This provides a valuable context for the analysis of complex social systems.

In order to fully grasp the evolution of understanding social resilience, Table 2 - 3 provides definitions from a broad range of social resilience theorists.

Table 2 - 3 Definitions of 'social' resilience

Author	Resilience Definition
Brown and Kulig, 1996	The ability to recover from or easily adjust to misfortune or sustained life stress
Sonn and Fisher, 1998	The process through which mediating structures (schools, peer groups, family) and activity settings moderate the impact of oppressive structures
Adger, 2000	The ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change
Paton <i>et al.</i> , 2001	The capability to bounce back and to use physical and economic resources effectively to aid recovery following exposure to hazards
Bruneau <i>et al.</i> , 2003	The ability of social units to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimise social disruption and mitigate the effects of future earthquakes
Ganor and Ben-Lavy, 2003	The ability of individuals and communities to deal with a state of continuous, long-term stress; the ability to find unknown inner strengths and resources in order to cope effectively; the measure of adaptation and flexibility
Godschalk, 2003	A sustainable network of physical systems and human communities, capable of managing extreme events; during disaster, both must be able to survive and function under extreme stress
Ahmed <i>et al.</i> , 2004	The development of material, physical, socio-political, and psychological resources that promote safety of residents and buffer adversity
Coles and Buckle, 2004	A community's capacities, skills, and knowledge that allow it to participate fully in recovery from disasters
Kimhi and Shamaï, 2004	Individuals' sense of the ability of their own community to deal successfully with the ongoing political violence
Pfefferbaum <i>et al.</i> , 2005	The ability to execute efficient and effective adjustment processes to alleviate stress and restore equilibrium in the face of trauma, tragedy, and threat. It is grounded in the ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene and move on
Norris <i>et al.</i> , 2008	A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance
Davidson, 2010	Does not define resilience directly, but presumes the definition of sustainability to be a systematic state of indefinite equilibrium
Hudson, 2010	The amount of change that a system can undergo while retaining its structure and functions, the degree to which it can reorganise, and the degree to which it can create and sustain the capacity to learn and adapt. Adaptability - the capability of actors in the system to influence resilience - is critical in such systems
Magis, 2010	The existence, development and engagement of community resources by community members to thrive in an environment characterised by change, uncertainty, unpredictability and surprise. Members of resilient communities intentionally develop personal and collective capacity that they engage and respond to and influence change, to sustain and renew the community, and to develop new trajectories for the communities' future
Pike <i>et al.</i> , 2010	The ability of places to react, respond and cope with uncertain, volatile and rapid change
Sherrieb <i>et al.</i> , 2010	A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance (application of Norris et al theory)
McManus <i>et al.</i> , 2012	The ability to embrace change, with a capacity to adapt seamlessly to largely exogenous events (such as technological change) in a form termed stable adaptation
Wilson, 2012a	The capacity of a system to absorb disturbance and reorganise while undergoing change to still retain essentially the same function, structure, identity, and feedbacks...resilience is measured by the size of the displacement the system can tolerate and yet return to a state where a given function can be maintained
Berkes and Ross, 2013	The ability of a community to respond to shocks and stresses, and actively develop through capacity building and social learning harnessing community strengths including people-place connections, values and beliefs, knowledge, skills and learning; social networks; engaged governance; a diverse and innovative economy; community infrastructure; leadership; a positive outlook and readiness to accept change.
Scott, 2013	The ability of a system to respond to shocks and disturbances by adaptation and adaptability with an emphasis on transformation or path creation in response to disturbances. Typically long term response, enabling reform, and a critical tool. Recognises the politics of resilience.
Walsh-Dilley <i>et al.</i> , 2013	The processes of learning, organization, and adaptation taking place across scales that enable people to respond to and cope with internal and external stresses in ways that allow them to build and defend healthy, happy, and meaningful lives and livelihoods

Taken collectively, these definitions present an understanding of a social or community-based resilience that reflects aspects of both system recovery *and* transformation, drawing on all of the ecological, physical, psychological and socio-ecological concepts of resilience. Social resilience continues to be used within the context of a 'system', be it simple or complex, and must be sensitive to principles of systems including feedbacks, unpredictability, non-linearity, and, importantly, scale (Berkes and Ross, 2013). The rest of this section will outline the critical features of social resilience, as developed in the academic literature, identifying social resilience at the individual and community scale as the conceptual focus of this doctoral study.

Firstly, there is the recognition that change to the social system can come in the form of social, political, economic and environmental action (Adger, 2000; Hudson, 2010; Magis, 2010). Although many authors identify disturbances as external, exogenous shocks (e.g. Pfefferbaum *et al.* 2005), there is also an underpinning shift to identify the relevance of internal, endogenous shocks to social dynamics and potential resilience (Brown, 2014; Sherrieb *et al.*, 2010). Ganor and Ben-Lavy (2003) discuss resilience in the context of long-term, continuous stress, while Magis (2010) identifies that change is the norm, echoed by Skerratt (2013) in her work on community land ownership. Therefore, developing resilience is understood as an everyday process, rather than an abnormal one, and shocks are not simply singular events, although that remains one of the many possibilities. Shocks may be constant and can reflect external and internal action: they can include 'slow-burn' changes, or longer term processes of change, which may prove equally important in place shaping (Scott, 2013). For example, the recent economic crises in Ireland was marked by sudden shocks including the collapse of the rural housing market and large-profile rural businesses going into administration, as well as longer term restructuring changes to rural economy and agricultural sector (Scott, 2013).

Secondly, scholars focus on the development of resources, physical and social or psychological resources, to both cope and adapt at the individual and community level, demonstrating the relevance of multiple pathways to recovery. While historically some definitions of social resilience relied more heavily on its physical origins and emphasised a return to baseline functioning (e.g. Butler *et al.*, 2007), more recent research has shown that social resilience is about community adaptability and developing new trajectories for the future (Magis, 2010; Sherrieb *et al.*, 2010; Skerratt, 2013). Paton *et al.* (2001) identify both 'bouncing back' and aiding recovery as aspects of resilience, while Brown and Kulig (1996) discuss both

adjusting and recovering. Social resilience is about both recovering and transforming, which results in the creation of transitional pathways for recovery (Curtis, 2010). Monofunctional pathways or rigid development pathways can be suboptimal for adaptability (Scott, 2013). The development of resilience pathways should optimally reflect the non-linearity and unpredictability of communities, with multiple pathways of adaptability (Berkes and Ross, 2013). Therefore, development does not follow a single path, but rather multiple pathways, an often long-term, adaptive capacity building approach. For example, different development paths in a rural area include relocalised low intensity rural systems, deagrarianised rural communities, and superproductivist rural systems (Scott, 2013). This aspect of social resilience highlights the incorporation of transformability, creating new system pathways when ecological, economic, or social structures make the existing context untenable (Keck and Sakdapolrak, 2013).

Thirdly, the inclusion of agency, or ‘proactive’ capacities is discussed by Davidson (2010) and Maguire and Cartwright (2008) as critical to social resilience. Animals and plants show adaptations in an evolutionary sense and at an evolutionary timescale, but only humans anticipate change and use social, political, and cultural means to influence resilience (Berkes and Ross, 2013). Hudson (2010), for example, states that the capability of actors to influence resilience is critical in regional systems. Norris *et al.* (2008) highlight that multi-level participation by empowered actors is a fundamental element of social resilience (also exemplified by Pfefferbaum *et al.*, 2005 and Robinson and Berkes, 2011). Godschalk (2003), in his work on resilient cities, states that sustainable networks of both physical systems and human associations are driving components of resilience, representative of the importance of human agency in resilience.

Finally, it is important to acknowledge scale. The idea of scale – that is, of individuals and communities, or larger entities - is echoed broadly across the resilience literature. Social resilience is considered to be multi-scalar, from individual to community, to regional, national, and global (Wilson, 2012b). This is echoed by Skerratt and Steiner (2013) in their identification of resilience at both the individual and community scale. Resilience is often discussed in relation to specifically the individual and the community, and this doctoral study furthers this discussion. Egeland *et al.* (1993), for example, were concerned with individual resilience, looking at the capacity for successful adaptation despite high-risk status, chronic stress or severe trauma. Butler *et al.* (2007) also highlighted individual scale resilience, discussing adaptation under extenuating circumstances: a resilient person can “bend rather than break in

the face of adversity” (p. 402). Resilience concepts are thought to apply at all levels, from individual to earth system and in any given case, resilience phenomena are occurring simultaneously at nested and interacting levels (e.g. Berkes and Ross, 2013; Wilson, 2012a, 2012b). Thus, transformational change at an individual level may enable resilience development at a higher level. For example, a farm’s food production assists the food security of its community and distant regions, and the economy of its nation. However, this is not a definitive relationship. The loss of the main financial contributor to a family could be devastating to that household unit, but would perhaps not influence the community overall. In these instances, actors seek transformation, a process by which individuals and communities build on community strengths and capitals to adapt (Berkes and Ross, 2013). Social resilience at the community scale is frequently considered for rural development, particularly among development agencies, policymakers and practitioners, who focus on, “understanding and promoting the capacity of local communities to respond to, to negotiate, and transform shocks such that disturbances do not initiate a downward spiral and may even provide opportunities” (Walsh-Dilley *et al.*, 2013, p. 3). Shucksmith (2010) notes that rural development is increasingly disintegrated, which leads to greater negotiation between competing discourses and creates challenges for coordinated local action, demonstrating the challenge and potential for resilience thinking within this rural development context. This thesis focuses on individual and community rural resilience and the potential linking between the two scales to contribute to the wider academic scholarship on social resilience.

Magis’ (2010) work on tracing the evolution of resilience in the context of natural resource dependent communities provides a robust definition that incorporates these evolutionary changes. Social resilience is therefore defined as:

‘...The existence, development, and engagement of community resources by community members in order to thrive in an environment characterised by change, uncertainty, unpredictability, and surprise. Members of resilient communities intentionally develop personal and collective capacity that they engage to respond to and influence change, to sustain and renew the community, and to develop new trajectories for the communities' future’ (Magis, 2010, p. 402).

This definition demonstrates the reactionary and proactive process of developing individual and community capacities in both physical resources and human associations and identifies the place for vulnerabilities. Given its encompassing scope, this is considered to be an effective and relevant definition of social resilience for this research. With its focus on the individual and community units, it allows us to further develop the links between individual

and community resilience to contribute to academic scholarship and policy.

2.3.1 What is ‘community’?

The spatial scale of the concept of ‘resilience’ focuses primarily on the individual and their related ‘communities’ as established in Section 2.3. This varies from a physically bounded community in relation to earthquake related hazards (Bruneau *et al.*, 2003), to terrorism uncertainties (Butler *et al.*, 2007) and to wider social or ecological change (Berkes and Ross, 2013; Davidson, 2010; Lyon, 2014; Magis, 2010; Skerratt, 2013). Understanding the concept of ‘community’, broadly representing a complex social system, is then vital to appropriately applying this concept of social resilience in practice.

Over the past two decades, there has been resurgence in attention to community as a critical arena for addressing a range of issues, including environmental and societal pathways of change (Chaskin, 2008; Wilson, 2012b). Within the context of resilience a focus on the community level is justified by Adger’s (2000) earlier criticism that “the concept of resilience has not effectively been brought across the disciplinary divide to examine the meaning of resilience of a community” (p. 348). This aligns with the *need* to analyse the community as a scale within this doctoral research, alongside the associated individuals. But what then is a ‘community’?

The range of literature on ‘community’ is vast and will only be explored briefly here. For some, community is an open or unbounded system, whilst others state that they are closed or easily defined geographic entities, similar to political boundaries (Wilson, 2012b). Maguire and Cartwright (2008) in their work on water management in Australia, highlight that communities can be defined in different ways by different disciplines and can be groups of people coming together in physical, environmental, economic, relational, political or social ways. As an open system, it could be argued that ‘community’ is largely an attitudinal construct that means different things to different people (Agrawal and Gibson, 1999). This can also be related to the focus on community as a social construct and thus not as a strictly structural concept (Cohen, 1985). Community viewed as a social construct reflects increasing interest in the plurality of different community identities and lifestyles.

Literature from sociology has generated two concepts of community, developed from the German sociologist Ferdinand Tönnies’ seminal work (1955). He identified a now classic distinction between *Gemeinschaft*, meaning a tight-knit community with repeated personal and face-to-face contact, and *Gesellschaft*, meaning a weakly bound society, based on impersonal

contact and relations to countryside and community. However, most geographers acknowledge that in any given locality, a plurality of communities may exist and just one society with consistent relationships representative of *Gemeinschaft* or *Gesellschaft* is unlikely (Gregory *et al.*, 2009). This perspective is reflective of the work done on community types. This includes ‘community of place’, based on geographic boundaries (Kelly, 2000, cited in Maguire and Cartwright, 2008), or ‘communities of interest’ or practice, which are less focussed on spatial orientation and defined as a group of individuals who have similar characteristics or interests (Maguire and Cartwright, 2008; Stoecker, 2013). These ‘communities’ may overlap and intersect at any given time. It is also acknowledged that communities (of any type) may ‘emerge’ in response to any number of issues (Maguire and Cartwright, 2008). The ‘Internet’ as a broad entity, for example, has been closely linked with communities of interest, and some literature highlights its potential to end ‘communities of place’ as it allows for a flourishing of communities of interest irrespective of place. This will be discussed in further detail in Chapter Three, but it is important to emphasise here that broadband technology, the technological focus of this thesis, can have diverse implications for both communities of place and interest.

From a geographical perspective, Woods (2011) cites Leipins (2000), who states that a community is a social construct about human connection that involves cultural, material and political dimensions, comprising the mutual interaction of meanings, practices, and spaces and structures. In Leipins’ model there is an emphasis on methodological practices when examining communities, focussing on participatory action research to engage the people that live and work within the community.

In this thesis, drawing on Wilson (2012b) and Cutter *et al.* (2008), communities will be seen as the totality of both social and physical system interactions (i.e. an affective unit of belonging and identity and a network of relations and resources) usually (but not exclusively) within a defined geographical space. This perspective has been used in resilience research previously, namely when examining environmental disasters, and the definition is appropriate given the context of the thesis on geographically bounded technological development.

2.4 Critiquing ‘social resilience’

The concept of social resilience can hardly be said to be unproblematic. Many authors have questioned its validity in the social sciences, asking whether it is misplaced in the context of place-space relationships, particularly considering the complexity of understanding the spectrum of either ‘resilience’ or ‘communities’, as presented above. The context of social

resilience has developed through its critiques, primarily those that postulate that past socio-ecological research has undertheorised the social dimensions, including social, political and cultural dynamics (Brown, 2014). These critiques push the theory forward in a productive manner and will be addressed throughout this section to continue to flesh out the meaning and nature of social resilience queried within this doctoral study.

Adger (2000) questioned the centrality of social resilience to sustainable development. He argued that complete transference of the ecological approach to a social system presumed that there are no behavioural differences between ‘socialised’ institutions and ecological institutions, an opinion which is heavily contested in the social sciences. Davidson (2010) also queries the transferability of an ecological framework to a social system due to the lack of ‘human agency’ within the physical concept. This reiterates that developing resilience from the ecological science to social systems requires care for further research. Another common critique of resilience is its normative associations, or non-neutral bias, stemming from these concerns of its transference between ecological and social sciences. Brown (2014) reviews the rise of resilience in literature and highlights the continual strongly normative assumptions in the writing, although acknowledges recent approaches which have sought to address this (e.g. Lyon, 2014). Resilience may also appear value-laden, implicitly generating good and bad reactions. Therefore, explicitness is needed when describing the interests playing a role in scripting the resilience narrative (Skerratt, 2013). I argue that social resilience is not neutral, but can be political, with authorities exerting control over resilience for whom (Cote and Nightingale, 2012). This is a starkly different view from ecological or physical resilience, which is shaped as a depoliticised approach.

MacKinnon and Derickson (2013) critiqued resilience specifically in its application to places. Their critique rests on three ideas: firstly, the ecological concept is conservative when applied to social relationships (mentioned again by Brown, 2014); secondly, it is externally defined; and thirdly, resilience of places is misplaced in terms of spatial scale. They argue that the concept of resourcefulness is more appropriate for community groups.

Is the application of ecological resilience to social systems conservative? MacKinnon and Derickson (2013) state that an ecological underpinning of resilience, coming from a largely apolitical field, favours existing social structures which can be shaped by unequal power relations and injustice, but closes off wider questions of progressive social change which require interference with, and transformation of, established systems. I argue that through the

evolution of resilience in the social context this has been debated extensively, and through identifying ‘human agency’ as central to the concept of community resilience, it distinguishes itself from the physical resilience frameworks (Davidson, 2010; Norris *et al.*, 2008). Walsh-Dilley *et al.* (2013) also emphasise this need to place agency (along with rights and power) directly into the formation of resilience. Their critique of its heavy reliance on systems theory is also relevant. Resilience should not treat social dynamics as operating more deterministically than they do. The addition of human agency and proactive agents within the resilience concept stands in response to the belief that the applicability of ecological resilience to social resilience is limited.

As an externally defined concept, MacKinnon and Derickson (2013) also raise concerns that state agencies and ‘experts’ such as the academic community externally define resilience, and these ‘top-down’ approaches place the onus on communities to respond to ‘external’ shocks. However, community capacity and empowerment in itself can be developed and applied internally, and can also be viewed as a necessary condition for the development, implementation and maintenance of community-based programmes (for example, health and disease prevention, seen in Goodman *et al.*, 1998). These are very plainly internal structures that can be influenced and affected by resilience. Resilience must be representative of internal and external actions and disturbances, which has been developed in Section 2.3. Finally, in examining the argument that it has been misplaced in terms of spatial scale, I argue that resilience has been identified through recent research as multi-scale and multi-dimensional (Skerratt and Steiner, 2013), enabling identification of resilience pathways.

Walsh-Dilley *et al.* (2013) highlight key critiques of the resilience approach, noting that, firstly, it is considered to be too broad and abstract to be operationalisable, secondly, it occasionally fails to successfully connect theory and practice due to a lack of guidance in terms of how the concept should be applied in research, and thirdly, it is unclear how to bound systems which are being studied. If resilience is related to systems, as developed in the outset of this Chapter, what are the boundaries of that system? Walsh-Dilley *et al.* (2013) also emphasise that relying too heavily on that systems theory can be problematic as it fails to pay attention to the agency of people. Related approaches that frame resilience solely as a personal attribute of individuals and groups are also seen as being problematic as they can leave out environmental factors. Finally, they critique the assumption that disturbances to a system are generally unexpected and unknown, as assumed in ecological resilience, and support that resilience in a social context fails to consider power relations.

Resilience's broadness as a theory has been discussed throughout its development, and some pursue what is termed a 'specified resilience', thinking about resilience in terms of a specific form, such as ecological resilience, livelihood resilience and so on (Walsh-Dilley *et al.*, 2013). However, this potentially detracts from the interconnectedness of systems, limiting our understanding of how resilience is influenced across scales and social institutions (Folke *et al.*, 2010). This thesis considers resilience in the context of individuals and communities, but with an acknowledgement that these two scales, as well as other scales, will interact, as established by Wilson (2012a). Its potential failure to connect theory and practice could be considered primarily due to the inherent persistence of systemic identities over time as central to resilience (e.g. Walsh-Dilley *et al.*, 2013). The incorporation of transformative thinking to resilience seeks to address this (e.g. Armitage *et al.* 2012), and the recognition of this evolution of resilience is central to this study.

Reflecting on systems theory, there is little agreement on how to bound systems being studied within resilience research, primarily due to its broadness as a theory. Walsh-Dilley *et al.* (2013) state that implicitly research seems to focus on the local-global system concept, and primarily focus on the local, "assuming that adaptive capacity is to be found there, rather than in changes in, say, international trade policy, or national political structures" (p. 18, see also Mackinnon and Derickson, 2012). There is a need then to acknowledge the relationships at the larger scale, and be incredibly clear on the physical and temporal boundaries within which we operate (Walsh-Dilley *et al.* 2013). This thesis seeks to place social resilience as multi-scalar, acknowledging that capacities can be harnessed or influence from internal and external actors. Relating to the critique that social approaches may ignore environmental factors that influence resilience, I would argue that resilience must incorporate the variety of structures and organisations that exist at many levels to adequately understand resilience of those individuals or groups.

Resilience is also depicted as a positive, perhaps overly optimistic construct; something, by inference, *wanted* by communities. This critique of resilience identifies that it largely ignores aspects of vulnerability and it presumes individuals can exert agency. This is reflected within the psychological context (e.g. Luthar *et al.*, 2000), but is largely ignored in other disciplinary contexts. There is an assumption that resilience is simply a positive ideal, and therefore not a useful term in the operational context where uncertainties are riddled with a myriad of positive, negative and neutral connotations. I argue that by reviewing resilience in the context

of both developing resilience and understanding vulnerabilities, we acknowledge and encourage the study of all facets of resilience, positive and otherwise. Walsh-Dilley *et al.* (2013) highlight the relevance of vulnerability studies in resilience: they note that “a focus on resilience without attention to vulnerability risks reproducing the very institutional structures and conditions that created the problems being addressed” (p. 3). I also acknowledge that in a quest to develop adaptive capacities as part of resilience, it is possible to develop or entrench new and existing vulnerabilities. Newman and Dale (2005) raise these issues in their research, stating that because not all social networks are equal, those composed of what they term ‘bonding’ links, which impose limiting social norms, can reduce resilience. The importance of maintaining diversity within communities is also stressed. With reference to whether disturbances are unknown, it is clear that without acknowledging that not all disturbances are a surprise, it is easy to not address the underlying structures that systematically disadvantage certain groups and will continue to entrench vulnerabilities. Social resilience, as developed within this thesis, identifies change as constant, and therefore not always an unexpected external event. This will result in being able to identify and understand the influence of internal power dynamics that may also be influencing resilience of that community or certain individuals.

A final, relevant, critique, related to these ideas of vulnerability and resilience, queries social resilience with respect to its relationships with power (e.g. Armitage *et al.*, 2012; Cote and Nightingale, 2012; Hornborg, 2009; Keck and Sakdapolrak, 2013; Nadasky, 2007; Walsh-Dilley *et al.* 2013). Walsh-Dilley *et al.* (2013) argue that frequently, in past use of resilience in a social context, the research has failed to consider or incorporate relations of power in society. They state that its failure is on two levels: 1) that it ignores or diverts attention away from the cause of the vulnerability to the shock, and 2) that it does not question the normative valence of resilience. Brown (2014) also highlights that resilience has been depoliticised and does not take into account institutions within which practices are embedded. Lorenz (2010) identifies that power dynamics can potentially lead to uneven participative capacity due to factors including role systems, education, and the existence of strong or weak ties in social networks. As already noted, I argue that developing social resilience is political, and non-neutral, and there are authorities and institutions exerting control over social dynamics. Therefore, when conducting resilience research, these power dimensions should be incorporated into the conceptual understanding of resilience. This echoes the discussion of extra-local resources, and interactions with multiple scales, and the need for understanding ‘participative capacity’, central to social resilience (Keck and Sakdapolrak, 2013; Lorenz, 2010). The sum of these

works emphasise the need to be explicit and better articulate the role of values when discussing resilience of what, and for whom (Armitage *et al.*, 2012). This doctoral study seeks to acknowledge this issue, and address power relations as they arise within the study.

Ultimately, these critiques have led to the evolution of the social resilience concept, and have increased its robustness as a theory. As a social development concept, resilience does have direct links to many other approaches, some of which reflect resilience facets within community research. In a policy context, sustainability and empowerment are central to rural community development narratives. Capital, often discussed as social capital, is also utilised. This term is a highly developed concept in the context of community capacities and resources (Árnason *et al.*, 2009; Gilchrist, 2009). Social quality is also often used in relation to community or social well-being; something that resilience strives towards in the face of uncertainties. The following section will outline the relationships between these concepts and resilience and seek to cement the position of social resilience as a useful and relevant analytical framework for social research.

2.4.1 Resilience and other concepts

This section outlines the linkages, both tangible and intangible, of ‘resilience’ to four related concepts. I will specifically review empowerment, capital, sustainability, and social quality, as they remain key sub-themes to understanding resilience. It is with this ethos in mind that I identify that resilience is not situated outside or in opposition to these well-developed concepts, but rather encompasses them.

Generally, empowerment is a process by which households and their members assume and wield greater socio-political and psychological power (e.g. knowledge, skills, voice, collective action, and self-confidence) to reshape the actions affecting their own lives: empowerment ultimately has come to mean different things to different actors (Gregory *et al.*, 2009; Kasmel and Anderson, 2011). As a theory in education research, empowerment has been traced to Paulo Freire, a Brazilian humanitarian who discussed the role of education in liberating the oppressed people of the world in his 1970 volume *Pedagogy of the Oppressed* (Archibald and Wilson, 2011; Hur, 2006). In community psychology the concept is linked to Rappaport (1987) in his work outlining an empowerment model for social policy (Brodsky and Cattaneo, 2013). It has historic links with gender empowerment (i.e. feminist scholarship) and was often discussed in terms of building local personal and collective power for an equitable society (Cornwall and Brock, 2005). Empowerment has also often been linked with community development, defined as the creation of sustainable structures and processes over which local

communities have control, again highlighting the place for building local community power to influence change (Craig, 2002; Toomey, 2011). While mainstream development agencies regard empowerment as a tool to improve efficiency of a community, it is also regarded as a metaphor for fundamental social transformation (Hur, 2006). It is here that the link to social resilience theory becomes increasingly evident. Brodsky and Cattaneo (2013) highlight the use of empowerment in community psychology, and emphasise that empowerment and resilience both reflect similar values including recognising, respecting and promoting local capacity and positive outcomes. Empowerment is relevant to power, and power relationships, existing across multiple dimensions and scales, including sociological, psychological, and political (Hur, 2006), and to individual, organisational or community power. It is both a process, and an outcome (Kasmel and Anderson, 2011), echoing the resilience debate. From a policy standpoint, empowerment is also being used in community development guidance such as the Community Empowerment and Renewal Bill in Scotland (Scottish Government, 2012a), and has been often linked with health promotion discourses and improved health outcomes (Kasmel and Anderson, 2011; Airhihenbuwa, 1994).

Empowerment as a concept ultimately acts as an integral part of resilience (e.g. Norris *et al.*, 2008). It can provide individuals and communities with the power to reshape the actions affecting their own lives and environment through participation and leadership (Kasmel and Anderson, 2011): that is, harnessing human agency. The theoretical process of resilience has been linked to empowerment, identified by Skerratt and Steiner (2013) as “...an important component of the concept of resilience because, in order to develop community resilience, community members have to be able to actively engage...empowered communities, as suggested, are more likely to possess the ability to anticipate, and adapt to, stresses and changes...” (p. 326). This chimes with work in leadership literature: as Skerratt (2011a) discusses in the rural leadership context, “within rural development, there is an increasing normative shift from development in rural communities towards development with communities...In such research, the analytical microscope focuses on attributes of communities: their capacity, capitals and assets” (p. 88). Community participation and leadership, developed through a foundation of empowerment and empowered individuals, are understood theoretically to play significant roles in resilience (e.g. Berkes and Ross, 2013; Pfefferbaum *et al.*, 2005). Craig (2002) highlights the critical role of participation for community development, while Cornwall and Brock (2005) review participation as a historical enabler of political agency. Berkes and Ross (2013) highlight both leadership and engaged governance as community strengths that assist in the development of resilience. Norris *et al.*

(2008) state, “empowered community settings are characterised by inspired, committed leadership and by opportunities for members to play meaningful roles” (p. 139). These findings highlight the necessity to incorporate empowerment and the related aspects of leadership and participation in our understanding of social resilience in community-based research.

Capital also exists as a component of resilience. It is a well-established concept within sociology and other social science disciplines. Although social capital is most commonly referenced, seven types of capital have been identified and are set out in Table 2 - 4.

Table 2 - 4 Types of capital

Type	Definition
Social	Capital mobilised through social networks and relations, the ability and willingness of community members to participate
Human	The stock of competencies, knowledge and personality attributes embodied in the community
Political	The inclusiveness of the political process and or the extent of institutional and democratic processes
Cultural	Society’s historical memories and experiences, ideological standpoints of the community (how they see the world)
Natural/Environmental	Landscape and any stock or flow of energy and material that produces goods and services. Resources are renewable and non-renewable materials
Built	Fixed assets which facilitate the livelihood or well-being of the community
Financial/Economic	Monetary income, financial assets, wealth, security, credit and investment: financial capital plays an important role in the economy, enabling other types of capital to be owned or traded

Source: Wilson (2012a), Magis (2010) and Bourdieu (1986).

The use of capital, often broken down into these specific types, is a complex concept. Within the existing social resilience literature, capital is often referenced as a component of resilience, representing resources of a community. Wilson (2012a) describes the creation of ‘resilience’ through the interaction of three principle capitals: social, economic and environmental. Where only one aspect of capital is present, communities remain weakly resilient, whereas the intersection of two can lead to moderately resilience/vulnerable communities, and finally the intersection of all three capitals can lead to strongly resilient communities (Wilson, 2012a). Magis (2010) identifies capitals as part of community resources, similarly discussed to be a characteristic of resilience. Given the close relationship of the use of the terms capital and resilience within the literature, I take the view that capital may be seen as a resource for resilience within the community system. Importantly, I distinguish that capital is not a replacement for resilience in terminology, as capital models tend to compartmentalise the

make-up of communities, whereas resilience is more holistically defined as a multi-dimensional process (Skerratt, 2013).

Similar to capital, community sustainability is a widespread concept with features relevant to the concept of social resilience. It is often presented as having three pillars - environmental, social and economic - and achieving positive success in those three areas may lead to a sustainable community (Swarr *et al.*, 2011). The scale of enquiry is mostly at the collective level, often hingeing on the environmental aspect (Faber *et al.*, 2005), and incorporates notions of intergenerational social justice (Derissen *et al.*, 2011). Sustainability, much like resilience, is not without its contestations. Kuhlman and Farrington (2010) argue that the creation of three meanings to sustainability has obscured the real contradiction between the aims of welfare for all and environmental conservation. It potentially risks diminishing the importance of the environmental dimension, and separates social from economic, which are fundamentally linked, as seen within social resilience research. Social resilience as utilised in this thesis is not tied to environmental uncertainties (although it may include them), and highlights processes; not directly addressing intergenerational justice, but acknowledging that resilience is built over time.

Finally, the concept of ‘social quality’, together with ideas of agency and structure, is often used to discuss social well-being, and is inherently linked to social resilience. Its definition is based on reciprocity: “reciprocal relationships...between processes of self-realisation of individual people as social beings and processes leading to the formation of collective identities” (Siltaniemi and Kauppinen, 2005, p. 1). This concept is depicted as an encompassing social theory with four broad dimensions, namely; socio-economic security, social cohesion, social inclusion and social empowerment (Wallace, 2012). The approach emerged from a critique of economic understandings of quality of life, and has been used to examine the nature of society and the establishment of social systems that promote social well-being (Wallace and Abbot, 2009). Indicators for social quality, operationalising the four dimensions, are often found in national statistics or standardised surveys, and are traditionally structured as a static method of understanding perceptions of living at a point in time (van der Maesen and Walker, 2005; Wallace, 2012). While this provides detail for many aspects of resilience theory, its use as a static measure misses analysing the processes and transitions that can enhance communities, something that is inherent to the developed social resilience theory. That is not to say that using measures of social quality cannot take place within a resilience analysis, particularly in relation to how self-realisation is enabled by social conditions, but

there is more focus on the processes than on the outcomes within social resilience thinking (e.g. Franklin *et al.* 2011).

The many theoretical influences on social resilience, established through the preceding sections, are exceedingly complex. This following section will cement the concept of social resilience as the most effective for this research.

2.5 Reflecting on social resilience

Social resilience is not a distinct and unique entity, but rather is part of the evolving nature of evaluating community growth (including individual relationships with community), and community development. It encompasses many aspects of the concepts reviewed in previous sections, and, ultimately, provides an overarching concept with which to analyse communities in transition. Resilience of a community or social system is enhanced through the presence of empowered individuals and groups, and ‘empowerment’ remains at the core of its thinking. Like the concept of ‘sustainability’, interaction between personal and collective skills, environment and resources (physical and social) leads to greater adaptation. Social resilience expounds scale, both individual and collective, as core to its identity. This distinction that capacities can, and are, developed within multiple scales is integral to the development of that community. Social resilience acknowledges the presence of both proactive and reactive capacity development at this individual and collective scale. The development of these pathways of resilience can flex and stretch as internal and external actions take place, demonstrating the process-based nature of resilience in terms of community development. In the context of this study, using the concept of social resilience allows the researcher to examine the influence of technology in a detailed, socially based manner, moving beyond a surface level statistical analysis. As Magis (2010) states:

‘Information on a community’s resilience has a number of purposes...it can be utilised by communities to track and *strengthen* their resilience. It can be used by community development organisations in pre- and post-test fashion to test the *efficacy* of various interventions on improving community resilience. It can be used by policymakers to inform decision-making, and to monitor the impact of policies on community sustainability’ (p. 413, emphasis added).

Social resilience, focussing on the intersections between individual and community scale, is therefore best placed to address the broad aims of this doctoral study, examining pre- and post- broadband installation.

2.6 Towards an analysis of resilience: from ‘toolkit’ to conceptualisation

The theoretical foundations and relationships of social resilience have been presented in this chapter, identifying it as a useful concept to underpin this doctoral study. However, this foundation neglects the operationalisation of the theory, its actual practical application in complex social systems. Carpenter *et al.* (2001), in their work on ecological resilience, discuss its use as a theoretical construct. They state “...more insight could be gained from empirical analyses, which would require an operational, measurable concept of resilience” (p. 767). The question thus becomes: How do we analyse resilience and identify ‘resilience’ across communities?

Since its introduction to social sciences, there have been many debates over the best ways in which to measure and understand social resilience. Resilience has often been developed on a regional scale as something that can be distilled into a ‘how to’ manual or process driven ‘toolkit’. In 2011 for example, the Cabinet Office of the United Kingdom Government published the *Strategic National Framework on Community Resilience* identifying a programme for resilience, with key features, phases and methods to measure success (UK Cabinet Office, 2011). In the United States of America, the city of Los Angeles, in partnership with academics and emergency networks, are developing a community disaster resilience toolkit, including psychological first aid, community mapping to identify risk factors and vulnerable groups and training field workers. There the focus is clearly on disaster recovery and prevention (RAND, 2013). The Torrens Resilience Institute in Australia similarly provides a scorecard to rate your community in relation to its potential response should a disaster strike, measuring connectedness in a community through communication levels, level of risks, and what emergency planning procedures are in place (Torrens Resilience Institute, 2009). Pfefferbaum *et al.* (2011, 2013) have developed the Community Advancing Resilience Toolkit (CART) rooted in ideas of connection and caring, resources, transformative potential, and disaster management, which begins to discuss empowering and strengthening communities. However, it does not address vulnerability, and the focus remains disaster management. The McCaughey Centre in Australia focus on the role of local government in resilience to climate change, but do not explicitly delve into broader socio-economic shifts (Edward and Wiseman, 2010). The Centre for Community Enterprise in British Columbia, Canada isolate 23 characteristics of resilience that derive from four broad themes: people, organisations, resources and community processes (Colussi, 2000). While the work of toolkits and academic endeavours provides interesting insights into natural disaster, or climate change resilience and field

measures for natural resource dependent communities, there are inherent complexities in attempting to empirically and categorically, in a step-by-step process, analyse communities.

I argue, firstly, that the local place context is highly important to the understanding and potential development of social resilience and, therefore, a toolkit, while a convenient starting point, provides little practical advice for communities and community leaders contending with highly localised issues, resources, and actors. Resilience, like adaptation in general, is always contextual (Masten *et al.*, 1990). Secondly, 'resilience' acts as a state of being. Becoming more resilient, or developing resilience, the focus of much of the resilience literature, is a process. This is a critical aspect to take away from the toolkit based literature and the academic literature. Developing and identifying social resilience is a process, and while a community may strive and attain success in some sectors, others may falter, and time may change individual and collective skills, resources, and partnerships. Therefore, the process of becoming more resilient can take on many different, often individualised or sector specific, forms. Through recent research on social resilience thinking, it can be argued that resilience provides an alternative to a more policy oriented analysis. It is a lens for understanding community development that incorporates multi-scalar dimensions of capitals and capital building, agency and capacity, and identity. The more convergence between these qualities in everyday situations and cumulative development over time, the more resilience is present, and the less likely the community is to face prolonged dysfunction (e.g. Sherrieb *et al.*, 2010). With its focus on processes, social resilience is a beneficial concept for ongoing community practices such as broadband delivery.

Focussing on academic authors of social resilience theory (primarily based in the community arena) I have compiled a cross sectional list of dimensions, or characteristics, of resilience and, through close examination and synthesis, have chosen to focus on four dimensions of resilience for this conceptual framework. These four dimensions, developed through the historical progression and critique of the resilience concept, include the availability and development of resources, or capitals, the ability to proactively engage and exercise human agency, equitability across resources, and place-based characteristics such as social memory. By approaching resilience as a conceptual framework, we can develop a more nuanced understanding for communities to look to for guidance to identify and design their own processes of resilience.

The rest of this section outlines resilience characteristic development within the published literature, highlighting the four aspects chosen to underpin this doctoral study. I begin by looking at those characteristics embedded in resources and resource engagement in Figure 2 - 1.

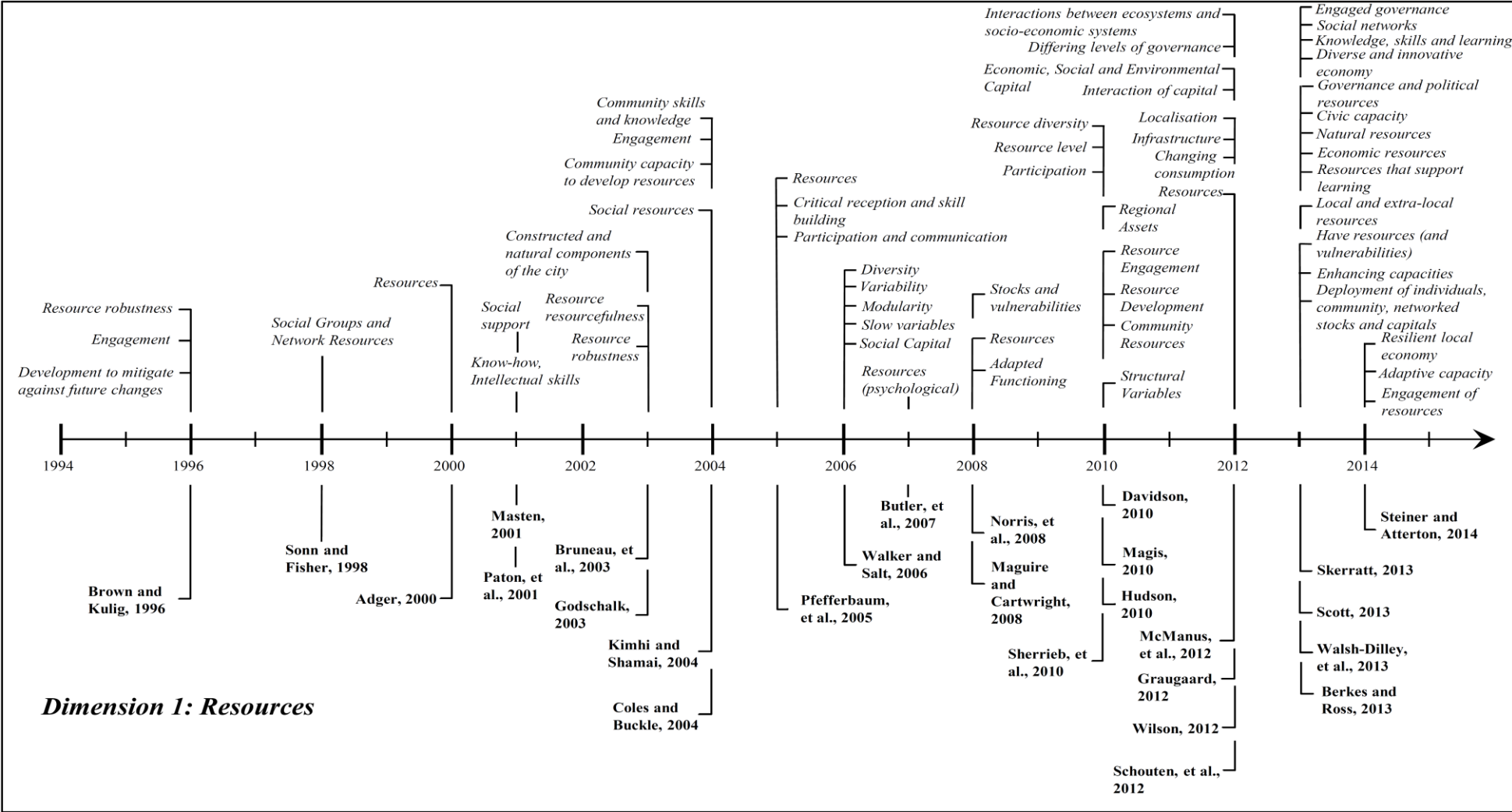


Figure 2 - 1 Dimension 1: Resources

The presence of resources, or capitals, including physical and social structures, their development, and engagement, play a key role in resilience. This was illustrated in the majority of literature. Sherrieb *et al.* (2010) highlighted the resource level, economic options, and presence of social organisations, and Brown and Kulig (1996) identify both physical conditions and social structures as important for resilience. Magis (2010) and Wilson (2012a, 2012b) both reference community capitals, be they economic, social, political, or cultural as relevant for developing resilience. This notion that resources are both physical and social is crucial to social resilience thinking; a lack of one will undermine resilience building overall.

It is also possible to reflect on scale with respect to resources (Wilson, 2012b). Sonn and Fisher (1998) identify the need for social groups and *networked* resources, alongside the recognition by Paton *et al.* (2001) of the need for social support options, Masten's (2001) intellectual skills, and Butler *et al.*'s (2007) psychological and interpersonal assets. Coles and Buckle (2004) emphasises *community* skills and knowledge, Hudson (2010) identifies more *regional* assets, and Pfefferbaum *et al.* (2005) state that resources include networks of all of individuals, groups and organisations, ultimately reflecting that resources are multi-scale. Berkes and Ross (2013) also exemplify this, identifying social networks, engaged governance, and a diverse and innovative economy as contributors to resilience.

Looking beyond this simple presence of resources, their long-term development and engagement also allows communities to improve resilience. Skerratt (2013) classifies this as the enhancement of adaptive capacity, while Norris *et al.* (2008) identify adapted functioning. The capacity to develop resources through communication, critical reflection, and skill building is also identified, emphasising that engagement with resources is a critical juncture if resilient tendencies are to be established and ultimately accessed over the time continuum (Ganor and Ben-Lavy, 2003; Pfefferbaum *et al.* 2005). Davidson (2010) calls this imagining and engagement, while Sherrieb *et al.* (2010), and Pfefferbaum *et al.* (2005) discuss the importance of participation.

The second dimension identifies a pattern of human agency and capacity building both collectively and individually, as inherently critical for social resilience. This is reflected in Figure 2 - 2.

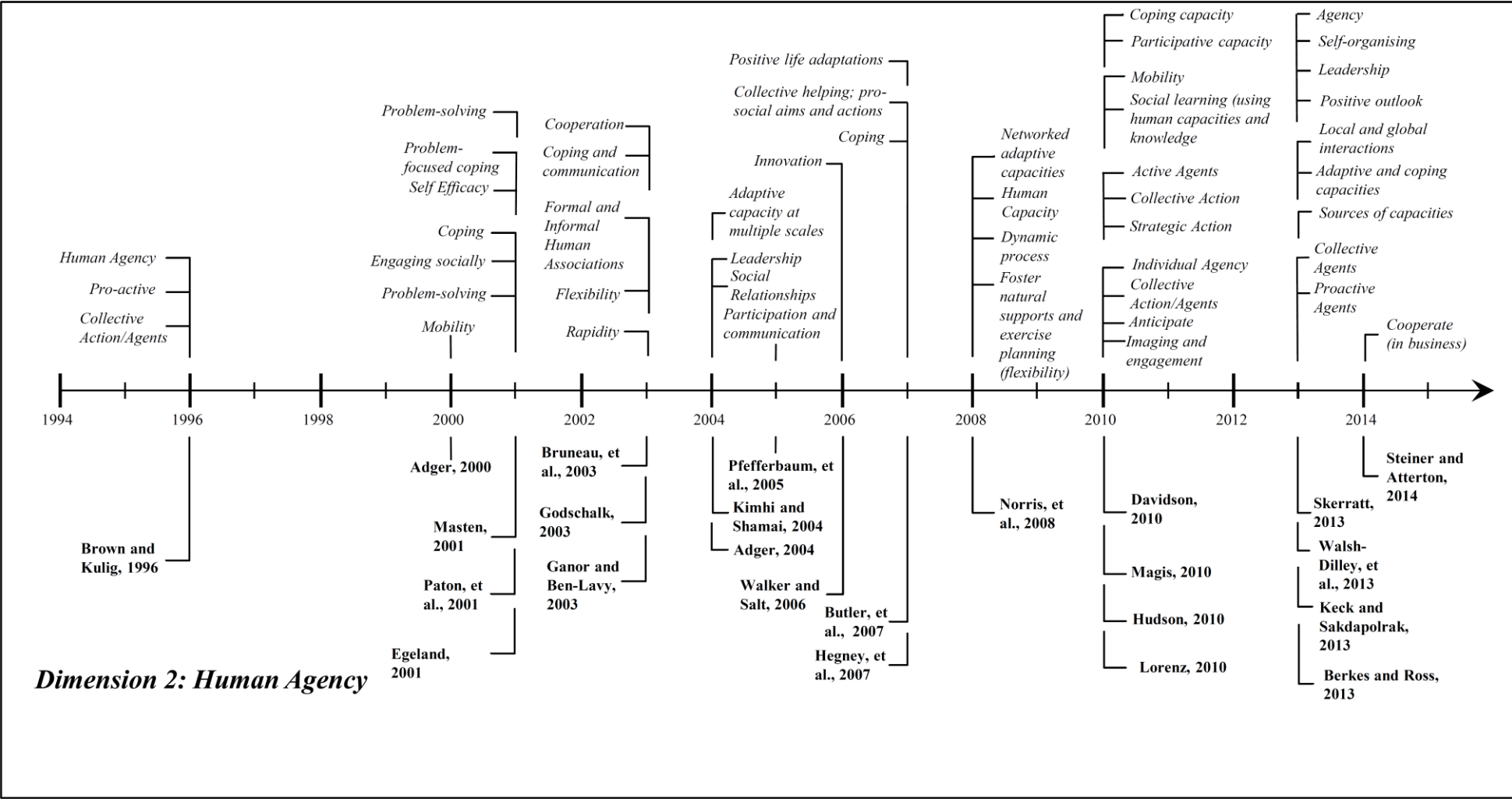


Figure 2 - 2 Dimension 2: Human agency

The concept of human agency, specifically proactive agency, is critical to social resilience, and is emphasised in the majority of the literature and its critiques (e.g. Davidson, 2010; Egeland *et al.*, 1993; Skerratt, 2013). Berkes and Ross (2013) emphasise self-organising, while Keck and Sakdapolrak (2013) also highlight both adaptive and coping capacities. This is supplemented by the discussion surrounding the need for leadership, problem solving and ultimately what Paton *et al.* (2001) call self-efficacy.

While much of the literature reflects on individual agency, the multi-scale nature of resilience emphasises that agency is also relevant at the collective scale (Brown and Kulig, 1996; Magis, 2010; Skerratt, 2013). Butler *et al.* (2007), for example, highlights the concept of collective helping, maintaining pro-social aims and actions. Lorenz (2010) also highlights adaptive capacity, focusing on coping capacity (short-term response) and participative capacity (collectively self-organise). Walsh-Dilley *et al.* (2013) also draw our attention to giving too much attention to 'local capacity', privileging it to the extent that it lays responsibility for all actions on local people. Rather, social resilience must address additional larger scales in order to recognise the ways in which the adaptive capacity of individuals and group is constrained by a variety of structures. This is similarly discussed by Keck and Sakdapolrak (2013), who highlight that while 'local' is a crucial level of analysis, social resilience must be considered as a *product* of local and global interactions (as well as scales in between).

The capacity to strategise is also prevalent here. Keck and Sakdapolrak (2013), in their representation of resilience, highlight transformative capacities, which they illustrate as the ability for social actors to craft institutions and foster individual welfare and sustainable societal robustness in the event of crises, relating to actors taking strategic action. Magis (2010) similarly identifies strategic action. Davidson (2010) highlights the concept of 'anticipating' as relevant due to the fact that social systems are able to exercise planning and flexibility in resource development and use (Norris *et al.*, 2008). Skerratt (2013) pushes the idea forward in stating that developing and identifying resilience is a process, not an outcome or position, supported by Norris *et al.* (2008) who state that it is dynamic. This, in turn, reflects that maintaining mobility and flexibility, represented by Hudson (2010) and Godschalk (2003) respectively, is relevant for social resilience. Therefore, I argue that becoming more resilient is a flexible process which can take a variety of pathways.

The third dimension, equity, is now depicted in Figure 2 - 3.

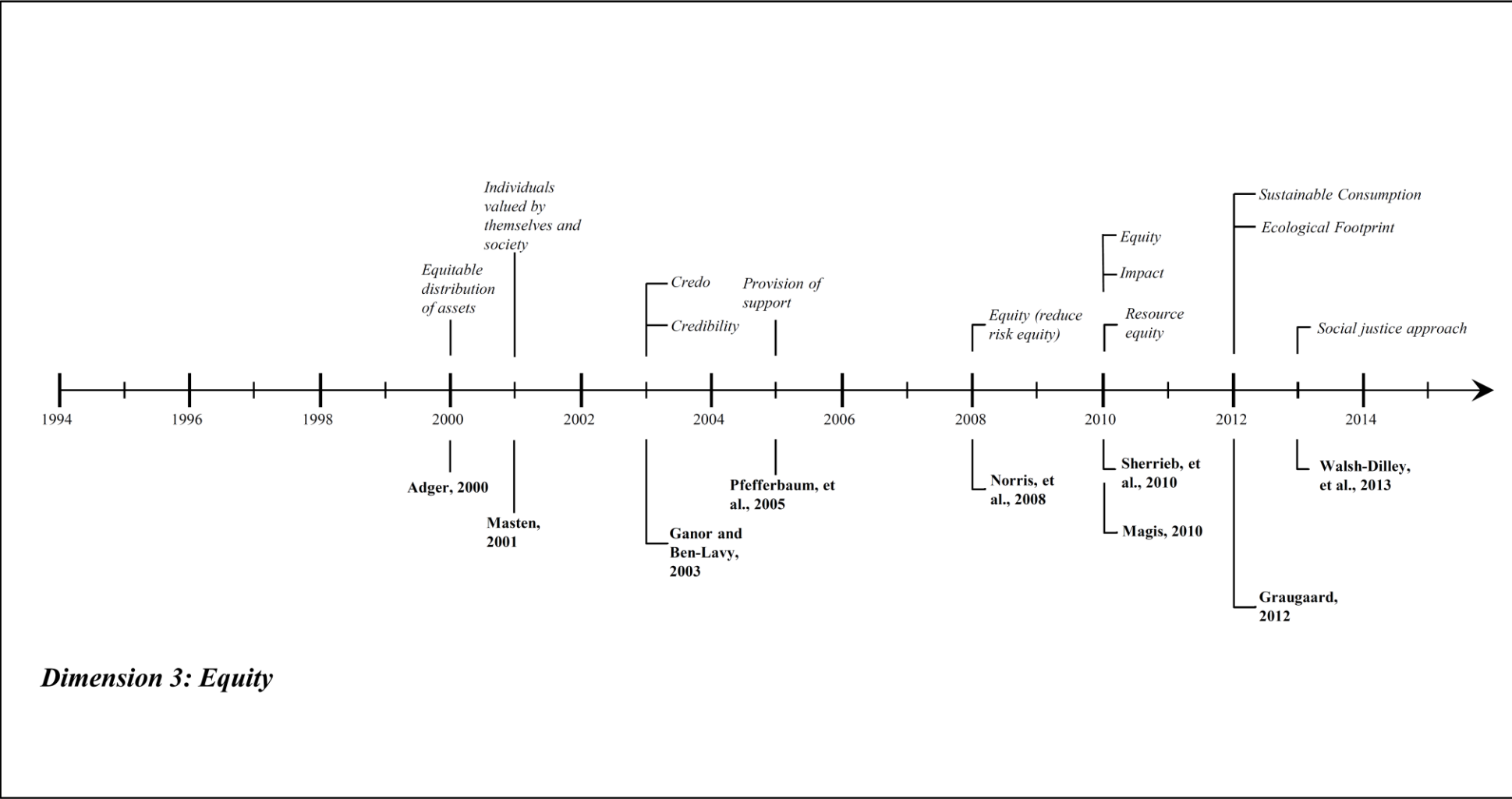


Figure 2 - 3 Dimension 3: Equity

Equitable development, particularly with respect to access to resources, is highlighted within the social resilience literature. Graugaard (2012) in a study about local food in a city in the UK, highlighted elements of equitable distribution of food and agricultural assets and impact, discussing sustainable consumption and ecological footprints: equity applicable to a global scale. Adger (2000) identifies equitable distribution of assets as relevant for resilience of a social system, while Magis (2010) and Sherrieb *et al.* (2010) identify the need for resource equity in general. Norris *et al.* (2008) similarly highlight the need to reduce risk equity for communities in order to enhance resilience. Finally, Walsh-Dilley *et al.* (2013) also highlight equity as central to a responsible, social justice approach to resilience. They emphasise that while a lack of equality would illustrate failed resilience, the presence of inequality itself diminishes the possibilities for resilience building, illustrating the complexity to analysing resilience.

Finally, social resilience is a spatial term, often explored within a specific geographic scale or scales. For this reason, the fourth dimension is the sense of place, reflecting place-based characteristics and the influence of place-based social bonds. This is illustrated in Figure 2 - 4.

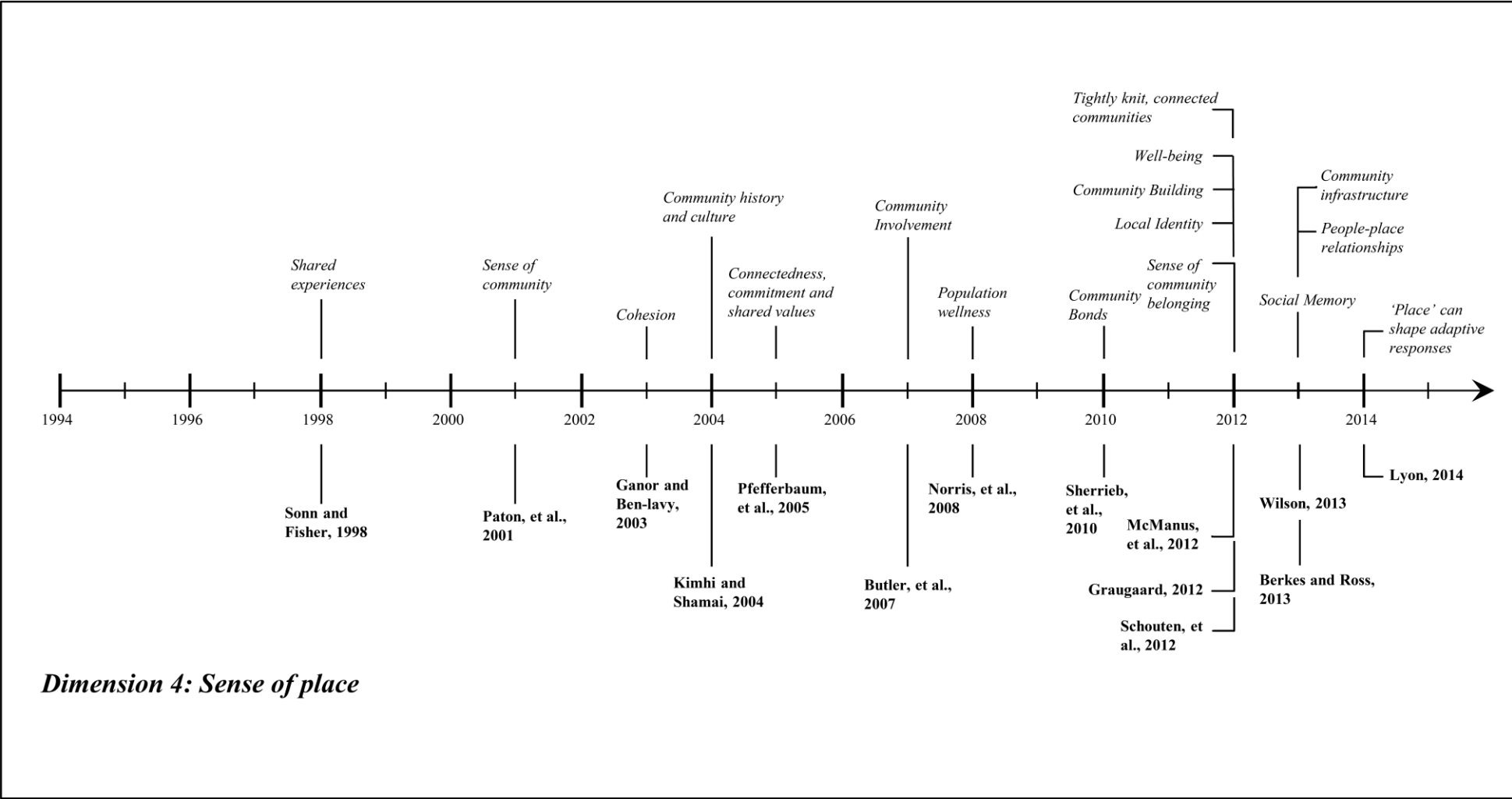


Figure 2 - 4 Dimension 4: Sense of place

The final dimension of social resilience is sense of place, or place-based values and memory, identified across a range of social resilience literature. Recent academic debates have identified that social resilience must be understood or analysed within ‘place’ (e.g. Lyon, 2014). Shared values, and in some cases shared experiences, could engender more community participation to contribute to resilience, and people-place relationships are considered exceedingly relevant to community resilience (Berkes and Ross, 2013; Butler *et al.* 2007; Pfefferbaum *et al.*, 2005; Sonn and Fisher, 1998). Lyon (2014) asserts that ‘place’ can shape people’s adaptive responses, and therefore must sit centrally to properly engage with social resilience. Berkes and Ross (2013), for example, identify specifically ‘community’ infrastructure as a component to resilience building. Sense of community belonging (McManus *et al.*, 2012) in farming communities was strongly linked to the ability of a community to react and transform through change. Wilson (2013), in his discussion of resilience following the Christchurch (New Zealand) earthquakes in 2010 and 2011, similarly identified ‘social memory’, the accumulated wisdom, knowledge, skills and experiences. He found that within a community this social memory was integral to building successful pathways of resilience. These research findings identify that place-based history and local identity can be a strong factor in resilience. This thesis seeks to incorporate the importance of place within resilience by addressing the community and community scale in the framework developed for the research. This research will function at both the rural community scale and the individual scale.

From this literature, as well as the toolkit motivations, I have designed the following conceptualisation of social resilience, designed to incorporate the concepts of capitals, capacities and agency, both individual and collective, equity, and place to be used throughout this doctoral research:

1. Dimension 1: Resources

- *Presence of resources – both physical and social structures.*
 - The presence of capitals, physical, constructed and natural environmental components of a community, as well as the presence of human associations, community and individual know-how and knowledge will be able to provide the stepping stones for resilience capacity building.
- *Capacity to develop and/or adapt resources.*
 - The capacity of a community or individual within the community to actively seek out, develop resources to ensure adaptability or future use (that may involve unintended use as well).

- *Capacity to engage and interact with resources.*
 - The ability of a community or individual to consciously choose when and how to utilise resources, network, and make decisions in response to change.

2. Dimension 2: Agency

- *Human agency and self-efficacy.*
 - The ability of humans to act of their own volition and with the intention of furthering oneself individually.
- *Networked, or collective agency.*
 - The ability of the community, or grouped individuals, to act of its own volition with the intention of furthering the collective group. This refers to not only the action taken within a community group or groups, but also the linkages a community holds externally.
- *Capacity to anticipate, strategise actions.*
 - The ability for communities and individuals to anticipate, imagine, and strategise actions to best capitalise resources, skills within the community at appropriate times, and into the future.
- *Capacity to maintain mobility and dynamism within social and physical structures.*
 - The ability of a community or individual to maintain flexibility of resources as a best method for responding to uncertainty.

3. Dimension 3: Equity

- *Encouragement of equitable distribution of assets.*
 - Equity across a community in both physical and social assets to ensure the most effective response to change at the individual and collective level.

4. Dimension 4: Sense of place

- *Sense of community bonds and cohesion (shared culture and vision).*
 - The sense of place, place-based bonds, social memory and community connectedness can influence involvement and interest in community activities and developing adequate resources to respond to and influence change.

Each of these dimensions can be articulated within communities, and the situational, place context (type of community, economy, and so on) can be locally applied and understood. From this, an understanding of social resilience within a community in the context of ongoing change can be developed. These dimensions are illustrated in Figure 2 – 5.

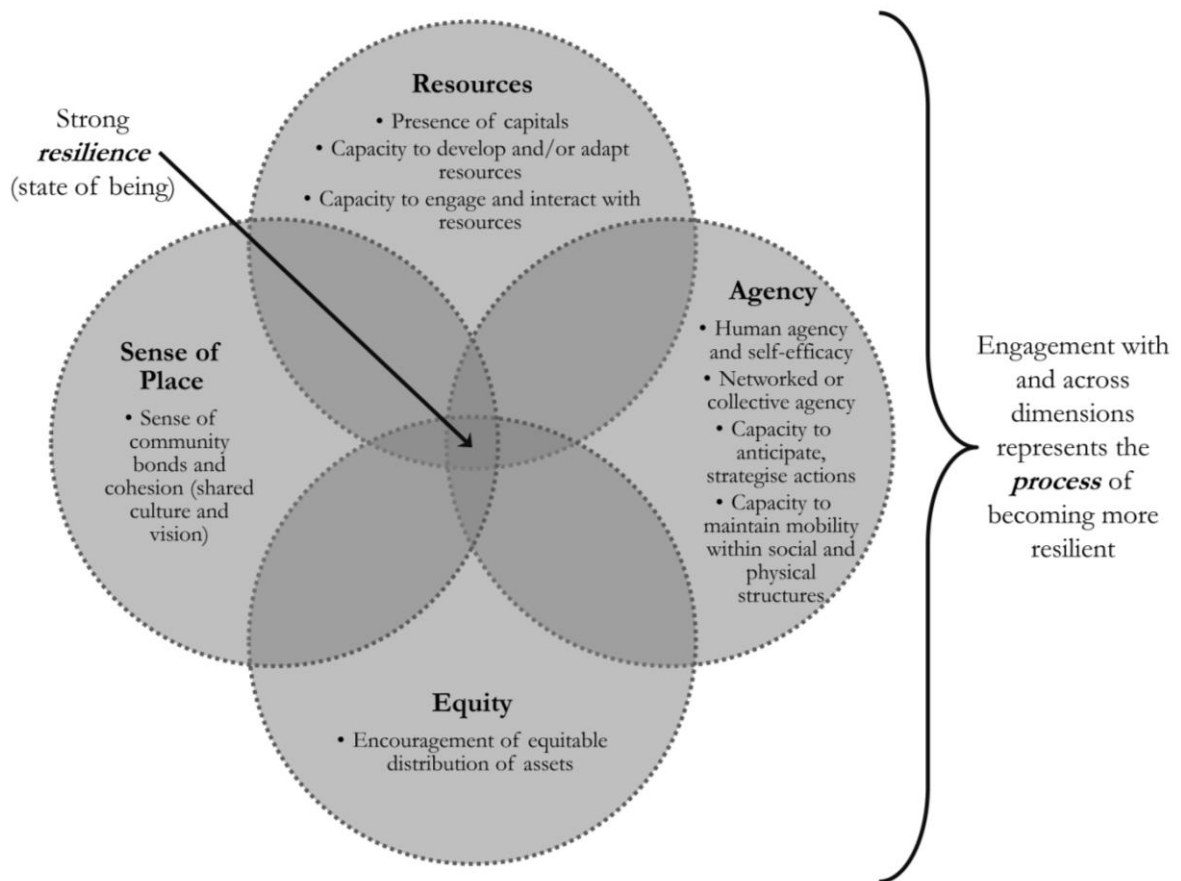


Figure 2 - 5 Dimensions of resilience

The more convergence between these qualities in everyday situations, and cumulative development over time (the process of becoming resilient), the more likely a community is to reach a state of strong resilience, and the less likely the community is to face prolonged dysfunction. As Newman and Dale (2005) state concerning the challenges facing modern society: “they are messy, wicked problems beyond the capacity of any one group, sector...” (n.p). The conceptualisation of resilience is thus developed to guide not dictate, and both localised and extra-local variables, individual and collective, must be taken into account to identify and achieve resilience.

To reiterate, I also take the view that change is constant (e.g. Keck and Sakdapolrak, 2013; Magis, 2010; Skerratt, 2013; Wilson, 2012a) and therefore I am not constructing resilience in the context of a specific rupture, natural disaster or other one event, but rather assuming that communities are constantly in flux and facing degrees of uncertainty. The differing degrees of uncertainty and vulnerability will be best responded to as the links between the resilience dimensions are strengthened within the community over time, and at multiple scales. I also

acknowledge that resiliency processes can be achieved through planned and unplanned decisions (Skerratt, 2011b). Becoming resilient is therefore a dynamic process.

2.7 Conclusion

From the origins of resilience theory in physical sciences and parallel psychological research, to its introduction to the social realm and the relevance of ‘community’, this literature review has developed social resilience as a conceptual framework. As demonstrated, social resilience can be characterised by multiple dimensions including resources and resource development, human agency, equity, and sense of place, and is ultimately considered an ongoing, long-term process. While some researchers have critiqued its place in human geography, I argue alongside Scott (2013) that social resilience provides alternative policy narratives for rural development practice and is a useful tool for understanding the processes of community development. By focussing on the interactions between individual and community scales within social resilience, this doctoral study contributes to our understanding of the impact of scalar interactions within community development. The domain for this application of social resilience analysis will be the introduction of community-led superfast broadband installation and use in rural areas.

Chapter Three will now introduce this digital dimension of the doctoral research. It will focus on the interplay between broadband technology and social resilience, specifically outlining the potential impacts of broadband services for individuals and communities, and how that can link to social resilience theory. This will continue to highlight the place for this doctoral research in wider academic scholarship and show how a novel contribution is being made.

3 THE INTERPLAY BETWEEN BROADBAND TECHNOLOGY AND SOCIAL RESILIENCE

3.1 Introduction

Broadband Internet⁴ is theorised to enhance individuals' social and economic capacities, as well as positively influence community wellbeing and, ultimately, social resilience (DCMS, 2010; Skerratt *et al.*, 2012). These potential benefits are often amplified when discussing broadband access for rural economy and society. This heightened attention is due to existing features common in rural areas, such as smaller and more dispersed populations, limited public service provision, and physical distance to markets, governance institutions, information and other resources, all of which degrade the ability for individuals and communities to engage with wider economy and society (Skerratt *et al.*, 2012). Broadband is therefore situated as a tool that provides the potential to overcome these issues (Townsend *et al.*, 2013).

The potential impact of broadband has been investigated across a range of academic and policy literature. Koutroumpis (2009) analysed the influence of broadband access on economic growth using OECD data sets and found that there was a significant link between economic growth and broadband use, specifically when a critical mass of infrastructure was present. In order to effectively see growth, his results supported that half the population must have access to broadband. LaRose *et al.* (2011), in their USA-based study, analysed the impact of rural broadband Internet investment. They found that awareness, adoption and perceptions of the benefits of broadband increased over time. However, there was no concrete result demonstrating an increase in positive economic development opportunities or an increase in satisfaction in one's local community. Galloway (2007) analysed the early potential for broadband access to 'rescue' the rural economy. At the time of publication, she found that the limited availability of broadband services for rural communities limited the technology's effectiveness for economic stimulation. These multifaceted findings emphasise continued ambiguity when trying to understand the impact of broadband adoption and use upon communities and, more specifically, rural communities.

⁴Appendix I contains a Glossary of all technical terms used within this thesis. 'Broadband' is not a precise term, nor is there a universally accepted definition. Ofcom (2013b) describe it as Internet that is always on, high-speed, and is significantly faster than earlier dial-up technology (see also Skerratt *et al.*, 2012). Gillett *et al.* (2004) describe 'broadband' access as having "a noticeable improvement over standard dial-up access, and, once in place, is no longer perceived as the limiting constant on what can be done on the Internet" (p. 538). 'Broadband' and 'broadband Internet' are treated as synonymous throughout this thesis.

These issues remain relevant for the installation and adoption of the latest generation of broadband, ‘superfast’ broadband, which is broadband access that delivers headline download speeds of 30Mbit/s or above. Current digital policy strategies in the UK promote superfast broadband installation and adoption in an effort to achieve wide scale broadband benefits for the UK economy and society. National goals are currently in place, with the aim to enable 95 percent of premises with superfast broadband by 2017 (Ofcom, 2013a), and to make broadband of at least 100 Mbit/s available to ‘nearly all UK premises’ (HM Treasury and DCMS, 2015). Despite this momentum for increased superfast broadband access at many government levels in the UK, few studies have explored the influence of superfast broadband installation processes and use on rural communities. Recent studies in Cornwall and Scotland have begun to address the impacts of superfast broadband use in the rural business context (e.g. Laco  e and Phippen, 2013 and Townsend *et al.*, 2015 respectively). However, there has been little detailed discussion on how installation practices were impacting upon the adoption and use of superfast broadband in communities more widely.

Compounding these issues is the challenge of rural broadband provision. Research has shown that rural areas remain underserved with respect to broadband Internet accessibility. This is primarily due to the prevailing neoliberal ideology and regulatory approach of the telecommunications industry, which ultimately diminishes rural communities’ ability to engage with any broadband-derived benefits (Philip *et al.*, forthcoming; Reisdorf and Oostveen, 2015; Simpson, 2010; Sutherland, 2015). Public intervention, primarily structured as national subsidies, is active across the UK to respond to this rural market failure and ensure superfast broadband can be delivered. Complementing these programmes are grassroots initiatives, rural community-led broadband initiatives that have emerged to respond to their lack of broadband connectivity locally (Buneman and Hughes, 2013; Wallace *et al.*, 2015). These community groups, as a method of superfast broadband installation for rural areas, are little understood in the context of wider telecommunications policy. So while UK digital policy strategies seek to realise potential digitally-related economic and social benefits by promoting superfast broadband connectivity, it is critical to first further our understanding of *why* and *how* people seek out, install and use broadband and the potential relationship it has with social resilience. This doctoral study specifically focuses on community-led superfast broadband installation processes and use in rural areas to respond to the lack of nuanced knowledge. This study will provide a robust analysis to contribute to the current superfast broadband policy landscape.

This chapter introduces these digital dimensions of the doctoral research, describing the interplay between broadband technologies and the developed framework of social resilience. Four areas of research form the basis of this chapter. It will outline: 1) the literature on broadband as a sociological construct (Section 3.2); 2) the literature on broadband in relation to ‘social resilience’, ‘community’ and ‘rurality’ (Section 3.3.); 3) the technical landscape of broadband installation in the UK with particular emphasis on rural installation practices (Section 3.4); and 4) the development and typology of community-led broadband operational models (Section 3.5). It will then set out the research questions of this doctoral study, which seek to guide analysis on community-led superfast broadband initiatives in rural areas through the developed social resilience framework (Section 3.6).

3.2 Framing the influence of broadband

Understanding the impact of broadband Internet accessibility and use, particularly for rural regions, is a critical part of contemporary socio-technical literature. The use of a social resilience perspective can provide alternative analysis and nuanced findings to contribute to academic scholarship. Broadband is generally recognised as having an impact upon multiple sectors including the economy and society and the provision of public services. This includes assisting entrepreneurs, providing new business and employment opportunities, supplementing existing social connections, offsetting public sector funding cuts through activities such as increasing online engagement with healthcare professionals, and integrating local travel information online (Anderson, 2008; Fourman, 2010; Galloway, 2007; Galloway *et al.*, 2011; Skerratt *et al.*, 2012). Theoretically, these impacts are often presented as initially so profound that they usher in a new era in industrial societies, often termed the *Information* or *Network Society* (Castells, 1996, 1997; Wallace, 2012). Spatially, these beneficial impacts of broadband are thought to aid rural communities in responding to change and disruption, and therefore potentially influence their social resilience. In relation to rural areas, changes can include depopulation, a loss of, or a disinclination to develop public services for small populations, economic deprivation and demographic ageing (e.g. Bosworth and Willett, 2011; Delfmann *et al.*, 2014). These changes, as well as the inherent rural features discussed in the introduction such as distance to governance institutions, require individuals and community groups to be proactive, and be able to adapt new practices (i.e. be resilient) for their rural community’s future.

To begin to understand the potential role for broadband in the creation and promotion of social resilience, it is critical to discuss broadband as it is socially constructed. This section will address three mainstream discourses of broadband Internet technology. Firstly, the concept of

broadband as a market good will be reviewed, firmly placing the understanding of broadband in an economic context. Secondly, it will be discussed as a utility, an emerging discourse that equates its installation and operation to that of electricity, water and others. Finally, broadband Internet will be discussed as a right. I argue that the context of people's use and access of broadband can be derived from their understanding of its importance and meaning within social and economic realms, and conversely, use of broadband can dictate how such a technology is viewed and how it might be defined within modern society. Therefore, in order to truly understand the impact of broadband in the context of social resilience we must first understand how it may be viewed in communities.

Broadband is often perceived solely in economic terms, whereby it is a market commodity, freely available to be bought or sold on the market. In this context, affordability is a key factor in broadband diffusion (Zhang, 2013). The installation practices of broadband networks, particularly in the European Union, mirror this thinking. Broadband installation is primarily governed by market forces, whereby the Internet is deployed through a market-led approach, targeting regions that provide measurable profits to the telecommunications industry. This is theoretically underpinned by a neoliberal agenda (Briglauer and Gugler, 2013; Simpson, 2010; Skerratt, 2010). This broadband installation process entails a certain amount of complacency in continuously developing and upgrading urban networks, where high density begets profits for Internet providers, prior to rural, sparse regions being designated for network improvements and development. Research has shown that rural areas remain underserved with respect to broadband Internet accessibility due to the prevailing neoliberal market ideology in the telecommunications industry. This continues to emphasise broadband as a 'market good'. Past research on the impact of broadband has often featured economic indicators prominently, such as Gross National Product (GNP) or Gross Domestic Product (GDP) as well as employment growth (e.g. Kolko, 2012; Thomson, Jr. and Garbacz, 2011). This strengthens and proliferates the view that broadband is a market entity.

Under this prevailing free market neoliberal ideology, it is recognised that rural and/or sparse regions are not always provided for, and therefore public subsidies are often dispersed to stimulate equitable telecommunication development. This is akin to electricity and other past public utility network developments (Cave and Martin, 2010; Mandel *et al.*, 2012). This has led to the portrayal of broadband as a utility in itself. It fulfills common characteristics of a utility including necessity, reliability, usability, utilisation, scalability, and service exclusivity (Rappa, 2004). The *expectation* of broadband availability is also not unlike the dependence on affordable

and readily available electricity, heat, or water (Crawford, 2013; Rappa, 2004). In the United States of America, there has been a recent call to consider broadband in terms of public utilities, a method that would make it difficult for providers to restrict the best access. However, critics of such a stance argue it is anti-free market, moving too far away from neoliberal ideology and providing too much power to government (Chambers, 2014). In terms of operation, the dispersal of broadband is also often modelled and paid for in the same manner as a conventional public utility business: using either a metering process or, more commonly, a subscription model (Rappa, 2004).

A new, distinct, discourse of broadband has evolved, moving it beyond the concept of utility, and into a right (Skerratt *et al.*, 2012; Townsend *et al.*, 2013; Tully, 2014). Broadly, rights can be understood as those that arise from our human existence, our instrumental rights, and those that arise from legal, contractual agreements within the political sphere (Wenar, 2011). Broadband Internet technology is quickly becoming entrenched in people's societal and economic interactions, has a range of political, economic, social and cultural uses, and as such, the concept of accessing broadband as a right is gaining momentum (Tully, 2014). Finland has declared Internet access to all a citizens' subjective right, creating a legal requirement of 1 megabit per second (Mbit/s) provision. The government likens it to water or electricity; the Internet is something you cannot live without (Skerratt *et al.*, 2012; Townsend *et al.*, 2013). In the UK, a recent policy directive has increased the Universal Service Obligation of Internet, the legal entitlement of a basic service, from dial-up Internet⁵ (not 'always on' Internet service) to 5Mbit/s broadband Internet. This means all consumers in the UK have a legal right to request 5Mbit/s capable services at an affordable price (HM Treasury and DCMS, 2015). However, it does not make broadband access a subjective right. While the characterisation of rights is hotly debated (e.g. Hynes *et al.*, 2010; Wenar, 2011), creating rights for broadband access can be viewed as a route to ensure that in the digital realm "everyone is treated as a full and equal member of society" (Kymlicka, 2002, p. 287).

A strand within this 'rights' debate centres on the potential for broadband to be a *tool* to allow people to exercise their rights, be they human or civil, rather than a right itself (Cerf, 2012). Barry (2013) states that Internet access in general is increasingly instrumental to the provision

⁵ Dial-up Internet access is no longer a realistic option for getting online in the UK. It is often called 'narrowband Internet' and is Internet access that uses public switched telephone network (PSTN) to establish a connection to an Internet service provider via a normal telephone line. Typically, it is understood to reach up to 56kbit/s speed. Main difference from broadband, beyond the speed, is that this service is not 'always on'. The normal telephone cannot be used while connected to the Internet (Skerratt *et al.*, 2012).

of economic rights, including the right to work. In the UK policy context, the Digital Britain report states that for rural individuals, the Internet, "...can bring huge new opportunities for engagement and participation" (BIS, 2009, p. 7). This reflects the concept that broadband access can be used for civic participatory action, enabling democratic dialogue, a civic right. Tully (2014) effectively summarises this movement, stating that, "the notion of universal access to Internet services at an affordable price is increasingly reflected in international public policy" (p. 194). This places broadband Internet within a human rights orientation. Nevertheless, it does not make broadband a standalone 'right'. This understanding of broadband, I argue, results in it being seen as a universal service, an enabler of rights, and of increasing importance in modern society.

These three characterisations of broadband, as a market good, a utility, or a right, frame the importance individuals place on broadband use and access, which can potentially mediate the influence of broadband for social resilience. The following section will directly relate the potential role for broadband to the developed framework of social resilience.

3.3 What is the potential role for broadband within social resilience?

This section will explicitly discuss broadband Internet within the context of the conceptual framework of social resilience. This serves to further the understanding of the potential influence of broadband in rural communities. It is at this point that I also focus on specifically fixed-line broadband, which is at the core of this doctoral research. Fixed-line broadband is the most common method to connect to the Internet⁶, and will be discussed in a detailed applied manner in Section 3.4.1.

Social resilience reflects four dimensions: resources, agency, equity, and sense of place. To reflect on the first dimension of resources: broadband in itself is tangible infrastructure, a resource that can be accessed by individuals and members of a rural community to address any number of issues. It can also be used to provide access to resources or various capitals. In particular, knowledge acquisition and personal skill set development can be enhanced through broadband use. Mack and Faggian (2013) note the relationship between productivity and broadband using econometric modelling and ascertain that broadband alone does have a positive impact on regional economies productivity. This was mostly noted in relation to areas

⁶ Fixed-line broadband can be accessed through the following methods (adapted from Ofcom, 2013a, 2013b; Skerratt *et al.*, 2012):

1. ADSL Technology: services run over home telephone lines (copper cables), up to 8 Mbit/s.
2. ADSL +2 Technology: services run over home telephone lines (copper cables), up to 24 Mbit/s.
3. Fibre-optic Broadband: services delivered through flexible, thin glass pipes called using waves of light, generally regarded as the successor to traditional copper cabling.

that also have high levels of human capital. Using social resilience theory is beneficial to disentangle these concepts of resources and resource acquisition to contribute to understanding why people use broadband, and how they access it. With respect to the second dimension, human agency, it has been noted that being able to produce and engage with online content through broadband access could provide personal, psychological empowerment, which in turn can enhance individual proactive capacities (e.g. Leung, 2009). Equality is often prevalent when considering education and economic opportunity. Broadband access can equalise education and economic opportunities for individuals, an aim that historically has had varied results (e.g. White and Selwyn, 2012). In terms of the final dimension, sense of place, broadband can influence and alter social connections and community of place, and place effects are considered highly relevant when discussing technology inequality (e.g. Mossberger *et al.*, 2012). Finally, broadband, in relation to the development of social resilience, is a reflection of, and embedded within, the political, economic, and cultural environment or community in which it is developed and used (Watling, 2012). Daniels (2013) emphasises the historical social structures that are inherent in all aspects of Internet studies, from infrastructure to programming, to delivery and adoption. Yet, these potential power relationships which could influence broadband use and access are rarely considered centrally in UK-based digital exclusion/inclusion research. Gurstein (2013) investigated the role of power, and how Internet, and broadband networks in general, can centralise power, “sustaining the dominant position of commercial and governmental institutions in society” (p. 2). Through the use of ‘social resilience’ as a framework to analyse these multiple broadband impact pathways experienced in rural UK, this doctoral thesis can probe all such issues in a detailed and robust manner, contributing to academic literature.

As emphasised, ‘community’ continues to play a role in understanding broadband, a discussion begun in Chapter Two in relation to social resilience scale. The following section will outline the debate surrounding ‘community’ and broadband. I will then briefly outline what is understood by the terms ‘rural’ and ‘rural communities’, which are the geographic context within which broadband is being analysed, establishing the relevance of using social resilience as a conceptual framework for this doctoral research.

3.3.1 Broadband and community

Chapter Two began a discussion about ‘community’, and its relationship to social resilience theory as an entity, i.e. ‘community resilience’. This section will further that discussion and develop understandings of community in relation to broadband technology to fully situate the scale of this doctoral research. A physical ‘community’ can influence how broadband may be

accessed and used and broadband access and use in turn can change ‘community’ dynamics. The debate around broad technological change and ‘community’ has long been discussed in academic literature, and was reignited following the rapid introduction and dissemination of the Internet (e.g. Hampton and Wellman, 2003; Wellman and Haythornthwaite, 2002).

Firstly, research concerning broadband and community often emphasises the role of spatiality in broadband access. Haythornthwaite and Kendall (2010) discuss that use of ICTs in general reinforce geographically based community identities, directly relating to a ‘community of place’. In Dutta-Bergman’s (2005) research on access to the Internet and community participation and satisfaction, she found similar links, and highlighted that the Internet as an information resource empowered individuals and produced a greater level of satisfaction and participation with the community in which they live. This thread of participation within a community through broadband access has been extensively studied (e.g. Elin and Davis, 2002; Hansen *et al.*, 2014; Mossberger and Tolbert, 2012; Ognyanova *et al.*, 2013). These authors highlights broadband, and information and communication technologies (ICTs) in general, as a source of information exchange and a place for public representation, acting as an online substitute for a physical space (Hand and Sandywell, 2002). Similarly, broadband may act simply as a means of communication, alongside phones, cars and so on, which facilitate contact with existing community members and augment existing relationships (Hampton and Wellman, 2003; Haythornthwaite and Kendall, 2010). This demonstrates that physical spaces, or communities, can remain central when discussing the adoption and use of broadband, and associated knock-on benefits.

Secondly, existing research has also hypothesised that broadband use can alter physical community spaces and serve to create new, online communities, or ‘communities of interest’, not tied to a location (introduced in Section 2.3.1). This plethora of alternative research has identified the potential for the Internet, a continent-spanning, global tool, to *diminish* interaction and participation at the local, neighbourhood level, and open up the “possibility that community would fragment into new virtual realities of shared interest that negated the necessity, even the desirability, of shared corporeal existence” (Hampton and Wellman, 2003, p. 277). Putnam (1995), using displacement theory, found that media consumption could reduce individuals’ participation in their communities. Thus, the Internet was thought to deplete social capital, which has been developed as a critical part of social resilience (Wilson 2012a). Hampton and Wellman (2003) highlight this potential weakening of private (relationship with friends, colleagues) and public (public place gatherings, involvement in civic

organisations) community through Internet use as online ‘communities’ proliferate. The literature finally highlights how the Internet may lead to novel kinds of virtual spaces and social life (Kirmayer *et al.*, 2013). In this manner, it can rekindle past social networks or ‘communities’, former friends and past acquaintances (Capece and Costa, 2013), particularly by midlife and older adults (Quinn, 2013). This process can contribute to a new sense of community and life satisfaction through interacting with social networking sites online (Oh *et al.*, 2014).

Wilson *et al.* (2015) demonstrates the complexity of these many pathways of the influence of broadband access and online interactions on a physical community through an analysis of island bloggers in Scotland. The authors found a high degree of interaction within each island, between the islands, and with the outside world (demonstrating the creation of new ‘communities’). However, new associations with other islanders, based on a common islander identity (representing a physical community of place), were primarily sought through digital connectivity. In this case, therefore, “the physical and metaphorical boundaries of island social life are not so much crossed and broken as flexed and stretched by the possibilities of the digital world” (p.1).

Overall, these research findings represent two strands concerning ICTs and ‘community’, which remain relevant when reflecting on specifically broadband and community. The first strand focuses on highly-local, geographically oriented broadband use which can contribute to community development. The second strand focuses on online-only, virtual experiences, which can in turn alter physical community life and lead to the creation of new communities of interest, where spatiality does not play a central role (Haythornthwaite and Kendall, 2010). Contemporarily, research has found that “...people are using the Internet in ways that are driving change in communities – specifically, where and how they are constituted – and creating transformative effects on how we define, attach to, and retain communal identity across online and offline venues” (Haythornthwaite and Kendall, 2010, p. 1083). The Internet, and more specifically superfast broadband, is linked to and can potentially influence local community of place, and therefore it remains relevant for research. This doctoral study embraces the complexity of broadband and community relationships and seeks to specifically, using social resilience theory, identify potential impacts of broadband installation practices on individuals’ community of place as well as provide an illustrative analysis of the potential transformative influence of broadband use on the many other types of ‘community’.

The concept of 'rural' will now be discussed to lay out the nuanced geographical and development context for such communities.

3.3.2 Broadband and rurality

This doctoral research considers rural community case studies and policy in the UK, and thus it is essential to establish a more detailed understanding of the rural and urban dynamic in the country. Appendix II presents the official urban-rural classifications currently in use by the four constituent nations of the UK (England, Scotland, Wales and Northern Ireland). While these definitions are intended to be operational, they do provide more than simply a binary between urban or rural and acknowledge that those living in remote locations may have different needs than those living within a close proximity to a city or large town (e.g. Grimes, 2003). These quantifiable definitions take into account population density, population size and proximity to larger centres (Pateman, 2010). Critically, these rural/urban definitions, or lines on a map, are important as they shape public policy and market intervention, even if the social perceptions of living in such locations differ from the assigned classification.

In many ways, these definitions are a method to operationalise a more theoretical understanding of rural and rurality (Farrington and Philip, 2009). In the academic literature, 'rural' has been extensively investigated, and as a consequence, is considered a mobile and malleable term (Cloke and Thrift, 1994). The term 'rural' is broadly understood to have no clear definition (Woods, 2005). It can be broadly conceptualised by drawing on functional attributes, economic approaches and social representations. Cloke and Thrift (1994) outline the growth of 'rural' understanding, highlighting these phases of rural representation. The first phase was the consideration that rural was equated to particular spaces and functional attributes. Rural, could then be clearly identified due to the lack of features or conversely the presence of other features (e.g. agricultural land use). This mirrors a discussion by Halfacree (1993), which emphasises understanding 'rural' through observable and measurable socio-spatial characteristics: a description rather than definition of 'rural'. These functional understandings of rural consequently underpin the definitions used by government due to their measurable nature.

The second phase discussed by Cloke and Thrift (1994) introduced pragmatic concepts linked to political economic approaches. Rural change was increasingly linked to national and international economy, and the 'causes' of change were located externally to the functional rural areas, leading to a need for interaction between networks to address rural challenges. This phase is again linked to the operational definitions provided by political bodies within the

UK, emphasising functional attributes. Halfacree (1993) also discusses defining rural by people's socio-cultural characteristics, or the manner in which people's socio-cultural characteristics vary with the type of environment in which they live. This inherently assumes a link between social and spatial attributes.

The third phase from Cloke and Thrift (1994) moved away from these spatial linkages, and discussed the inability to identify a single, unified 'rural' space. They importantly presented that rurality should be seen as a social construct. Halfacree (1993) also argues for the distinction between 'rural' as space and 'rural' as representing space, highlighting that attention should shift from a concentration on tangible space to the non-tangible space of 'social representations'. 'Rural' is then situated within wider social science thinking, and social constructs of 'rural' are increasingly thought of outside of the relationship with a functional, geographic space (Cloke and Thrift, 1994). Halfacree (1995) also states the case for 'rural' to be an abstract 'social representation', allowing the researcher to build-up a definition of rural from individual respondents. Halfacree's (1995) discussion on representations of rurality contains aspects of the rural 'idyll', which traditionally underlines peaceful, healthy, pastoral and flourishing representations of rurality. However, his work emphasised new critical reflection when considering rural living. Marsden (2006) stresses this idea of rural as a social construct as a 'refreshing' component of rural research, and states that rural research "now has a confidence to both incorporate and develop broader social science conceptualisations and political and economic frameworks..." (p. 16). 'Rural' is therefore discussed on a spectrum, rather than a functional dichotomy with urban (Woods, 2005). In order to address its ambiguities, 'rurality' is often discussed as a social or cultural construct, meaning that "rural researchers now try to understand how particular places, objects, traditions, practices, and people come to be identified as 'rural'..." (Woods, 2005, p. 15).

While the definitions used by governmental bodies are critical as they inform associated policy measures, a feature which is particularly relevant for subsidised broadband installation, they are inherently lacking this non-tangible understanding of 'rural' developed in the academic literature. As Salemink and Bosworth (2014) summarise, the rural "is a diverse spatial entity with many different social groups and stakeholders...the diverse set of elements can cohere around a common problem, but are just as easily in conflict..." (p. 6). Within rural development practice, for example, in this case community broadband development, these authors highlight the need for interplay between local, rural actors, and exogenous, external actors and networks, a process that is termed neo-endogenous development. This links to the

idea of 'rural' change being influenced by national and international economies, presented by Cloke and Thrift (1994). Similarly, in more general rural development research, 'bottom-up', place-based development is identified as important, but can be undermined by national or international policies. This again highlights the relevance for both local and extra-local actors and resources for rural development, what has been termed 'networked' rural development (Shucksmith, 2012). This chimes with resilience research, which highlights the interplay of resources, and capacity to identify and harness resources at multiple scales, internal and external to its community. Resilience is considered an increasingly popular way to consider rural communities and their development, as a response to the perception of increasing volatility in rural spaces (social and otherwise) briefly illustrated in Section 3.2 (see also Walsh-Dilley *et al.*, 2013).

With this understanding of rural in place, it is important to then consider the technological implications of living rurally. Rural communities are highly susceptible to socio-economic and environmental shifts due to factors such as low population density, low density or single-industry markets, limited public service provision, and physical distance to markets, governance institutions, information, labour and other resources, all of which weakens the ability for individuals and communities to engage with wider economy and society. Digital connectivity in general is positioned to ameliorate the friction of distance, allowing such individuals and communities to engage instantaneously online with physically distant services (Townsend *et al.*, 2013). In terms of the potential influence on rural individuals or households, broadband can contribute to social connections, education and government services accessibility, and provide alternative means of access for ageing populations and remote households, which would otherwise be at a disadvantage. Businesses can connect for ease of everyday activities (i.e. limiting paper transactions, email, ordering supplies, and advertising) as well as creating additional avenues for growth (i.e. operating an online marketplace) and generating additional collaborations (e.g. DCMS, 2010). This is also thought to result in cost saving for the businesses and/or individuals through activities such as online accounting or being able to source the most affordable supplies or personal goods through online means (Openreach, 2014). At the community level, broadband can be used for shared activities such as engaging in, or formulating, community-wide protests, or to promote community events/meetings of civic organisation (e.g. for or against wind farms, school closures). Broadband access can also enable dynamic citizenship engagement (such as actively trying to retain public services). Peronard and Just (2011) studied broadband adoption motivation, and found that it aided the communication of local initiatives, and generated a higher level of local

activity. This is not an exhaustive outline of what broadband can be used for, but it highlights the potential for both individuals (households and businesses) and communities to use broadband. In a resilience context, then, it is relevant and significant to examine individual and community use of superfast broadband and determine, through discussions with rural residents, in real terms how and if interaction with broadband builds adaptive capacities to support future individual and community recovery and transformation.

It should also be noted that while broadband has the potential to influence many facets of life, it could not be considered a veritable cure for social change. Cammaerts (2011) examines accessibility of Internet infrastructures and states that “social exclusion is a complex phenomenon and that access to information and communication infrastructure is by no means the miracle solution to social inclusion and social cohesion” (p. 9).

In spite of the potential for communities through broadband access, rural development of broadband networks remains a persistent challenge, due to what Malecki (2003) calls the ‘rural penalty’. This reflects factors such as low population density and distance to infrastructure. The contemporary rise of neoliberal economic policies, emphasising the efficacy of competition through market forces, underscores these issues, and results in low profit areas, such as the majority of rural spaces, lacking development (Mowbray, 2010; Simpson, 2010). Neoliberal ideology has heavily influenced the telecommunications industry in the UK, and indeed the European Union. It was initially believed to lower consumer prices, provide better service quality and increase innovation in the sector (Morgan and Webber, 1986, in Simpson, 2010). Telecommunications ultimately became part of what Sutherland (2015) calls the ‘regulatory state’, with risks and rewards for innovation and development geared towards to the private sector subject to regulation, which is set out by UK parliamentary policy. While this process did result in some of the benefits, it remained problematic. This was particularly evident with the roll out of next generation networks where there remained little to no transparency over existing lead provider strategies and market failure became pronounced across the European Union (European Commission, 2007; Simpson, 2010). Sutherland (2015) emphasised that the complexity of the regulatory system is too extreme for appropriate and effective oversight and review, which contributes to this market failure. In the UK for example, rural areas rarely lead next generation technology installation. Broadband provision is aggravated by a lack of market presence due to the smaller and more dispersed populations, and physical geography challenges, such as distance from exchanges, backhaul access points and fewer street cabinets (Skerratt *et al.*, 2012). Urban broadband coverage, conversely, is

relatively stable and continuously being improved, particularly as superfast broadband roll out is cheaper to deploy in higher density areas and has been prioritised by the telecommunications industry (Briglauer and Gugler, 2013; Ofcom, 2012a; Skerratt, 2010). Those in rural areas who do gain access to basic broadband tend to suffer from slow speeds and pay the most for inferior Internet connectivity (Ofcom, 2012a). Ultimately, this exemplifies the consequences of neoliberal methods: spatial digital exclusion.

Warren (2007) defines digital exclusion as “...a discrete sector of the population suffers significant and possibly indefinite lags in its adoption of ICT through circumstances beyond its immediate control” (p. 375). These divides stem from both infrastructural access (the ‘place’) as well as socio-economic circumstances (the ‘person’) (Hindman, 2000). There have been numerous previous studies that have investigated the ‘digital divide’, both in the geographical, physical sense of divides and the social sense (limited use by elderly, young people, technology literacy and so on) including Townsend *et al.*, (2013), Armenta *et al.* (2012) Skerratt (2010), Commission for Rural Communities (2009), Livingstone and Helsper (2007) Warren (2007), Hindman (2000), and Parker (2000).

A myriad of issues perpetuate this digital divide. Firstly, the digital divide can be discussed in terms of infrastructure: rural communities are often seen to have little or no access to adequate or basic broadband, defined as at least 2Mbit/s service, due to the lacking market presence, dispersed populations and other factors (Townsend *et al.*, 2013). Yet, it is currently acknowledged that even 2Mbit/s is rapidly becoming unusable, and is inadequate to support effective digital participation (Oostveen *et al.*, 2014; Philip *et al.*, forthcoming). These cycles of inadequate infrastructure provision are also viewed as contributing factors to cycles of decline or wellbeing and prosperity (Hindman, 2000; Skerratt, 2010). Overcoming the infrastructure divide, which Warren (2007) titles ‘material access’, is a common target for policy initiatives. Recent policy directives, including increasing the Universal Service Obligation (USO) in the UK to 5Mbit/s broadband, reflects these concerns over speed divides across spaces (HM Treasury and DCMS, 2015).

Secondly, reflecting on socio-economic factors, digital divides exist due to income level, age, level of education and digital literacy (Flamm and Chaudhuri, 2007; Hindman, 2000; Skerratt and Warren, 2003). These are intrinsically bound up in other social issues, often local in nature, that make addressing them complex and less popular from a policy viewpoint (Warren, 2007). These local concerns can affect technological adoption in both rural and urban areas,

highlighted by Mossberger *et al.* (2012). Their work in the American urban context identified concentrated poverty influence, segregated neighbourhoods and differences in age across racial and ethnic groups as influential to home Internet access, emphasising the importance for ‘place effects’. It is also relevant to highlight that many individuals simply do not desire basic or superfast broadband connectivity, a factor that can be conflated and inappropriately aligned with involuntary digital exclusion. According to the Oxford Internet Survey although non-use has declined substantially, of those classed as non-users (those that do not currently have access to the Internet), 81 percent have said they have no interest in the Internet, demonstrating what they term ‘digital choice’ (Dutton *et al.*, 2013). This finding highlights that a lack of Internet does not immediately correlate to involuntary digital exclusion due to cost, access or skills.

Townsend *et al.* (2013) argue that the digital divide is therefore interplay between challenges of technology installation in harder to reach locations, the costs associated with such provision and rural characteristics, such as age and digital literacy that inhibit uptake. Age and digital literacy are not inherently rural characteristics; they reflect individual characteristics that are pronounced in rural areas because of reasons such as distinctive age profiles, access to IT training opportunity, all of which can magnify their presence in rural areas. This is true for all Internet services, not simply superfast broadband. The academic understanding of digital divides then is relatively well developed, although new studies can provide a better understanding of the divides with respect to specific technological advances. The potential impact of broadband for rural social resilience, then, could be mediated by the presence of these spatial and socio-cultural divides across rural communities.

The following section will outline in more detail the current state of broadband policy and accessibility in the UK in order to further situate our understanding of digital divides and address the relevance of analysing community-led superfast broadband in rural communities.

3.4 State of broadband development in the UK

Broadband development in the UK is supported at the global, national and regional level through several layers of policy guidance. All of these structural factors can influence the resilience of individuals and communities. At the global level, UNESCO (2010) has called for increased investment and research on broadband’s impact, arguing that increased access has the power to greatly improve lives. Recommendations to successfully harness broadband include promoting diverse applications, addressing privacy concerns, and promoting broad policy funding mandates. The *OECD Communications Outlook* (2013) highlights the potential

transformative nature of broadband access, particularly in developing new, online business models (OECD, 2013). At the European Union level, the *Digital Agenda for Europe* (DAE) represents a critical foundation for ICT growth to enhance productivity and innovation capacity and to promote economic opportunities and employment (European Commission, 2010). Through this policy Member states have appointed motivated individuals to become national Digital Champions to actively promote digital inclusion (European Commission, 2014b). These processes are designed to promote multi-scale participation in the digital agenda, which arguably is embodied in the complementary localised community-led broadband movement at the core of this doctoral research.

Broadband development in the UK has been heavily influenced in recent years by the domestic policy landscape, which mirrors the broad aims expounded at the supra-national level. *Digital Britain 2009* represented an initial step towards achieving universal Internet access across the UK, outlining the Government's ambition "...to secure the UK's position as one of the world's leading digital knowledge economies" (BIS, 2009, p. 7). *Britain's Superfast Future 2010* also lays out the UK's priorities for network development, focussing on the latest generation of broadband technology, superfast broadband, as a means to spur economic growth and innovation (DCMS, 2010). As of April 2014, Ofcom reported that the UK had experienced a superfast 'surge' where one in four UK broadband connections were superfast. However, challenges remain and coverage of superfast broadband in rural areas is limited (as illustrated in Section 3.3.2), and other adoption challenges, such as income, have become evident (Ofcom, 2014c, 2014d). Devolved nation policies, including the Scottish Government's *Scotland's Digital Future*, identify both the need for broadband, and flag these digital connectivity barriers that currently exist, namely access, confidence and inclination (Scottish Government, 2012c). The Welsh Assembly Government's report *Delivering a Digital Wales*, parallel to Scottish policy, establishes a target of ensuring universal access to 30Mb/s. Difficulties in providing for rural regions are recognised and support for public sector intervention is promoted (Welsh Government, 2010). Finally, Northern Ireland's *Telecommunications Action Plan for Northern Ireland* echoes the need for improved broadband and the rural challenges of installation (DETI, 2011).

Despite these policies and strategies, superfast broadband accessibility is varied across the geographical spectrum in the UK. As of 2013, superfast broadband coverage in the UK varied from 88 percent for urban areas, 76 percent for semi-urban areas, and only 25 percent for rural areas (see Table 3 – 1). This demonstrates that location characteristics continue to play a

significant role in broadband accessibility. It is worth noting here that within the areas of the UK, differences exist as well. On average, Scotland and Wales perform poorly compared to England on modem sync speed data (Ofcom, 2013b).

Table 3 - 1 Superfast broadband coverage in the UK by settlement type

Area	Urban Areas	Semi-urban areas	Rural areas
England	89%	79%	24%
Scotland	78%	56%	9%
Northern Ireland	98%	97%	91%
Wales	92%	49%	9%
<i>TOTAL UK</i>	<i>88%</i>	<i>76%</i>	<i>25%</i>

Source: Ofcom (2013b).

The following three sections of this chapter strive to classify the current UK digital landscape in relation to broadband technology types (Section 3.4.1), international urban and rural perspectives on broadband installation (Section 3.4.2), and current UK delivery initiatives (Section 3.4.3).

3.4.1 Broadband technology

There are multiple methods to access broadband including fibre-optic or copper cable broadband, wireless, satellite, or mobile (via a smartphone). For the purposes of this thesis, the focus is on the impact of fixed-line broadband technology, which is the principle manner of Internet access in the UK (Ofcom, 2012b). Fixed broadband more generally refers to a broadband connection that is limited to a fixed location (i.e. home or business line connection). This is typically installed via copper cables, fibre-optic cables, or cable and fibre-optic combinations, which constitute wired fixed-line infrastructure, or fixed wireless and satellite broadband, which is wireless infrastructure. The multiple methods for broadband accessibility are depicted in Table 3 – 2.

Table 3 - 2 Types of fixed broadband infrastructure

Internet Infrastructure Types	Accepted Definition
*DSL (Digital Subscriber Line) family – <i>copper-based, wired infrastructure</i>	<i>ADSL Technology (Asymmetric Digital Subscriber Line broadband):</i> Broadband services run over home telephone lines (copper cables). Fastest it can support is 8 Mbit/s. Limited Internet connectivity exists on this type of connection the further the premises is from the exchange
	<i>ADSL2+ Technology (Asymmetric Digital Subscriber Line broadband):</i> Broadband services run over home telephone lines (copper cables). Fastest it can support is typically 24 Mbit/s.

	<i>VDSL, VDSL2+ (Very-high-bit-rate Digital Subscriber Line broadband):</i> Very-high-bit-rate DSL (VDSL, VDSL2) is copper cabling used in combination with fibre-optic cabling to provide for the Cabinet-to-Premises section of Fibre-to-the-Cabinet broadband.
Fibre Optic Broadband – <i>fibre-optic cable-based, wired infrastructure</i>	Broadband services delivered through flexible, thin glass pipes called fibre optic cables using waves of light. Generally regarded as the successor to traditional copper cabling, it can deliver higher speeds over longer distances without the loss seen in traditional metal cables. Speeds vary, and can exceed 1 Gbit/s. Can be provided via fibre-to-the-cabinet, or fibre-to-the-home.
Fixed wireless broadband – <i>wireless infrastructure</i>	Broadband services delivered through radio waves, usually via Wi-Fi network access points. However, some companies use other technologies.
Satellite broadband – <i>wireless infrastructure</i>	Broadband services delivered through a satellite in orbit around the earth that communicates with a computer or host of computers through a satellite dish on the premises. The location of end users has little impact on cost and availability of service. The installation is relatively expensive, and due to the capacity of satellites being shared by all users, only a relatively small number of users can be served.

Source: BIS (2010a, 2010b), CBS (2013), Ofcom (2013a, 2013b, 2014b) and Skerratt *et al.* (2012).

ADSL, ADSL2+ and fibre broadband (with or without VDSL) are considered fixed-line wired infrastructure, whereas satellite and wireless broadband services are still often fixed to a premise, but are wireless infrastructure. Regardless of wired or wireless, these services all must connect to backhaul, which represents the connection from the local sub-network to the Internet core network (Skerratt *et al.*, 2012). Cable and fibre networks, representing fixed-line broadband, broadly follow prescribed pathways, depicted in Figure 3 - 1.

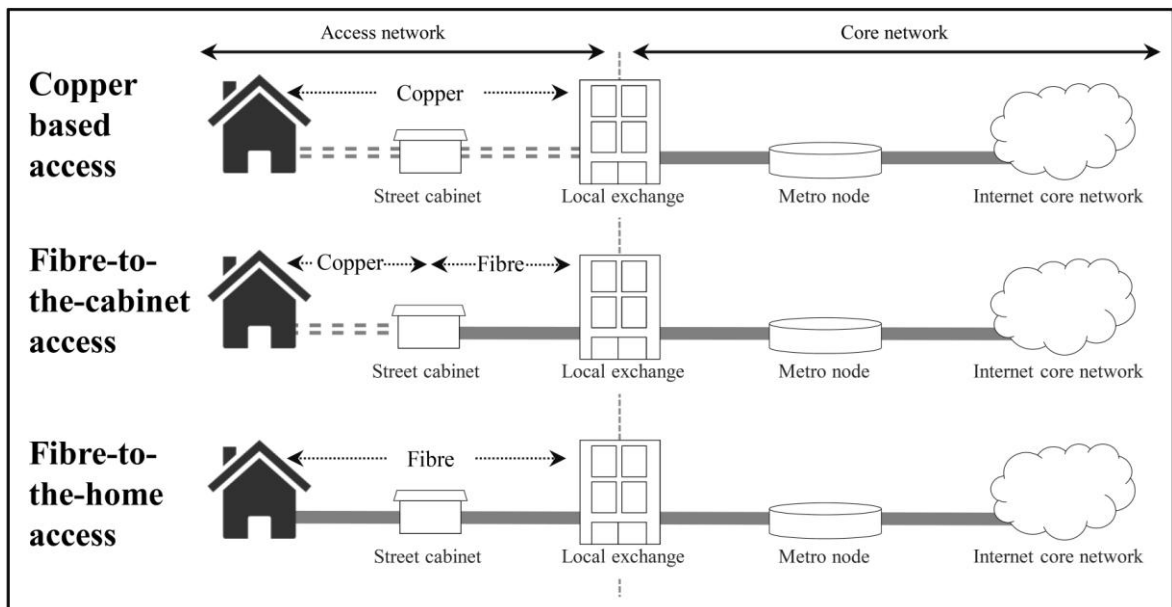


Figure 3 - 1 Fixed broadband - copper based and fibre access

Source: Created by Author with data from BIS (2010b).

Cable and fibre broadband connections are the most widely used in the UK (Ofcom, 2012b). The copper based broadband represents older generation networks, which cannot support superfast broadband services. With respect to fibre broadband, there are two forms of fibre connections: Fibre-to-the-Cabinet (FTTC) and Fibre-to-the-Home (FTTH)⁷. FTTC relies on a combination of fibre, and then copper cable to connect the home or premise to the cabinet. VDSL and VDSL2+ cabling are often used in the cabinet-to-the-premises section of the FTTC network (Ofcom, 2014c). FTTH, on the other hand, does not rely on copper cabling at any point in the network, resulting in a reliable transmission with little data loss over distance due to its glass structure. This virtually lossless connection is a feature desired by many who wish for ‘future-proof’ broadband access (e.g. Wakefield, 2014). While both FTTC and FTTH are considered ‘superfast’, or next generation, fixed-line broadband networks, an argument has been made that FTTC is not the most ‘future-proof’ of the two. This is because speeds will still be impacted by the inclusion of copper cabling covering the distance from the premise to the cabinet. This feature is particularly prominent in rural, sparse, areas, where homes can be located large distances from cabinets and exchanges, leading to concerns over actual deliverable speeds for the end user. In rural areas, due to this distance between exchanges, street cabinets and between homes, most service provision is still via traditional copper cabling (ADSL, ADSL2+). However, many rural areas also utilise wireless services in the form of fixed satellite or wireless options for broadband access, representing an alternative to wired broadband access. These alternatives are useful as they can quickly overcome distance issues. However, satellite and wireless do not always deliver ‘superfast’ broadband services because customers on the networks share available bandwidth (Ofcom, 2014a). These options are depicted in Figure 3 – 2.

⁷ Fibre services in general are also often referred to as FTTx, with the ‘x’ representing any number of options including ‘cabinet’, ‘home’, ‘premise’, ‘building’ and so on (Ofcom, 2014d).

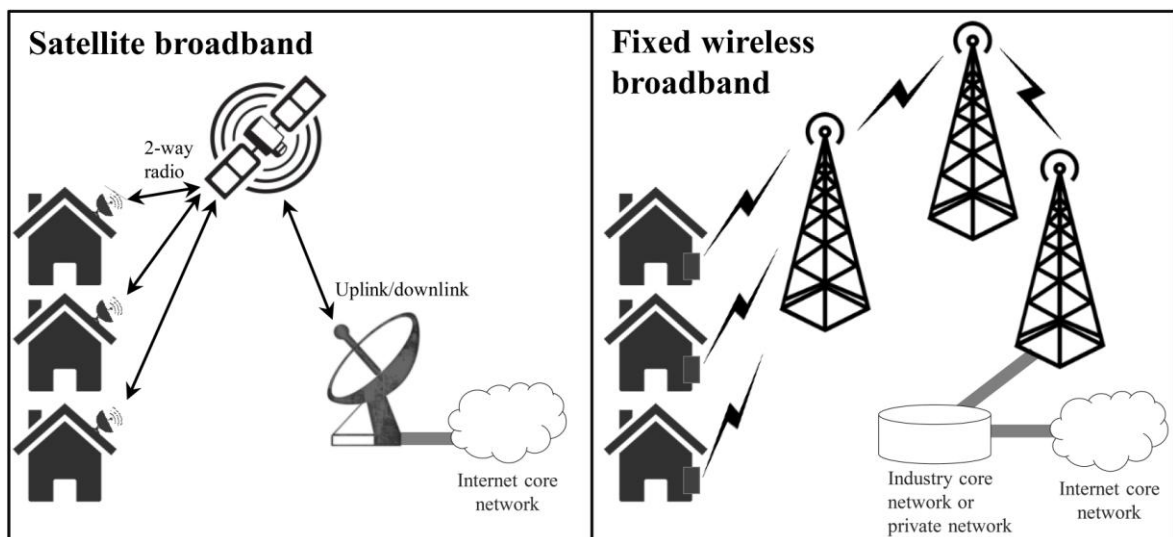


Figure 3 - 2 Satellite and wireless broadband alternatives

Source: Created by Author with data from BIS (2010b) and Mannion (2003).

Satellite broadband services are delivered through a satellite that communicates with a computer or host of computers through a satellite dish on the premises (CBS, 2013). Fixed wireless operates on a point-to-point system, beaming signals from strategically placed towers to receiver units installed in the home or business premises. Wireless has been identified as a strategically placed broadband alternative for the hard-to-reach premises around the UK because it does not require extensive cable installation (see DCMS & DEFRA, 2013).

I note here that mobile broadband access (not linked to any fixed location) as the primary source of Internet access for individuals across the UK is gaining momentum. Since its inception, four generations of mobile communications technology have been developed. The first generation delivered voice services only. The second generation, or 2G, provided digital technology in place of analogue, and introduced basic low-speed data services. 3G optimised data opportunities, and developed dedicated data services with significant enhancements to the data speeds (Ofcom, 2014b). It was at this stage that mobile broadband access proliferated. The newest generation, 4G, was introduced in October 2012 to eleven cities in the UK (Ofcom, 2013a). 4G has been designed to deliver “high-performance mobile broadband data service centred around an internet protocol (IP) packet core and offering the promise of much faster broadband than 3G could deliver, alongside increased capacity to deliver these improved speeds to more consumers” (Ofcom, 2014b, p. 12). Is it then necessary to conduct a study analysing fixed line installation solutions when mobile broadband alternatives are becoming more prevalent? In short, yes. Mobile technology, particularly 4G, is in its infancy and coverage and uptake is extremely limited (Ofcom, 2013a). Mobile broadband

coverage in rural areas of the UK is also extremely limited, with many regions not receiving access to 2G or 3G to allow for Internet browsing on mobile devices (Skerratt *et al.*, 2012). The European Broadband Report Card notes that 0% of rural areas of the UK have 4G coverage as of 2013 (European Commission, 2014a). In Scotland, approximately 50% of the geographical area has no 3G coverage, Wales 22%, Northern Ireland 13.3% and in England, 6% (Philip *et al.*, forthcoming). While it has been considered that 4G mobile broadband could be advantageous to develop in rural areas due to lower installation costs compared to fixed-line broadband, additional considerations such as access to energy sources and backhaul accessibility remain problematic (Ofcom, 2013b). With current erratic coverage, and relatively high costs for areas where mobile broadband is available, fixed-line broadband is still an essential for households and, in particular, businesses that rely heavily on Internet traffic as a consumer base (Decoded Solutions, 2013).

Due to the multiple options for broadband delivery (which can result in differing speeds and network capacity for the end user), there is a need to understand how superfast broadband is and could be in the future delivered to rural areas. This includes both the physical delivery methods and any related public market intervention. The following sections will first introduce and address international perspectives on rural delivery of broadband (Section 3.4.2), followed by the main UK delivery initiatives (Section 3.4.3).

3.4.2 International perspectives on rural installation of broadband

Many international examples of rural broadband installation provide useful comparators for practices in the UK. This section will discuss installation policies and practices for specifically rural regions of Australia and New Zealand, North America, and Europe. These areas have been selected for economic and social comparability to the UK, and will serve to identify potential pathways for the UK broadband development experience.

In Australia and New Zealand, a primarily national level approach to broadband installation has taken force. Commitments made in 2007 and 2008 respectively aim to provide high-speed, next generation fibre-optic broadband networks equitably across both countries. In Australia, the creation of the National Broadband Network (NBN Co Limited), a wholly owned Commonwealth company, represents the largest ever publicly funded infrastructure project in that country. They have pledged to reach 93 percent of homes and businesses with fibre broadband, and the remaining 7 percent will be reached by fixed wireless and satellite networks (NBN Co., 2014). This national approach was initially pursued as both a ‘nation’-building measure and to prevent monopolising behavior on the part of telecommunications

industry. The entire Australia project is receiving approximately A\$37.4 billion (£19.74 billion), with A\$30.4 billion from public government investment and the remainder from the private sector (Beltrán, 2014). As much of Australia has dispersed or low-density population, the installation plans for the rural areas are of particular interest to this doctoral research. The coverage of rural regions under the NBN has been widely criticised for its cost: the company has budgeted A\$5 billion to reach the remote locations using wireless and satellite technology, and yet only approximately A\$600 million is expected in return economic benefits (Knott, 2014). This limited return on investment calls into question the value of using public funds for such extensive broadband development. It has been argued by critics that an unsubsidised roll out method for rural areas would be a better use of public money and infrastructure. However, an unsubsidised roll out is thought to result in 7 percent of the population without high speed broadband, an option the current government argues is neither fair nor politically acceptable. Overcoming inequality in telecommunications access was considered to be worth the ‘fiendishly expensive’ public subsidy (e.g. Knott, 2014). While Australia’s roll out plan has significant financial costs, the drive for equity in geographic telecommunications access was a key factor in encouraging the nationwide plans within the political sphere.

In New Zealand, the persistent lag behind the rest of the world in relation to broadband speeds created a political desire to reform the telecommunications sector and ultimately boost economic growth. This led to the creation of the Ultra-Fast Broadband (UFB) network initiative. It is a public investment of NZ\$1.35 billion (£669 million) and will cover 75 percent of the population with fibre broadband, and the remaining 25 percent with satellite and wireless solutions (Beltrán, 2014). Alongside this, the Rural Broadband Initiative was developed, covering these harder to reach locations as part of the wider government response. The Rural Broadband Initiative addresses the lack of commercial investment in rural areas, similarly to that seen in the UK. The plan is to deliver broadband to 252,000 rural households at prices and levels of services comparable to its urban counterparts (Alcatel-Lucent, 2012; Ministry of Business, Innovation and Employment, 2013).

These initiatives, in both Australia and New Zealand, are very much political responses, and exist due to the supportive political environment towards such public initiatives and public expenditure at the time. Rural coverage has been placed centrally in Australia as part of the main plan, and in New Zealand, the Rural Broadband Initiative controls rural installation.

In North America, the United States of America has undergone a less radical, national approach, and instead has developed multiple public and private initiatives to increase universal broadband access. This approach historically has been successful for past technology development. The telecommunications sector in the USA has traditionally operated under the auspices of neoliberalism, where competition was the overwhelming principle for growth. Nevertheless, more recently, public interventions for telecommunications development have been adopted to respond to associated rural market failure, similar to the UK experience (LaRose *et al.*, 2014). In 2009, US\$7.2 billion (£4.58 billion) national stimulus funding was designated under the American Recovery and Reinvestment Act to accelerate installation of advanced broadband services to unserved (less than 10% broadband penetration) and underserved (less than 40%) regions (LaRose *et al.*, 2014). Broadly, this encompassed most rural areas of the country. Through this stimulus package, two funding programmes were announced: the Broadband Technology Opportunities Program (BTOP) and the Broadband Initiative Program (BIP) (LaRose *et al.* 2014). The BIP programme, administered by the Rural Utilities Service of the Department of Agriculture, was allocated US\$2.5 billion to aid in broadband roll out of rural areas. The programme offered loans or grant/loan combinations to established providers, focussing on those providers that had previously received funding from the Rural Utilities Service. Existing, proven, organisations were therefore best placed to engage with this programme and develop broadband services in their respective rural areas.

The BTOP was more open than the BIP, and funded 265 projects, 55 of which served rural communities only, and 160 served both urban and rural areas (LaRose *et al.* 2014). One such project targeting rural areas is the 'Middle Mile' project, focussed on providing rural anchor institutions with public access (e.g. libraries, schools). The range of projects under the BTOP was extremely varied, and encompassed broadband infrastructure projects, creating local nodes for access (such as the Middle Mile project), and projects stimulating demand for broadband through awareness, education and support (NTIA, 2009). A community based, public utility model was also encouraged under BTOP, whereby the local authorities incorporated broadband into their utility portfolios (Mandel *et al.*, 2012). According to LaRose *et al.* (2014), rural spaces received slightly more attention and funding through the BIP and the BTOP, yet often were offered slower speeds than those in urban areas. Therefore, rural areas in the USA continue to suffer from a spatial digital divide with respect to broadband accessibility.

In Canada, federal and provincial politics contribute to the complexity of broadband installation. There is currently a lack of action for broadband development at the national level, with weak essential facilities regime and regulatory barriers to entry. Conversely, the provincial players in Canada have increased access to essential facilities and put public investment into Internet backbone infrastructure (Rajabiun and Middleton, 2013). Due to the more local nature of intervention through the provincial level of politics, Canada has experienced diverse policies for broadband development. These include direct public investments in backbone infrastructure, targeted private sector subsidies, public ownership, and the use of strategic procurement policy as a tool for shaping market behavior of operators (Rajabiun and Middleton, 2013). An example of one such measure is the Eastern Ontario Regional Network. This is a public-private partnership approach to build a fibre-optic cable network, after which lines can be rented from many service providers to increase market competition (EORN, 2012). Community-led approaches are also gaining momentum in the country as small town's band together to build superfast broadband services, similar to the UK experience. An example is the Olds Institute in Olds, Alberta (Chung, 2013).

In an effort to target rural, remote and First Nations communities in Canada, a range of programmes have been initiated. While most of the varied policies and programmes are pursued at the provincial level, the federal government was involved in several rural based programmes including Broadband for Rural and Northern Development (BRAND) and the Connecting Rural Canadians programme, that latter of which was valued at CAN\$225 million (£123 million) (Rajabiun and Middleton, 2013). These policies have focussed on increasing access to high-speed Internet networks by stimulating private investment to reach rural communities. Operators were committed to performance targets and open access policies, a practice that was more effective for broadband network development than direct public investment in backbone infrastructure (Rajabiun and Middleton, 2013). It is possible to draw lessons from the interplay between federal and provincial sources to the interplay between UK-wide and regional policies, which may modulate the benefits of any installation programmes.

In both Canada and the USA, programmes for stimulating rural broadband focussed on broadband infrastructure in combination with other digital strategies (such as free public nodal access and demand stimulation).

European countries have adopted multiple methods of installation that are relevant for consideration. France recently committed equivalent to £17 billion for the next ten years to support superfast broadband, under a programme called the French Digital Ambition, or *Ambition Numerique*. This fund which will be separated into three blocks: one third will go to commercial operators in urban areas, one third to operators and communities in moderately populated areas, and the final third, funded solely by state and local government, to the hardest to reach rural areas (Jowitt, 2013). This retains some of the neoliberal approach historically present in the telecommunications sector, whereby the market-led development occurs in the most profitable areas, similar to the UK. It also highlights the potential for state intervention to respond to rural market failure.

Scandinavia presents a diverse range of broadband development practices. Norway has adopted a primarily commercial approach following deregulation of telecommunications in 1998. Previously, only one national company had been allowed to own telecommunications infrastructure beyond one building (Skogseid *et al.*, 2014). In allowing multiple companies to own infrastructure, a highly competitive market emerged in Norway, with new local, regional, and national operations providing broadband access in areas that previously national providers could not justify due to lack of market demand. In 2004 a report concluded that there were 130 telecommunications providers in the country, 10 being ‘national’, 40 being ‘regional’, and 80 being ‘local’ alternatives. Within 50 of those local alternatives, municipalities, or local-level government participated as owners of the telecommunications companies (Skogseid *et al.*, 2014). This reflects the success of ‘bottom-up’ approaches in rural places as a consequence of relaxed telecommunications regulations.

In Sweden, much of the broadband infrastructure development was government-led, representing a supply-led model. The government committed substantial public monies to broadband installation, increasing roll out and uptake of fibre, and providing more choices to the consumer. A large share of these fibre networks are deployed and owned by municipalities, known as City Urban Networks, which have taken an ‘open network’ approach and consider broadband a ‘public good’, where profit is not the only priority in terms of success, nor does it lead development priorities (Sandgren and Mölleryd, 2013).

These examples of international rural broadband development represent the range of policy interventions and highlight some successes for broadband installation and adoption. Australia and New Zealand have concentrated on national level plans with significant public

investment. In North America, the USA has pursued a mixed public-private approach, and in Canada, a focus on provincial policies as opposed to federal plans has proliferated. In Europe, France is pursuing a mixed public private approach. Norway has pursued a deregulated market to stimulate infrastructure development and mixed ownership. Finally, Sweden has created and mandated the presence of publicly owned broadband infrastructure to stimulate adoption of fibre technology. Broadly, public policy has been active in all of these interventions to develop next generation networks, particularly for rural areas of these countries. The multitude of policy measures, at national and more regional levels, demonstrates the challenging process of determining the ‘best fit’ policy for the country. The following section will outline the principle UK methods, reflecting on UK-wide and regional policies.

3.4.3 Current UK delivery initiatives

The main method for broadband delivery in the UK is through commercial provision, the operations of which are not directly steered by government policy (Ofcom, 2012a). In an effort to combat the inequalities that commercial provision creates between urban and rural fixed-line provision (e.g. Hindman, 2000; Parker 2000; Prieger, 2007; Skerratt, 2010; Townsend *et al.*, 2013), policy frameworks include government intervention in rural regions of the UK. This is a similar market intervention response to many of the international measures outlined in the above section. The current primary programme in the UK is Broadband Delivery UK (BDUK), run by the Department of Media, Culture, and Sport (DCMS, 2014). BDUK operates on a bidding platform, whereby telecommunications companies bid to have access to funds to build networks. The intention of this process was initially to “stimulate commercial investment to roll out high speed broadband in rural communities” (DCMS, 2015, para 4). It has since been updated to stimulate private sector investment in broadband to ensure that the benefits are available to all (DCMS, 2014). BDUK operates with three⁸ key goals in relation to fixed-line broadband for rural regions specifically. Firstly, they aim to provide superfast broadband to at least 90 percent of premises in the UK by 2016, with up to 95% coverage by 2017. Secondly, they aim to provide universal access to standard broadband with a speed of at least 2 Mbit/s to everyone by 2016. Finally, BDUK aim to explore options to get near universal superfast broadband coverage across the UK by 2018 (DCMS, 2014).

Under the broad umbrella of BDUK, multiple policies and funding avenues have been developed to enhance both urban and rural broadband installation. Urban centre development

⁸Additionally, BDUK will seek to improve mobile coverage in remote areas by 2016, and will create 22 ‘SuperConnected Cities’ across the UK by 2015. Neither is relevant to this study: the first as it discusses mobile coverage rather than fixed, and the second as it is focussed on urban centres outside the focus of this study (DCMS, 2014).

is supported through a 'super-connected' cities initiative, primarily contributing to costs for small businesses to get connected to superfast broadband. Rural broadband development is supported through three methods. Firstly, the stimulation of commercial investment provides part monies to local authorities and devolved administrations that then contract private sector companies to enable broadband connectivity. This commitment totals £780 million as of June 2013. Secondly, an additional £10 million has been allocated for a competitive fund to market test innovative solutions for hard to reach locations. Finally, the government has developed policy to support community-led broadband development strategies, such as the Rural Community Broadband Fund (RCBF). The RCBF is an additional competitive fund established in 2011 from which the hardest-to-reach rural regions can apply for a share of £20 million to help community projects achieve speeds faster than 2Mbit/s in England (Baker and White, 2014; DCMS, 2014).

BDUK has met with criticism since its inception from both lobbyists and rural development groups themselves (Sutherland, 2015). Firstly, the design of the main programme failed to deliver intended competition for superfast broadband development. The bidding process resulted in British Telecom (BT), a major national telecommunications company, strengthening its already strong position in the market (e.g. Public Accounts Committee, 2013; Sutherland, 2015). Following the withdrawal of Fujitsu as a bidder for BDUK funds in March 2013, BT was the sole remaining bidder in the process and at that time was awarded 19 BDUK contracts (Ofcom, 2013a). This bidding process placed rural communities in competition with one another, which disempowers those without existing capacities and resources (Roberts and Anderson, 2013). Secondly, since the signing of contracts between BT and the relevant Local Authority administrations, multiple community-led infrastructure initiatives have experienced a swift demise, decreasing competition and alternative modes of broadband access (e.g. Wakefield, 2014). This sits in contrast to the aims of the broader digital policy landscape, which includes the place for bottom-up, community-led partnerships (BIS, 2010a).

These methods outlined above for broadband development are being applied across the UK. However, due to the devolved political nature of some regions (Scotland, Wales, Northern Ireland), each area is employing the BDUK process slightly differently (including England, though it does not operate as a devolved government). This doctoral research is concerned primarily with case studies based in England and Scotland, and will therefore endeavour to detail further those two political contexts.

According to Ofcom (2013b), superfast broadband coverage in rural areas of England covered 24 percent, compared to 89 percent in urban areas and 79 percent in semi-urban areas, demonstrating the disparity in broadband coverage, and emphasising the need for public intervention. England's broadband roll out does not have many additional policies or plans other than those already in place under BDUK and the DCMS. Geographically, England as an area was split into 41 regional areas for BDUK funds (all of BDUK covers 44 areas, with Scotland, Wales and Northern Ireland each representing 'one' area). The Rural Community Broadband Fund (RCBF), funded under DEFRA and BDUK, does operate solely in England, with an initial aim of providing funding to cover 70,000 rural premises. It was a £20 million fund, with £10 million allocated from Europe, and £10 million exchequer funding from BDUK. RCBF was intended as a funding avenue for rural communities to apply to in efforts to build their own networks. As of August 2014, five community projects were approved for funding from the RCBF⁹ (DEFRA, 2014a). Alongside the critiques leveled at BDUK, similar critiques have been discussed in relation to RCBF. The main critique of the RCBF application process was that as BDUK rolls out, applicants to the RCBF are faced with having to confirm that there will be no other public money being spent to roll out broadband in their exact coverage area. Therefore, community organisations needed to determine if any BDUK contracts had been awarded and what coverage was being provided for under that process. Due to commercial sensitivities and county level plans, which resulted in a lack of publicly available detailed coverage information, it has proven difficult or impossible for community organisations to achieve that guarantee (Garside, 2013).

In the Scottish context, Scotland aims to achieve 95 percent fibre-optic broadband coverage by the end of 2017 (Digital Scotland, 2013). *Digital Scotland* aids in the roll out of superfast broadband to regions where commercial actors have chosen not to develop, due to lack of profitability. Superfast broadband in Scotland in 2013 only covered 9 percent of rural areas, compared to 80 percent of urban areas and 56 percent of semi-urban areas, a remarkably lower coverage compared to England. This, again, highlights the potential need for public

⁹ These projects are:

1. Fell End – located in the north west of England.
2. Rothbury – located in the north east of England.
3. Northmoor and Bablockhythe - located in the midlands of England.
4. Tove Valley – located in the midlands of England.
5. Fibre GarDen – located in the north west of England.

These community projects will only cover 3,269 premises, a much smaller number than the initial 70,000. The financial per premises costs proved to be significantly higher than anticipated (at £300 excluding VAT per premise) hence the difference. Additionally, projects that are extensions of existing BDUK roll out are not reported, and that could result in an additional 20-25,000 premises covered (DEFRA, 2014a).

intervention (Ofcom, 2013b). As part of the main BDUK programme, Scotland has been geographically separated into the ‘Highlands and Islands’ and the ‘Rest of Scotland’ for superfast broadband network building, with BT winning both contracts. Alongside this programme, Community Broadband Scotland (CBS) has formed to assist rural communities to play a central role in developing their broadband needs. This body is a partnership between the Scottish Government, Scottish Enterprise, Highlands and Islands Enterprise, COSLA, Scottish Local Authorities Economic Development Group, Carnegie UK Trust, Cairngorms National Park Authority and Loch Lomond and the Trossachs National Park Authority. CBS operates as a resource for communities with limited or no broadband access. They will aim to assist the 10 to 15 percent of the region that is not subject to market intervention, and will not benefit from the BDUK roll out. This approach is in its infancy, and has chosen six existing projects at various stages to exemplify its mission and be ‘pilot projects’¹⁰. These projects receive some funding and targeted support from CBS to accelerate broadband delivery and on-the-ground community learning (CBS, 2013). Similar to the English context, communities must prove that their area will not be in receipt of other publicly-funded development (such as BT networks funded under BDUK) before being able to engage with any CBS funds. Similar to the RCBF process, this is a challenge for many community organisations.

This section has outlined technology alternatives for broadband in the urban and rural context, outlined international examples of rural broadband delivery methods, and concluded by outlining the current state of broadband delivery in the UK, focussing both on government subsidised, regional approaches, and introducing local level opportunities and challenges. This next section will now develop local approaches to broadband further, focusing on community-led broadband initiatives. They represent an alternative mode of broadband delivery that is becoming increasingly present in rural UK.

¹⁰ The pilot projects are as follows:

1. Ewes Valley (Dumfries and Galloway) – small community unable to gain broadband due to distance from exchange.
2. Tomintoul and Glenlivet (Moray) – remote mountain communities, isolated from a range of services in the Moray area of Cairngorm National Park.
3. Elvanfoot (South Lanarkshire) – community has created a partnership with 9 villages to create B4GAL, a case study of this thesis.
4. Colonsay (Argyll and Bute) – Island community, identifying broadband as a key component for supporting development and retaining population.
5. Corgarff and Glenbuchat (Aberdeenshire) – small dispersed settlements, remote from BT exchanges, many relying on satellite provision
6. Applecross (Highland) – remote coast community, low population and reliant on tourism.

3.5 Community-led broadband initiatives

Community-led broadband initiatives are increasingly present in broadband policy (as demonstrated in both England and Scotland). They are identified as pioneering communities, often with informal digital champions, or leaders, which have chosen to tackle the lack of broadband in rural areas ‘head-on’, developing locally-based broadband infrastructure and/or services (Carnegie UK Trust, 2012). Social resilience thinking, incorporating empowerment and leadership concepts as developed in detail in Chapter Two (see also Roberts and Townsend, 2015), provides a useful frame for illustrating the influence of such participatory initiatives in communities. This section will first discuss community-led broadband in the context of the wider political economy (Section 3.5.1). It will then provide an analysis of community-led models, as developed through literature and practice (Section 3.5.2).

3.5.1 Community-led broadband within the broader political economy

Neoliberal agendas have arguably led the specific patterns of development in the telecommunications industry in the UK (Simpson, 2010). Having been introduced in Section 3.2, it is relevant here to consider the neoliberal practices in the direct context of community-led broadband initiatives.

Traditionally, the broadband provision landscape in the UK is marked by neoliberal ideology, with smaller, rural, areas failing to attract broadband investment. Superfast broadband installation programmes have primarily focused on national policies and subsidies, dispersed and operationalised at a regional level with little local involvement. However, government policy has begun to include community-level activism and interest, through bodies such as Community Broadband Scotland and the Rural Community Broadband Fund (DCMS, 2014; Digital Scotland, 2013). This reflects the burgeoning importance of what Gillett *et al.* (2004) called the ‘local context’. This highlights the push for localism practices in broadband development, particularly due to the effects of neoliberal development including geographically uneven technological accessibility (illustrated in Section 3.3). Gillett *et al.* (2004) at the outset of broadband development in general highlighted that,

‘...the deployment of broadband infrastructure is more contingent on local context than narrowband (dialup) has been. As the relevance of broadband Internet access to local economic development and quality of life becomes increasingly evident to communities, it is reasonable to expect their involvement in the development of broadband infrastructure to continue growing’ (p. 555).

Mandel *et al.* (2012) more generally highlighted that, in order to develop digital resources, communities should “pool resources, plan jointly, and look across needs to achieve economies

of scale, better services, and more robust community technology infrastructure” (p. 142). This demonstrates the need for networked resources and actors at the community scale in order to best respond to the rural broadband market. Shaw *et al.* (2014) similarly highlighted the potential for the geographically close north of England and south of Scotland, currently developing broadband under two different regulatory frameworks due to boundaries of jurisdiction, to network and work together to exploit critical mass and coordinate funding schemes to provide and meet the needs of the rural population as a whole. This literature addresses the broad need for localism approaches in broadband development. These local approaches are particularly relevant as a method to overcome existing provision divides due to prevailing neoliberal ideology. However, this literature has not addressed specific community organisations as builders and developers of broadband infrastructure. More recent research into broadband provision, presented below, begins to analyse and typify community-led broadband initiatives directly.

Gaved and Mulholland (2010) generated early academic discourse on networked community initiatives, what they define as communities of locality that have developed network infrastructure with minimal external support. Through an analysis of eight initiatives in the UK, they created a typology for these initiatives, arguing that these local approaches could be useful to overcome digital insufficiencies. However, the potential influence of external policy linkages on such initiatives is not addressed, with Gaved and Mulholland (2010) preferring to situate the research on initiatives that exist largely without external involvement. The three typologies they develop include ‘cooperatives’, ‘subcultures’ and ‘pioneers’. Cooperative initiatives are most strongly identified with a specific geography and location, seeking to engage as much of the population as possible in developing a computing network. Subcultures and Pioneers are by nature more dispersed initiatives. Subcultures address a community of interest within a locality (i.e. artists or musicians within a city), while Pioneers represent a specific community of interest grounded in specific localities but also engaged with a global association of peers (i.e. computer experts).

Salemink and Bosworth (2014) more recently have contributed research into place and broadband connectivity, identifying community-led broadband as a potential model for neo-endogenous development. Rural actors (which could manifest as local digital champions) interact with exogenous networks and resources for the benefit of their own futures. In their preliminary work, they highlight the process of community-led broadband as an example of rural development. Rural development historically represented external interventions to

overcome inherent disadvantages, but is now recast to reflect a process of actions reflective of local conditions and local needs, which still interact with external actors and networks. This also reflects the term ‘networked’ rural development (Shucksmith, 2012). Salemink and Bosworth (2014) go on to categorise what they see as the two main contemporary responses to the broadband market from communities. This includes an *activist* response, stressing the unfairness of (often neoliberal) market and governmental positions, and a *dialogue* or *negotiation* response, what they term as a less politicised approach, involving local and extra-local interaction from the outset (Salemink and Bosworth, 2014). These approaches can both build internal bonding relationships (common in the case of activist response) or bridging relationships (common in the dialogue response), both of which reflect potential resilience as developed in Chapter Two. Salemink and Bosworth (2014) continue that UK community-level responses to rural broadband are styled primarily in an activist response opposing a perceived common unfairness. For example, neoliberal politics that have motivated a larger, commercial roll out and resulted in neglected rural broadband development, and the continued rigidity of the market and governmental positions in the public intervention models, operate as an ‘unfairness’ to local communities. These community-led broadband initiatives are then a result of neoliberal market ideology.

The Plunkett Foundation, in combination with Carnegie UK Trust, also has worked with broadband initiatives to develop what they termed the ‘enterprise development curve’. This ‘curve’ sets out to determine stage of development, rather than a typology, of organisations. The three phases are the *Pioneers* phase, the *Development* phase, and the *Mainstream* phase. In 2012, the authors identified that community-led broadband was in the early Pioneers phase,

‘characterised by highly resourceful and entrepreneurial individuals who will do whatever it takes to make their community enterprise a success...however, inspiration is currently insufficient in the current rural broadband debate and more needs to be done to inspire more communities to take action in this area’ (Carnegie UK Trust, 2012, p. 18-19).

This identifies the potential for community-led broadband practices to take a larger role in rural broadband provision, but also the potential inadequacies that may hinder community-led broadband from becoming a successful, replicable, provision model. Recent work by Wallace *et al.* (2015) sought to understand more directly how some community broadband initiatives were successful. Their work resulted in the identification of several capitals within the communities that are depended upon for rural broadband provision. These were human capital, social and technological capital, local commitment, identity capital and financial

capital. Wallace *et al.* (2015) emphasise, similar to the Plunkett Foundation, that the “fact that [community initiatives] depend on particular local actors able to mobilise various kinds of capital means that they are not a universal model for ICT development...” (p. 116). They also identified that, in their case studies, the local governments were facilitators to the process, rather than initiators, which relates to overall rural development policies of rural communities ‘doing it for themselves’, with little state intervention, reflective of ‘bottom-up’ approaches.

In more general rural development research, ‘bottom-up’, place-based development is identified as important, but can be undermined by national policies, highlighting the relevance for government actors (Shucksmith, 2010). This role of local government in community broadband development has received some attention in past academic research. Gillett *et al.* (2004) created a taxonomy for classifying local or regional government involvement (as opposed to national level involvement), distinguishing four categories of local government-related action. These included the government acting as: 1) a broadband user, utilising demand side policies to attract investment and stimulate development, often incorporating community involvement to do so; 2) a rule maker, enabling access to rights of way, adopting or reforming local ordinances to support installation by any such organisation possible; 3) a financier, providing subsidies for users or providers which could include partnerships with community-led alternatives; and finally 4) as an infrastructure developer, adopting supply side policies in which a division of local government is responsible for provision of one or more components of infrastructure, placing broadband firmly in the realm of public utility. McShane (2013) outlined municipal broadband, reflecting this fourth category of action, describing how the international prevalence of municipal broadband as a public utility is determined by the structure of the telecommunications markets and regulatory policies, traditions of public intervention, and the historical role of municipalities in urban planning and utility provision. Ideologically, this reintroduces the idea that broadband access is a ‘public good’ or ‘utility’, discussed in Section 3.2, highlighting broadband’s potential to be a “meeting place, play space, a place for community dialogue, enjoyment, social learning and activism” (McShane, 2013, p. 116). In Australia, local government provides funding for public Internet in libraries (McShane, 2013), both demonstrating a type of community Internet connectivity reliant on a communal space for physical access. Its success and actual use was considered contingent on factors including, but not limited to: demographic, technical knowledge and interest, administrative leadership and support, trained IT staff, and ability to strategically plan to leverage anchor institutions to obtain and deploy broadband (Mandel *et al.*, 2012). So while local government can ultimately play a significant role in community-based broadband as a

provider or an enabler of telecommunications infrastructure, local community features can still significantly influence broadband adoption and use.

This research from Gillett *et al.* (2004), Carnegie UK Trust (2012), Mandel *et al.* (2012), Shaw *et al.* (2014), Saleminck and Bosworth (2014), Wallace *et al.* (2015), and Mandel *et al.* (2012) demonstrates multiple facets about the rural broadband market and community-led approaches: 1) the *neoliberal political atmosphere* in the UK had profound influence on the motivation for locally-based initiatives in order to achieve equitable access; 2) simply put, local involvement is *relevant* for broadband infrastructure installation and can contribute to what we understand as social resilience (see Chapter Two); 3) local approaches should practically reflect on *both internal and external* actors and networks; and 4) local approaches must consider *existing local resources and capitals*, including relevant technological capital, to be able to provide a tangible ‘best-fit’ community response to the rural broadband market. The relative fluid nature of community-led broadband in relation to broadband provision and their place within wider telecommunications strategies will be well-served by the chosen social resilience analytical approach. This research approach intends to draw out these multiple facets of the rural broadband market and community approaches by focusing on individual and networked resources and agency, equity, and sense of place.

3.5.2 Contemporary community-led broadband operational models

Community-led broadband initiatives in practice occupy a range of development models, all of which are ultimately trying to overcome the historical inadequacies of rural broadband provision. The type of Internet infrastructure (satellite, fibre-optic cabling, fixed wireless and so on) deployed can differ across the range of initiatives and is dependent on factors such as geography and funding. Development models may involve focussing on one area of digital support, or stimulating demand within a community to attempt to attract better services from the private sector. They may include engaging in local, authority-led plans as a community to obtain the ‘best-fit’ services for their area. Finally community-led broadband initiatives may also represent a complete public control model over the entire Internet infrastructure development process, from identifying funding, network mapping, and providing content and services as a community Internet Service Provider (ISP) (Carnegie UK Trust, 2012; Nucciarelli *et al.*, 2010). Nucciarelli *et al.* (2010) studied differing public-private opportunities for community networks in a European setting and highlighted these multiple models, demonstrated in Figure 3 - 3.

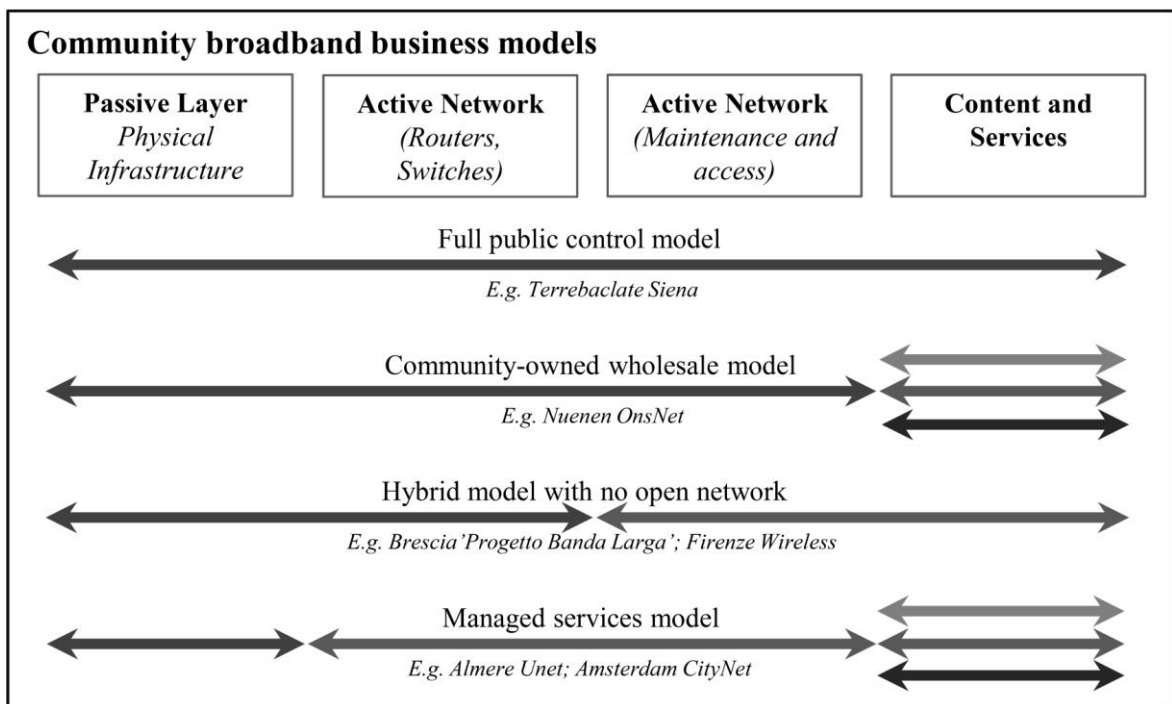


Figure 3 - 3 Business models in Italian and Dutch community broadband initiatives

Source: Created by Author, data from Nucciarelli *et al.* (2010).

In Nucciarelli *et al.*'s (2010) work examining the provision of NGA across continental Europe, it was identified that these differing interactions between public and private interests could each foster broadband installation; one model is not 'better' than any other (Nucciarelli *et al.*, 2010). Fortunado *et al.* (2013) similarly looked at public-private interplay in rural broadband provision in Maine, USA, and found that public-private partnerships were more likely to be successful than complete public or complete private provision. In addition, those that incorporated a locally based response provided higher satisfaction rates than those with an extra-local response, and were in general thought to be the most 'fair' to citizens (Fortunado *et al.*, 2013). This references the relevance of such locally based innovation in broader public-private partnerships and within the digital service provision spectrum. As community-led initiatives are becoming more prolific in the technology installation sphere, this thesis is concerned primarily with complete community-run broadband initiatives. Current live examples of complete community-run broadband service providers include Cybermoor, Ltd., in Cumbria, England, Lothian Broadband, in East Lothian, Scotland, the Olds Institute, in Olds, Alberta, Canada, guifi.net, in Catalonia, Spain, Freifunk in Germany, and wlanslovenija in Slovenia¹¹.

¹¹ Further information about these community-led broadband projects is available at <http://www.cybermoor.org/>; <http://lothianbroadband.coop/>; <http://www.o-net.ca/>; <http://guifi.net/>; <http://freifunk.net/en/>; and <https://wlan-si.net/en/>.

When examining the relevant operational models of community-led broadband internationally and in the UK, a clear set of actions underpinning community-led broadband development became evident. These are presented in Figure 3 – 4, and specifically touch on actions taken when building a FTTH network, the technical focus of this thesis. They are also detailed further in Appendix III. While they are illustrated as linear, most community-led broadband initiatives will experience cyclical actions and change that may require revisiting certain stages of the broadband development process.

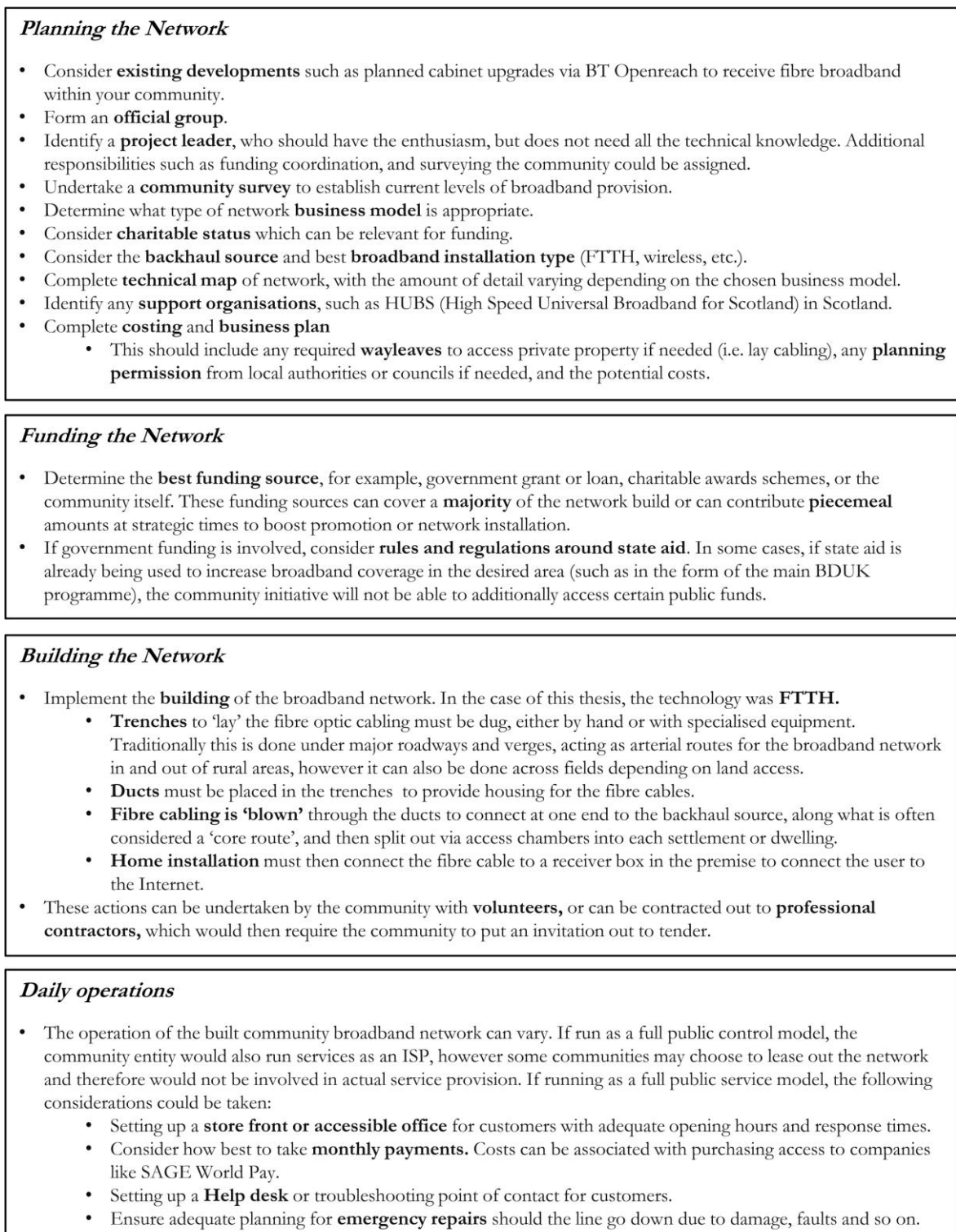


Figure 3 - 4 Example processes for building an FTTH community-led broadband network

Source: Created by Author with information from CBS (2013); DCMS (2011); Forde (2013), INCA (2012); and Rural Broadband Partnership (2015).

Recent research on the influence of such community-led initiatives reflects on the potential for both social and economic well-being through broadband interaction. This is often considered once the network is active. However, impacts to social and economic well-being can be understood to occur at all stages of installation presented in Figure 3 - 4. O'Donnell *et*

al. (2007) investigated the use of community-based organisations in First Nations communities in Canada to support videoconferencing and found that this allowed individuals to share stories within and outside of the existing communities, fostering community development and social inclusion. Jackson and Gordon (2011) also found that community broadband organisations were an opportunity for localised economic development, but many challenges from higher levels (funding bodies, bureaucratic requirements) limited their success, particularly during the early stages of broadband development. This begins to address the interaction between the community-led broadband process and overarching national digital agendas. Salemink and Bosworth (2014) have followed on from this, and primarily discussed the process of community-led broadband, identifying that the existence and engagement of current local human capital, as well as links to external networks and actors is important for the emergence and participation in such community action groups. They also highlight that generally dialogue with governmental bodies or telecommunications companies can require different literacies, from as early as the planning stage of a network through to operating one, and the ability of a community to use or develop these literacies are important in the process of community-led broadband development. Wallace *et al.* (2015) echo this when discussing the need for ‘technological capital’ in community initiatives. In the case of the UK, policy has sought to support these community-led broadband endeavours through knowledge exchange and small funding opportunities including Community Broadband Scotland in Scotland (Digital Scotland, 2013) and the Rural Community Broadband Fund in England (DCMS, 2014). These programmes seek to rectify the divide of provision created through the neoliberal tendencies of the UK telecommunications market (Simpson, 2010).

These intersecting threads of academic research and policy development have begun to reflect the processes that community-led broadband initiatives must navigate, something that has, “little research-based guidance available on the core issues and challenges that must be addressed by a community during the process...” (Mandviwalla *et al.*, 2008, p. 73-74). The manner in which rural superfast broadband provision may be engaged in by individuals and communities, together with potential outcomes of superfast broadband use, form the focus of this social resilience study.

3.5.3 Summary

The Plunkett Foundation and the Carnegie UK Trust noted “...Rural communities themselves...must play a central role in achieving the services they require” (2012, p. 7). This ‘reframing’ of the rural broadband delivery debate is a recognition that in order to achieve the aspirations set out by the UK nationally, a multi-pronged approach, including market,

government, and local, or community level, forces will be best suited to address the broadband infrastructure needs. These community-led installation strategies and initiatives are representative of complementary approaches, intended to sit alongside the principle BDUK intervention. Similar to other local development initiatives (e.g. Rankin, 2001), it could be argued that the pursuit of community-led alternatives for broadband development generates new forms of domination in a manner consistent with neoliberalism. This increased rhetoric about the requirement for local approaches to broadband means rural communities are being made 'responsible' for their broadband at that local level. However, urban networks are not required to take part in any way in their broadband provision, provision which is guaranteed by the prevailing market forces. The process of rural communities routinely being expected to 'do it for themselves', with respect to development, is rarely, if ever, considered in the urban context. Finally, where a standard definition of community development hinges on ideas of people being empowered and building community through collective resolutions of needs for a common good, neoliberalism espouses a depoliticised market-based perspective; two concepts that remain difficult to reconcile (Mowbray, 2010). Despite these conflicting views and the increasing prominence of rural community-led broadband in the UK, little is understood about the place and context of community-led broadband within the wider telecommunications sector and intervention. This illustrates a knowledge gap this thesis will address.

This section has focused on community-led broadband alternatives in the UK as an alternative mode for rural broadband delivery. It has significantly developed the academic discussion on 'community-led broadband' as a movement within the UK and internationally in order to contextualise its place within the wider political economy and the historical neoliberal agenda of the telecommunications sector. It outlined the range of operational models for community broadband, as well as associated research into its efficacy as part of the digital infrastructure spectrum. As a relatively new method with wide-ranging impacts to the engaged communities, this doctoral study will focus on these community-led broadband initiatives to contribute to a better understanding of their role as part of superfast broadband delivery strategies.

3.6 Relevance and research questions

With the ambition for increased superfast broadband installation in the UK, I have chosen to focus on fixed-line superfast broadband access in this thesis. It represents the latest shift in next generation broadband service provision, there have been relatively few studies of its impact conducted, and the continuous drive for increased superfast broadband access from a policy standpoint begs the question- what does it actually do for rural communities? In

keeping with the recent literature and installation landscape, I will focus on community-led broadband initiatives, an element of the wider telecommunications sector that is little understood, to enable an analysis of the influence of both building and using a superfast broadband network in the rural market context. Two case studies have been identified and will be analysed using a pre- and post-installation method, which will be discussed in detail in Chapter Four.

A gap in the literature has been identified in this chapter for investigating the potential for community-led superfast broadband to play a role in enhancing rural communities through a social resilience conceptual framework. There is currently no published research about the actual impact of superfast broadband installation and use on rural communities through a resilience lens, despite resilience increasingly becoming a ubiquitous concept (Skerratt, 2013). As Masten (2001) states in the psychological resilience context, "...the task now is to delineate how adaptive systems develop, how they operate under diverse conditions, how they work for or against success..." (p. 235). This research will offer a novel contribution by exploring the experiences of rural dwellers developing and achieving superfast broadband access, with particular insight into its ability to enhance an individual's and community's resilience. The introduction of a conceptual model of social resilience in Chapter Two focussing on four dimensions when conducting qualitative research adds to the growing literature in resilience, as well provides a conceptual framework for future research in assessing social resilience in other contexts. The research questions of this doctoral study are therefore as follows:

1. Does the process of acquiring superfast broadband technology infrastructure in rural areas play a role in enhancing individual and community resilience?
2. Does the presence of superfast broadband technology infrastructure in rural areas play a role in enhancing individual and community resilience?

I will not only address where and how individual and community resilience is being 'built' or 'diminished' through interaction with community-led superfast broadband infrastructure but what challenges individuals and communities have faced throughout the pre- and post-installation process. By shedding light on the intricacies of rural broadband connectivity at the local level, I am adding to our understanding of the real impact of superfast broadband on communities' adaptive capacity. My efforts are focussed on the individual and the rural community in which those individuals live. This scale of enquiry is best suited to understand and illuminate rural broadband connectivity needs and impacts. The continued stress on a

local approach for telecommunications infrastructure from national government policy and strategy mark the analysis of community-led initiatives herein as current, relevant, and importantly, insightful for the future direction of rural communities and policy.

This chapter has conveyed the digital dimensions of this thesis, including research on broadband technology use and installation and the related rural community context. This serves to complement the social resilience conceptual framework developed to guide the data collection outlined in Chapter Two. The chapter has concluded by clearly stating the research questions of this doctoral study. The research methodology adopted is now described in Chapter Four.

4 RESEARCH METHODOLOGY

4.1 Introduction

This chapter charts the development and critical evaluation of the methodology adopted to address the aims and objectives of this study. Indicated in Chapter One, the aim is to explore the impact of the installation and use of superfast broadband in rural communities. The objectives are:

- To build and critically evaluate the concept of social resilience.
- To develop and analyse the potential relationship between social resilience and broadband technology.
- To identify and characterise trajectories of community-led broadband initiatives and investigate the scalar relationships that community-led broadband initiatives exploit to obtain services.
- To elucidate how the processes of broadband acquisition are contributing to the changing technological rural landscape and how that may contribute to individual and community resilience.
- To investigate what broadband speeds are ‘needed’ in rural communities and for what purpose and identify how they are contributing to individual and community resilience.

This study is concerned with the processes of superfast broadband, communities and community leaders’ negotiation of, and response to, the national telecommunications sector and government policies regarding superfast broadband roll out, and the implications of these negotiations on superfast broadband use. This study adds value to current telecommunications installation practices as well as providing a basis for developing future digital policy interventions, which incorporate community-led technology initiatives. These aims have resulted in two key research questions, contextualised within the current literature in Chapters Two and Three, namely:

1. Does the *process* of acquiring superfast broadband technology in rural areas play a role in enhancing individual and community resilience?
2. Does the *presence* of superfast broadband technology infrastructure in rural areas play a role in enhancing individual and community resilience?

This chapter takes the reader through explanations of why the research was designed in the way it was and the rationale for the selection of particular techniques of data collection and analysis. Four sections are used to structure the narrative: firstly, I depict the methodological approach, grounded in social resilience theory; secondly, I outline the case study locations and their relevant characteristics; thirdly, I consider the data collection instruments; and fourthly, I outline the analysis process, formed through a consideration of the theoretical frame of social resilience.

I first consider the selection of the methodological approach, which grounds the study in the theoretical frame of resilience rather than focusing on a single philosophical ideology (Section 4.2). I discuss current methodological approaches applied to human geography, primarily rural studies, social resilience studies, and socially-based Internet studies, demonstrating the considerations taken into account when structuring this research within relevant methodological debates (Section 4.2.1). I then outline the chosen methodology, a qualitative, longitudinal approach (Section 4.2.2).

In order to address the research aims and objectives, new empirical data had to be collected, some of which was relatively straightforward and more factual in nature, relating to the locations of enquiry, or the case study element, of this thesis, which constitutes Section 4.3. The case studies are Broadband for the Rural North (B4RN) and Broadband for Glencaple and Lowther (B4GAL). I outline their characteristics relevant to the research and develop the rationale for their selection, focusing on location and rurality (Section 4.3.1), socio-economic considerations (Section 4.3.2) and technological characteristics (Section 4.3.3).

Having built the theoretical and methodological approach and outlined the locations of enquiry, I then focus on the third stage, addressing the acquisition of knowledge relating to the processes of community-led superfast broadband initiatives and broadband use, which required more exploratory approaches to issues relating to these aims. Thus, this study required a multi-phased open-ended approach to primary data collection, with each phase guided by particular theoretical orientations as appropriate to the subject and nature of enquiry. Chronologically, the first phase of research informed the second data collection stage. Section 4.4 outlines Phase One of data collection, which aims to establish a 'baseline' in relation to community-led broadband initiatives and broadband use and the potential for individual and community resilience within the case study locations. In keeping with the longitudinal, or multi-phased, methodology, this phase of the research took place prior to the

introduction of superfast broadband. Phase Two data collection is then outlined in Section 4.5, following similar processes as outlined in Phase One to ensure comparable results over the time of this doctoral research. This is considered a follow-up, or post-installation phase, probing the case study locations after superfast broadband implementation via a community-led broadband initiative. The selection of data collection instruments, interview design, the operation of data collection procedures in the field, and the methods used for recording are described in detail in Sections 4.4 and 4.5.

Finally, Section 4.6 details the fourth stage, the analytical process. I develop a ‘resilience’ analysis, following on from the chosen theoretical frame of social resilience as described in Section 4.2, outlining the methods used for analysing and interpreting the data of both Phase One and Phase Two to effectively demonstrate the potential for social resilience.

4.2 Selecting a methodological approach

This section will first provide a brief overview of previously used methods in research related to this doctoral work (Section 4.2.1). It will then concentrate on reviewing the theoretical position of this project, which has a critical influence on design and analysis practices, and conclude with a justification of the selection of a qualitative, longitudinal approach for this doctoral study (Section 4.2.2).

4.2.1 Methods in previous studies of rural geography, resilience, and social science

Internet research

In order to identify the most effective data collection and analysis strategy for this thesis, a review was undertaken of existing research methods used in rural geography research, resilience research, and social science Internet research. In terms of human geography research, specifically work in rural communities, many studies utilise qualitative, case study methods. Qualitative data has long been viewed as providing a rich and full, or holistic, view of the research questions (Miles, 1979), often concerned with “developing an understanding of the meaning and experience dimensions of humans’ lives and social worlds” (Fossey *et al.*, 2002, p. 717). Longman *et al.* (2011) studied social isolation in rural community health and hospital visits, utilising semi-structured interviews in rural New South Wales, Australia. The authors found that the perspectives given through the interviews were able to elucidate the role of social isolation in hospital admission. Analysis for such qualitative textual data (such as interview transcripts) often included, but is not limited to, content analysis, thematic analysis and narrative analysis. Jordan and Javernick-Will (2013) studied community recovery from disaster demonstrating the use of content analysis to identify indicators used to measure

community recovery through a sample of 202 academic journal articles. Averill (2003) studied the elderly population of a specific rural community to investigate issues of health utilising thematic analysis on interview text. Worley *et al.* (2000), studied rural medical practice utilising thematic analysis to present themes from interviewed stakeholders. Dare *et al.* (2011) utilised narratives to examine community engagement in forest management, highlighting the perspectives of practitioners and other stakeholders.

Many rural geography studies have also used an ethnographic approach, embedding the researcher within the community to conduct research, seen as a more intensive approach (e.g. Hughes *et al.*, 2000). This results in an attempt to understand and document the lived essence of a community (Woods, 2005). Falk and Kilpatrick (2000) utilise a ‘whole-community case study’ and use ethnographic techniques to research the nature of local networks in a rural community (p. 93). Their focus on interviews, diaries and focus groups was deemed the most appropriate to achieve the outcomes of the research.

Meinzen-Dick *et al.* (2004) highlighted a similarly intensive method called action research, or participatory action research (PAR), a highly participatory process that allows the researcher to actively engage in the communities they study, creating a very dynamic and adaptive research process. In her review of action research, McNiff (2013) states that it is about, “learning in and through action and reflection” (p. 24) and it is, “an enquiry by the self into the self, with others acting as co-researchers and critical learning partners” (p. 24). The participatory research movement has been prominent in the human geography discipline for some time, reflecting research activity across a range of themes including rurality. Rachel Pain’s (2003, 2004) seminal work on participatory research, published as multiple reviews, emphasised the emerging place for action-oriented social geographies, creating new spaces for engagement and aligning neatly with the subject matter and approaches of social geography, such as researching people’s relations with space, place and environment. Critically relevant for studies of social geography, she highlights that participatory-based research methods enable the drawing of multiple connections between issues at multiple scales. Later work by Pain and Kindon (2007) continued this emphasis on the relevance of participatory approaches for geography for introducing new methods, knowledge, and social change outcomes. Looking to the rural context, Panelli *et al.* (2006), used action research to discuss rural health services, identifying that using community activism approaches can unearth gaps between policy rhetoric and health access experiences. Bish *et al.* (2013) similarly utilised action research in a rural health context to understand nurse leadership in Australian rural hospitals and stated that

the relationship between participants was egalitarian rather than hierarchical, highlighting the immersive process. It was also acknowledged that PAR represents, “a significant investment of time and emotional energies of both the researchers and the research participants” (p. 287).

This is particularly relevant to PAR, but can also be attributed to other qualitative studies, as methods are restricted to the amount of time and resources available to the researcher(s). Miles (1979) highlights this, stating that although qualitative research is attractive for its many positive attributes, it is highly labour intensive for the lone researcher, and can be difficult to coordinate and ensure comparability if the research is being conducted as a team. In all qualitative research, particularly those bound to case studies, ensuring transferable and generalisable results, rather than anecdotal, can be problematic. Lukka and Kasanen (1995) discussed issues of generalisability in financial research, highlighting the challenges of analysing social structures and institutions, which often change over time and may be location dependent, and identify that there is an inherent difficulty in predicting human behaviour. In general, human geography studies cover a range of methodologies, and those specifically focusing on the rural community scale are often qualitative, case study based, occasionally incorporating intensive methods including ethnography and PAR.

Studies of social resilience represent a relatively new field within academic literature (e.g. Graugaard, 2012; Scott, 2013; Skerratt, 2013). Many studies have taken advantage of quantitative characteristics (GDP, employment levels and so on) to provide an understanding of the presence (or lack thereof) of resilience. Sherrieb *et al.* (2010), for example, used state level statistics to measure resilience capacities. Quantitative resilience research has focussed on identifying change (for example, economic benefit) using inferential statistical analysis and, more specifically multivariate tests to identify relationships between variables (e.g. Graugaard, 2012; Schwartz *et al.*, 2011). Masten (2001) describes using multivariate tests as well for analysing resilience within the psychological context, testing for linkages among measures of risk, adversity and so on.

While this can provide a good overview of a region’s wellbeing, it lacks the depth provided through an in-depth qualitative study. Recent resilience research has undertaken what is considered a more traditional qualitative approach to identify resilience capacities. McManus *et al.* (2012) conducted face to face interviews in their study of rural community resilience and the importance of engagement with farmers, representing a qualitative approach. Skerratt (2013), in her work examining community land ownership and its impact on resilience, also

utilised qualitative semi-structured interviews. Franklin *et al.* (2011) studied local food and its impact on resilience building using action-based qualitative research, including informal participant observation and stakeholder interviews over a set period of time. Graugaard (2012) studied the use of local currency (the Lewes Pound) to determine the likelihood of it influencing consumption patterns and the building of social-ecological resilience. Her methods included building resilience ‘criteria’ (similar to the process completed in this study in Chapter Two) and conducting a range of semi-structured interviews as well as surveys. Matarrita-Cascante and Trejos (2013) also developed three conditions of resilience and then sought to identify those using place-based, qualitative research. Masten (2001) identified person-focussed approaches for understanding psychological resilience, comparing children across backgrounds over time to identify resiliency, supporting data collection that looks beyond a surface level statistical background of communities and incorporates a longitudinal element. Qualitatively, participant observation, informal discussions and interviewing took many analytical approaches including thematically viewing and coding data, close reading and content analysis, and developing narratives (e.g. Franklin, 2012; Longenecker *et al.*, 2012; Wilson, 2013). In Skerratt’s (2013) review of resilience relationships with community land ownership, thematic analysis is conducted, deemed a recognised analysis approach for semi-structured interviewing. The newness of resilience as a conceptual lens means that there is little uniformity within accepted methods, creating a challenge for resilience research. There appears to be some consistency in developing resilience criteria and, using qualitative methods including participant observation and interviewing, identifying those criteria *in situ*. It is importantly acknowledged that resilience is useful as it offers alternative analytical methods, which can provide alternative policy narratives (Scott, 2013).

Social science Internet research has often taken advantage of quantitative methods, such as surveys and statistical analyses. Stern *et al.* (2011), for example, used local and national survey data to analyse the relationship between Internet access and community participation. Kolko (2012) studied broadband and employment using specific national-level data sets outlining broadband providers and employment levels and deriving relationship patterns. Koutroumpis (2009) similarly examined broadband and economic development using econometric models on OECD data sets. Whitacre (2010) analysed diffusion of Internet technologies in rural communities by looking at state level statistical data sets at two points in time, beginning to develop the idea that Internet uses are best understood over a period of time. The Oxford Internet Survey (OxIS), describes access to, use of, and attitudes towards, the Internet across the UK, sampling approximately 2000 people biennially, and is also currently grounded in

quantitative data collection methods and analysis (Dutton *et al.*, 2013). These examples, as well as many others, highlight the focus on quantitative techniques when analysing Internet-related issues across academic disciplines. They also often depict the influence of Internet technology over time, so periodic studies, such as OxIS, or studies that include multiple points in time are deemed beneficial to understanding this fast moving field of academic enquiry.

Thus, guiding the methodological approach taken to address the research questions there are two key requirements of the data to be collected. The first is to elicit reference points of the community in relation to community participation and broadband, from which to secondly enable an exploration of the ideas and meanings with respect to a community-led superfast broadband installation and use through a lens of social resilience. This clearly has implications for research design and the selection of techniques for data collection and analysis. The approach taken in the study is now outlined in Section 4.2.2.

4.2.2 A qualitative, longitudinal ‘social resilience’ approach

The aim of this doctoral study is to explore and understand the impact of the installation and use of superfast broadband in rural communities. By critically engaging with the academic literature and the developed research objectives and questions, a fusion of related research approaches is needed. This requires joining the qualitative methods from community-based research in the geography discipline, the qualitative focus and the creation of deductive criteria to help situate our understanding of such data from social resilience research, and the phased or longitudinal element from social science Internet research. This represents the most appropriate approach through which to situate and create a critical understanding of the social and cultural implications of superfast broadband installation and use in a rural setting. However, to enable an informed discussion of the implications of community-led approaches for superfast broadband roll out on access, coverage, and future broadband use, it is recognised that the complexity of these community and technology processes require some reference points through which to approach the subject. It is relevant here to consider the philosophical assumptions taken throughout the study as they shape the formulation of problems and solutions and their evaluation (Cresswell, 2013).

Broadly, this research is guided by an interpretivist epistemology, which aims to understand and interpret human behaviour through motives, meanings and reasons, which can be time and context bound, ultimately seeing the world as socially made. In interpretivist thinking, knowledge is situated and entangled in power relationships (Wedeen, 2010), and developing an understanding of the influence of installation of superfast broadband through community-led

practices for that community, as this thesis seeks to do, is necessarily underpinned by such an approach. While this perspective informs the stance taken in terms of the objectives and research questions, aligning with the focus on complex social processes, it does not constitute a rejection of structurally informed vantage points nor associated methodologies. Alongside this philosophical epistemological approach, I also consider the theoretical framing of this research within 'social resilience', a theory (developed in Chapter Two) that has meaning and value for research design and methods. This research theorises that the resilience of individuals and communities can be influenced by broadband installation and use. The research aims and objectives are formed primarily through the conceptual theory of resilience, ultimately placing theory central to the research design and questions of methods and analysis. My approach then lends itself towards conducting a theoretically informed inductive research method, creating open-ended avenues for social interaction investigation to be analysed through a theoretical lens. This doctoral study is therefore primarily a theoretical approach *guided* by interpretivist thinking rather than grounded strictly in such a philosophical ideology. This aligns with the pragmatist approach advocated by Cresswell (2013) within the context of mixed method research.

The choice of research design and methods are dependent on the nature of the investigation, outlined in Chapters Two and Three. As reviewed in Chapter Two, investigations into social resilience at a local community scale can be approached quantitatively or qualitatively. However, the conceptual framework of social resilience built through the literature review and guiding this study is likely to benefit from a qualitative approach in the first instance, with greater scope in future work. This thesis aims to explore and capture an understanding of the installation and use of superfast broadband *from the perspective of the rural dweller*, best served by the adoption of a qualitative approach, reflected in previous rural geography and resilience studies. It is also broadly understood that qualitative research is best utilised when complex issues are being explored, with multiple voices and variables (Cresswell, 2013), as is the case in this doctoral study.

Social resilience is developed as a process, which steered my research design in the direction of a longitudinal approach, and is complemented by the longitudinal, or phased, nature of previous social science Internet research. The research questions of this study ask whether or not superfast broadband enhances rural resilience at both the individual and community scale. This requires data collection methods that develop some level of baseline initially, followed by follow-up research after the inclusion of the new broadband service, again supporting the adoption of a longitudinal approach. This is indicative of a pre-post study, or before and after

study, which is a well-established method for studying technological impacts, demonstrated through precedents discussed above and including works such as LaRose *et al.* (2011), Kolko (2012) and Hitt and Tambe (2007). The sequencing of these two data collecting phases was designed so that the collection of the first set of data facilitated the collection of the second phase, and incorporated periods of reflection into this process. In relation to the research objectives, this approach results in the following suitable methods presented in Table 4 – 1.

Table 4 - 1 Research objectives with selected methods

Research Objectives	Methods
To build and critically evaluate the concept of social resilience.	- Literature review and framework development
To develop and analyse the potential relationship between social resilience and broadband technology.	- Literature review and policy discussion - Semi-structured interviews, baseline phase
To identify and characterise trajectories of community-led broadband initiatives and investigate the scalar relationships that community-led broadband initiatives exploit to obtain services.	- Semi-structured interviews, primarily stakeholder interviewees, baseline and follow-up phase
To elucidate how the processes of broadband acquisition are contributing to the changing technological rural landscape and how that may contribute to individual and community resilience.	- Semi-structured interviews, baseline phase
To investigate what broadband speeds are 'needed' in rural communities and for what purpose and identify how they are contributing to individual and community resilience.	- Semi-structured interviews, follow-up phase

A qualitative research design has implications for later stages in the research process, including the ways in which research data are analysed and interpreted (Brannen, 2004). With this in mind, it is reiterated that this work was guided by interpretivist assumptions, and the theoretical positioning of social resilience was used to frame data analysis and interpretation. Qualitative analysis is considered an important tool for understanding the highly complex socio-cultural dimensions of ICT use in general (Eynon and Geniets, 2012; Thomas *et al.*, 2005). The use of such data collection and analysis tools in this study will enable an understanding of the complexity of underlying processes of community initiatives and broadband adoption that profoundly shape the role of community-led superfast broadband initiatives. Furthermore, qualitative analysis of a range of people's constructions and representations raises awareness of the multiplicity of meanings attached to both broadband and community initiatives. Importantly, a qualitative and longitudinal approach, including a pre-installation phase and post-installation phase, allowed these meanings to be comprehended in the contexts of actual technology use and everyday life in which they were embedded, enabling closer scrutiny of the links between the process of installing and the use of superfast broadband.

4.3 Case studies: Community-led broadband initiatives

Case study approaches are commonly adopted in many social science disciplines (Gillham, 2000). They are considered appropriate to study relatively bounded systems such as a process, an activity or multiple individuals (Cresswell, 2013). Case studies provide for the development of in-depth description and analysis of a case, or cases, and have been used extensively in previous rural geography research. The potential limitations of case studies as a means to producing generalisable findings are acknowledged. However, in keeping with best practice, this study has used methodological triangulation. The use of two case studies in two geographically different regions with different community structures adds both depth and makes it possible for transferability of findings to be identified with more confidence than would be possible from a single case study research design (Cresswell, 2013).

This doctoral study set out to analyse the installation practices and use of superfast broadband. As described in Section 3.5, community-led superfast broadband initiatives represent a recent addition to national broadband strategies and are highly valued to ensure universal provision. This has created a need to understand their impact in rural communities. In 2005, it was estimated that there were 260 organisations running community broadband initiatives of various models covering 550 towns and villages in the UK (Corbett *et al.*, 2005). These were constituted, approximately, as 40% social enterprises, 30% Small and Medium Enterprises (SMEs), 10% public sector, and 20% not yet constituted (Corbett *et al.*, 2005). In the intervening years, alongside the increasing interest in digital services, community-led broadband initiatives have continued to exist, often as a response to continued rural market failure. In 2012, Skerratt *et al.* recorded a minimum of 18 community projects in Scotland. In England in 2014, a total of 51 community broadband initiatives applied to the Rural Community Broadband Fund (5 were successful) (DEFRA, 2014b), demonstrating a significant presence. In Wales and Northern Ireland, at least 5 were present in 2013 with mixed results (3 in Wales and 2 in Northern Ireland)¹². At the outset of this doctoral research, there was no formally established number of specifically community-led broadband initiatives in operation, but it could be inferred to be a minimum of 74 for the whole of the UK, and increasing if accounting for those initiatives in their infancy or without a prominent online

¹² Identified from the Rural Broadband Partnership Project database (Rural Broadband Partnership, 2010). The Welsh schemes are:

1. Gower Broadband - concluded in 2013, resulted in partial cabinet upgrades.
2. Radnor Broadband - no current information available, resulted in no change.
3. Goldcliffe, Whitson & Nash broadband - no current information available, resulted in no change.

The Northern Ireland schemes are:

1. Lightstream Community Fibre – no current information available, campaign for 1 Gbit/s FTTP service in Ards Borough, County Down
2. Fibre4Edenderry – no current information available, interest expressed.

presence. This research set out to study two locations. The decision to select only two of the potential many was due to time and resource constraints, although it is recognised that additional case studies using this qualitative methodology could strengthen the findings. The qualitative approach ensured a richness of data that would address multiple voices and perspectives not afforded to a quantitative method, such as wide-ranging surveys. The case study selection process sought to accommodate a range of different spatial and social conditions that could potentially mediate the decisions of superfast broadband users. This included the 'rural' nature of the study areas, socio-economic conditions, technology infrastructure availability and type of community initiative leading the development of superfast broadband locally. By situating the two case studies across a spatial spectrum, the findings can be validated as potentially transferable across rural areas. The two locations selected are a region of rural Lancashire, north west England where a group called Broadband for the Rural North (B4RN, pronounced BARN) are active, and a region of South Lanarkshire and Dumfries and Galloway, south central Scotland where a group called Broadband for Glencaple and Lowther (B4GAL, pronounced BAGEL) are leading attempts to develop superfast broadband in the area.

B4RN and B4GAL were selected purposefully and strategically to generate a robust and relevant research study. B4RN was a timely development, its position as a fully public model with a locally based funding and building scheme contributed to their selection, as was the access to a 'gatekeeper' who served as the introduction point. B4GAL diverges from B4RN in relation to its funding and construction model and broadband installation goals, and is therefore a useful comparator. It was selected after researching Scottish community broadband opportunities, to accompany B4RN as an English case study, acknowledging the differing policy mechanisms and opportunities for such initiatives. It was recommended by informal communication with Scottish Government based on timeliness of potential roll out and relative ease of access and willingness of the initiative to operate as gatekeepers to the community. Similarities and differences between B4RN and B4GAL are presented in detail in the following sections: Section 4.3.1 discusses their location, rurality and land use characteristics; Section 4.3.2 outlines their respective socio-economic characteristics building up a contextual understanding of the areas; and Section 4.3.3 provides an in-depth account of their technological considerations at the outset of this research, describing their current broadband access, and their project structure. This data¹³ was used early on in the research to

¹³Sources used include Ofcom, the Scottish Government and the Office for National Statistics, as well as local authorities and internally collected B4RN and B4GAL data presented in their respective business plans.

aid the case study selection process and re-used to set the context for each case study. Established in Chapter Two, resilience is best understood when place-based characteristics are addressed, indicating that each region should be contextualised within its rural, socio-economic, and technological characteristics. This enables a relevant comparison of the findings in order to elucidate the many alternative pathways of community-led superfast broadband and their relationship with resilience, responding to the aims and objectives outlined in the introduction to this chapter.

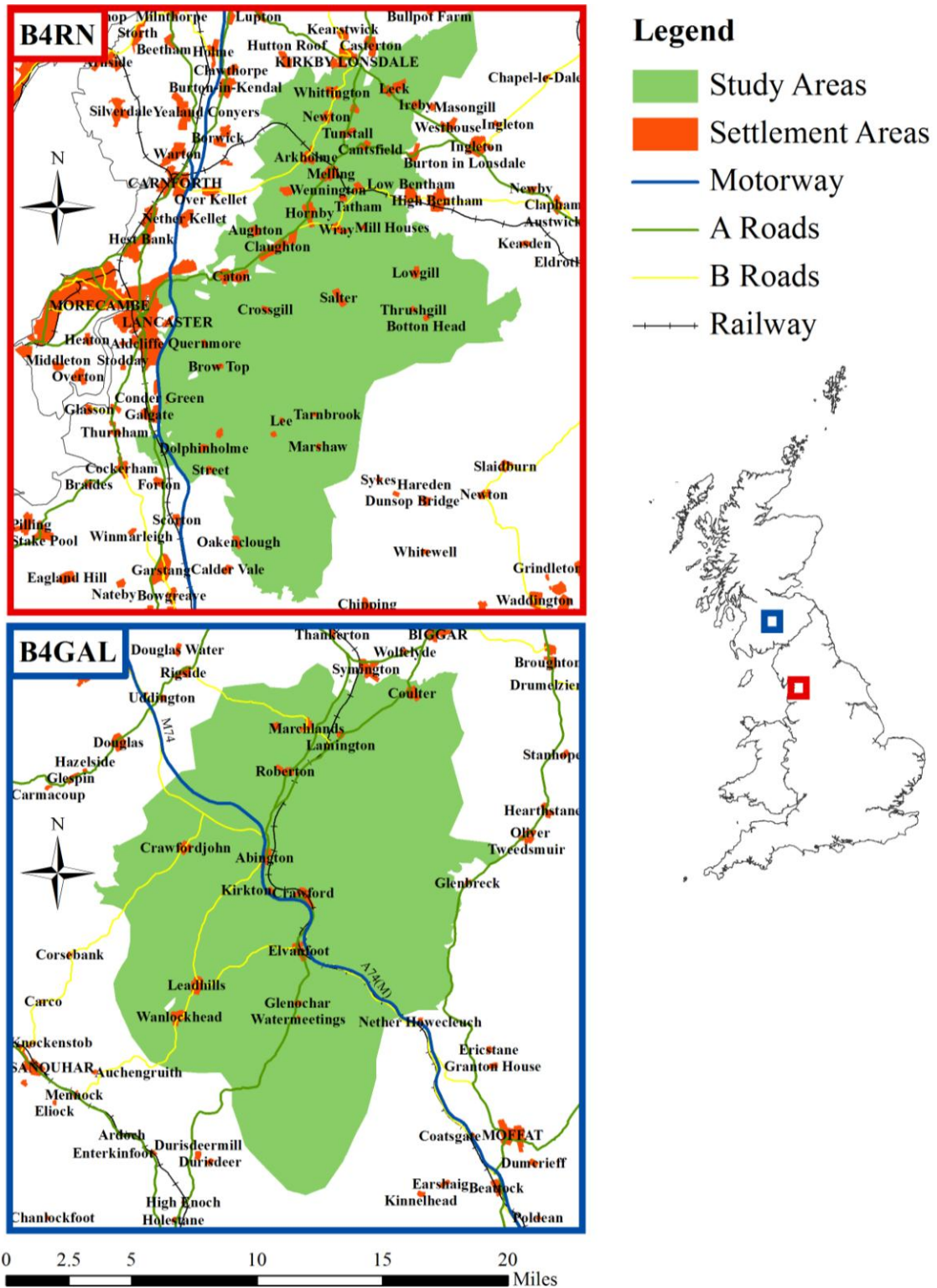
4.3.1 Location, rurality and land use of B4RN and B4GAL

B4RN is located in a region of rural Lancashire in north-east England, situated east of Lancaster, the main urban centre in this part of England. B4GAL represents a region in South Lanarkshire and part of Dumfries and Galloway, and is located in south-central Scotland. Map 4 - 1 shows the location and geographical context of both the B4RN¹⁴ and the B4GAL¹⁵ study areas.

¹⁴ In order to identify the geographic area under which B4RN was operating, a list of postcodes being covered was obtained from the B4RN business plan (see Forde, 2013), and using census data these postcodes were matched manually to their corresponding census output area, reflecting a high level of geographic accuracy.

¹⁵ In B4GAL, no postcodes were available as their coverage was not confirmed at the time of investigation. In order to identify the geographic 'best-fit' area under which B4GAL was operating, a mapping exercise was undertaken; output areas were visually correlated within Scotland's Census portal to a broad polygon map provided by B4GAL on their website (see B4GAL, 2014). This resulted in the identification of an approximation of the postcodes, which were then related to output areas to look up data within the census.

Map 4 - 1 B4RN and B4GAL case study locations



Source: Created by Author with information from B4RN and B4GAL. *B4RN information:* Forde (2013). *B4GAL information:* B4GAL (2014).

At the outset of this study, B4RN was in the final stages of building the first phase of their fibre-optic superfast network, with a plan to cover a landmass of approximately 420km² with 3206 properties (Forde, 2013). B4GAL, modelled on the ideals of B4RN, is planning to offer

superfast broadband services to nine villages and surrounding areas, covering 499 km² with approximately 967 households. This is slightly less than a third of the B4RN household coverage. This demonstrates, at least in terms of population, that B4GAL is a smaller study area in comparison with B4RN, but represents the lower population densities found across much of rural Scotland. This is also visually present when comparing the B4RN and B4GAL maps, which are drawn to the same scale. A comparative table, Table 4 - 2, reflects the location, rurality and land use patterns of B4RN and B4GAL.

Table 4 - 2 Location, rurality, and land use in B4RN and B4GAL

Selected Characteristics	Broadband for the Rural North (B4RN)	Broadband for Glencaple and Lowther (B4GAL)
Location	<ul style="list-style-type: none"> Part of Lancashire, north-west England 	<ul style="list-style-type: none"> Part of South Lanarkshire and Dumfries and Galloway, Scotland
Size	<ul style="list-style-type: none"> 420 km² 	<ul style="list-style-type: none"> 499km²
Population	<ul style="list-style-type: none"> 13193 	<ul style="list-style-type: none"> 2220
Density	<ul style="list-style-type: none"> 0.27 people/hectare 	<ul style="list-style-type: none"> 0.044 people per hectare
Rural Nature	<ul style="list-style-type: none"> Primarily <i>Rural Hamlets and Isolated Dwellings</i>, some 'sparse', small sections <i>Rural Town and Fringe</i> and <i>Rural Village</i> (DEFRA urban-rural classification for England) 	<ul style="list-style-type: none"> <i>Remote Rural</i> and <i>Accessible Rural</i> (Scottish Government urban- rural 8 fold classification)
Land Use	<ul style="list-style-type: none"> Borders Lancaster city (pop.138,375) and the M6 motorway to the west, the Pennines to the East. Covers the majority of the Lune Valley. Sits primarily within the Forest of Bowland, an Area of Natural Beauty (AONB). Duke of Westminster, as part of the Grosvenor Estate, owns large tracts of land in the study area. Most undeveloped land is active farmland. 	<ul style="list-style-type: none"> Situated southwest and southeast of Glasgow and Edinburgh respectively. Dumfries, closest urban centre, is located directly to the south, and is much smaller than Lancaster (pop. 31,600). Upland region home in part to Scotland's largest onshore wind farm, the Clyde Valley Wind Farm. Most undeveloped land is farmland, used for grazing rather than arable agriculture. Two major transportation routes bisect the study area: the M74 (accessible to residents) and the West Coast Rail Line (not accessible).

Source: *B4RN Information*: Forde (2013); Lancashire County Council (2014a, 2014b); Lancaster City Council (2015); ONS (2011a, 2011b). *B4GAL Information*: Dumfries and Galloway (2015); National Records of Scotland (2011); SSE (2014).

The B4RN region is relatively large with respect to population, and is a mixture of rural towns, hamlets and isolated dwellings, whereas B4GAL in comparison has a relatively small

population, yet is geographically large, and therefore more sparsely populated. The distance between settlements, depicted in Map 4 – 1, also reflects this sparsity in B4GAL much more strikingly than in B4RN. Both areas have access to major road transportation routes, but they have little additional transportation infrastructure, and most of the both regions' undeveloped land is active farmland. Farming remains an important land use and economic activity in both areas.

4.3.2 Socio-economic characteristics of B4RN and B4GAL

The rural physical spaces introduced above are best understood in relation to socio-economic characteristics. Table 4 - 3 outlines historic and current economy and social indicators for the B4RN and B4GAL case studies.

Table 4 - 3 Socio-economic characteristics in B4RN and B4GAL¹⁶

Selected characteristics	Broadband for the Rural North	Broadband for Glencaple and Lowther
Historical economy	<ul style="list-style-type: none"> • Lancashire County was a centre for manufacturing activity including mining and textile production. • Along the coast to the west of the B4RN region, fishing and port activities took precedence. 	<ul style="list-style-type: none"> • South Lanarkshire was an industrial centre, mined for its lead and coal. Dumfries and Galloway was also mined for its gold. • Its location with direct trading routes to Glasgow, Edinburgh and the south, meant it was successful for exporting. • It was also a stopping location for individuals travelling to Edinburgh and Glasgow and north, and those going south towards Carlisle. An historic pilgrim route from Edinburgh to Whitorn in Galloway also crosses through the B4GAL area.
Current economy	<ul style="list-style-type: none"> • Located in Lancaster district, the second largest unitary authority in Lancashire, it is known for its proximity to the Lake District, well-regarded universities, and architectural legacy. • Its economy is predominantly linked to the service sector and the education sector 	<ul style="list-style-type: none"> • Many residents of the area commute to the central belt of Scotland (the corridor between and including Glasgow and Edinburgh) for employment. • There are few local business centres, similar to much of rural Scotland. • Its economy is predominantly linked to retailing, specialised consulting and agricultural sectors.

¹⁶ Statistics supporting these general findings are located in Appendix IV.

Socio-demographic Considerations	<p>In general compared to England/Wales average:</p> <ul style="list-style-type: none"> • Low deprivation. • Good health. • Professional, educated workforce with a high proportion of skilled trades workers. • High percentage of self-employed individuals. • Large retired population • Low unemployment. • Most premises are individual family homes. • High proportion of older one-person households. • Few daily public transportation options. 	<p>In general compared to Scottish average:</p> <ul style="list-style-type: none"> • Middle, or medium, level deprivation. • Good health. • Evenly mixed workforce, similar to national average education levels, high proportion of skilled trades workers. • High percentage of self-employed individuals and those that work from home. • Large retired population. • National level unemployment. • Most premises are individual family homes. • High proportion being older one-person households. • Few daily public transportation options.
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Source: *B4RN Information*: Forde (2013); Lancashire County Council (2014a, 2014c); Moulding (2010); ONS (2011a, 2011b). *B4GAL information*: National Records of Scotland (2011); SIMD (2012); South Lanarkshire Council (2013).

In relation to overall socio-economic conditions, the information presented in Table 4 – 3 paints a relatively simplistic picture of the B4RN and B4GAL study areas. Historically, both areas were centres for industry and manufacturing; industries that have declined significantly in the recent past. Currently, B4RN and B4GAL both serve partly as commuter hubs for urban centres. In B4RN, there is low unemployment and the working population has a high percentage of self-employed individuals. B4RN is broadly characterised as having a professional, highly educated workforce with a high proportion of skilled trades workers (common due to the agricultural nature of the area). B4GAL exhibits middle, or medium level deprivation as reported in the SIMD (indicative of more deprivation than B4RN), has a working population with a similarly high percentage of self-employed individuals, as well as those that work from home, and although it also has a similarly high proportion of skilled trades workers, it has a more evenly mixed workforce whose educational profile aligns with the Scottish average. Overall, both B4RN and B4GAL have a large retired population compared to the England/Wales and Scotland averages respectively, with B4RN exhibiting low unemployment and B4GAL with slightly higher Scottish national level unemployment. Both areas exhibit high proportions of older one-person households compared to the England/Wales and Scotland averages, generally report good health, and retain few daily public transportation options.

4.3.3 Technological considerations of B4RN and B4GAL

Both B4RN and B4GAL explicitly seek to develop superfast broadband networks for their respective communities. Table 4 - 4 outlines the technological characteristics they aspire to in relation to broadband, as well as each project's model and progress as at the outset of this doctoral study.

Table 4 - 4 Technological considerations in B4RN and B4GAL

Selected Characteristics	Broadband for the Rural North	Broadband for Glencaple and Lowther
Project Aim	<ul style="list-style-type: none"> • Create a superfast fibre-to-the-home (FTTH) community-run service • 1 Gbit/s symmetrical service 	<ul style="list-style-type: none"> • Create a superfast fibre-to-the-home (FTTH) community-run service • Aiming for 30Mbit/s
Existing Technological Considerations¹⁷	<ul style="list-style-type: none"> • Average speed: 4.22Mbit/s (UK average: 12.49Mbit/s). • Median speed: 4Mbit/s (UK median: 10Mbit/s). • Maximum speed: 12.1Mbit/s (UK maximum: ≥ 30Mbit/s). • Internet connectivity through cable, satellite, or local alternatives. • No access to superfast services. • Lack of commercial investment. • Wray, a small village within B4RN, experienced Internet infrastructure development in the past through Lancaster University, which connected approximately 100 households in Wray to a wireless network (no longer active). 	<ul style="list-style-type: none"> • Average speed: 3.68Mbit/s (UK average: 12.49Mbit/s). • Median speed: 3.4Mbit/s (UK median: 10Mbit/s). • Maximum speed: 9.1Mbit/s (UK maximum: ≥ 30Mbit/s). • Internet connectivity through cable, satellite, or mobile alternatives. • No access to superfast services. • Lack of commercial investment.
Project Progress	<ul style="list-style-type: none"> • Set up as a Community Benefit Society with charitable status. • Initial fundraising complete. • At implementation stage beginning to 'dig' the network and lay fibre cables. 	<ul style="list-style-type: none"> • Set up as a Company Limited by Guarantee with charitable status. • Nominated a pilot project within Community Broadband Scotland. • At planning stage, writing business plans and considering large-scale funding applications.

¹⁷ Internet availability, including average, median and maximum speeds for B4RN and B4GAL prior to superfast implementation, is further illustrated in Appendix V.

Project Method and Funding Model	<ul style="list-style-type: none"> • Entirely volunteer-run. • A ‘full public control model’. • Individual and community funding through a ‘share’ framework including offering cash and labour ‘shares’ - the latter of which could be obtained by being involved in the building process. • Building the network across fields/private property to reduce costs. • Using volunteers for the build 	<ul style="list-style-type: none"> • Entirely volunteer-run. • Aiming for a completely ‘full public control model’. • Aiming for large grants to fund the entirety of the network. • Aiming to build the network alongside roadways. • Aiming to use professional contractors for the bulk of the build.
Policy Mechanisms	<ul style="list-style-type: none"> • B4RN has accessed local and regional development schemes including the Prince’s Trust and the Forest of Bowland AONB. • At the national level they have begun engaging with the Rural Community Broadband Fund (RCBF) through Broadband Delivery UK (BDUK) 	<ul style="list-style-type: none"> • B4GAL has begun to engage with regional development schemes including the Clyde Valley Wind Farm Community Fund. • At the national level they have engaged with Community Broadband Scotland, as part of Digital Scotland, and become a pilot project.

Source: *B4RN Information*: DEFRA (2014a); DCMS (2014); Forde (2013); Ofcom (2012a, 2012b). *B4GAL Information*: B4GAL (2014); CBS (2013); Ofcom (2012a, 2012b); SSE (2014).

B4RN is offering a 1 Gbit/s fibre-to-the-home (FTTH) service, for a £150 connection fee and £30 per month for services. This is to be 1 Gbit/s symmetrical service, a contrast to most current asymmetrical provision, where upload speeds can be much lower than download speeds (Forde, 2013). B4GAL is aiming to develop FTTH connections with speeds of at least 30Mbit/s for £20 per month, and a possible business priority service for £50 per month, with connection fees to be determined once subscriber numbers became more concrete (B4Gal Community Broadband Ltd, July 28, 2014).

Types of existing broadband connections held in the B4RN and B4GAL areas included copper cable, which was unreliable and patchy given average distances to exchanges, and satellite, which provided up to 10 Mbit/s and was much more reliable, although costly. In B4GAL, interviewees also spoke of mobile alternatives, such as dongles for broadband access, and in B4RN, a wireless mesh service was highlighted, although its use in Wray was in decline (this inference was supported by conversations held in 2012 by users reflecting a lack of infrastructure and administrative support as the university project ended). The wireless mesh technology was installed as part of a Lancaster University research project with Wray acting as a ‘rural test bed’ for alternative solutions (as described in Ewald *et al.* 2011). During that research, approximately 100 households in Wray were connected to a wireless mesh network approximately 3.11% of the B4RN coverage (Ishmael *et al.*, 2008). Due to the small scale of

the intervention compared to the entirety of the B4RN project, I argue that previous work by Lancaster University has not unduly impacted upon the behaviour of the majority of B4RN interviewees or volunteers, and therefore B4RN remains a justifiable case study for this research.

Overall speeds in B4RN at the start of this study were low, with an average of 4.22Mbit/s, and much of the region only receiving less than 2Mbit/s, with some areas exhibiting no broadband access (an inference supported by interviews held with individuals who remained reliant on older dialup technology in 2012). B4GAL similarly experienced low speeds, with an average of 3.68Mbit/s. In both B4RN and B4GAL, households that did have faster speeds tended to be located close to roads or road intersections (not unexpected due to potential cabinet location and distance for cables). At the time, neither B4RN nor B4GAL had access to superfast services.

The project models for B4RN and B4GAL are similar: B4RN is set up as a not-for-profit social enterprise, and has charitable status. It officially registered as a Community Benefit Society as of 2011, seeking to demonstrate its commitment to the community, and is made up completely of volunteers (Forde, 2013). B4GAL is volunteer run, and officially set up as a Company Limited by Guarantee with charitable status, supporting 'by the community, for the community' aims. The projects diverge when reflecting on the funding models and building regimes.

B4RN, following a failed attempt to secure large grant funds from Lancashire County Council, turned to the community with a financial and volunteering model to reach its expected cost of £1.86 million. A 'share' framework, including both cash and labour or effort 'shares', which could be obtained by being involved in digging trenches to lay the fibre cabling and so on was established to finance B4RN. They opened the project to share purchase in December 2011. Additional incentives included a tax benefit, and a free connection and 12 months free service if an individual household invested at least £1500. This led to a total initial cash investment of £500,000 (Forde, 2013), with a further £600,000 which could be obtained from labour shares, and future monies through a loan from a charitable bank (B4RN 23, personal communication, 2012). B4RN's funding model was reliant on keeping costs down, which dictated not only the number of subscribers needed, but physical methods of installation, including running cables cross-country as opposed to along roads (which remains standard commercial procedure), using small bore ducts, and maintaining a volunteer approach to the majority of the labour

(B4RN 23, personal communication, 2012). In order to have the external capacity to support the gigabit to the home service, the network was expanded to edge south towards Manchester, where they could connect directly (or ‘peer’) with content providers and benefit from wholesale rates (B4RN 23, personal communication, 2012).

B4GAL was at an earlier stage than B4RN at the commencement of this doctoral research and represents a different building and funding model. They aim to follow a more traditional building process, laying fibre cables alongside roadways, and using professional contractors for the bulk of the network build (B4GAL 11, personal communication, 2013). With respect to funding the network build, B4GAL has been applying for large block grants to fund the entirety of the project. Potential funding bodies include the Scottish Government, Big Lottery, and the Clyde Valley Wind Farm Community Fund (see SSE, 2014). At the outset of this research, these applications were in process, and a complete business plan was being written. Initial funds were provided through Community Broadband Scotland (CBS) to pursue training and publicity for the building of the network, and CBS continues to provide targeted support and assistance to B4GAL¹⁸.

Throughout the cycle of this doctoral study, and following the first pre-installation phase of qualitative data collection, the B4GAL initiative altered its intentions to include building a fixed wireless system for the hardest to reach premises, a change that is discussed in detail in Chapter Six. At the centre of the B4GAL initiative remains a dedicated core group of volunteers working to obtain funds and push telecommunications infrastructure development. In this way, despite any differences in motivation, funding models or access points, B4GAL remains relatable to B4RN, and will serve as a relevant comparison for community-led broadband processes in practice.

4.3.4 Case studies summary

This section has introduced the two case studies, building a profile of each region to illustrate their relevance for inclusion in this doctoral study. B4RN has a mixture of rural towns and hamlets, an economically active population with a high percentage of self-employed individuals, low deprivation and a large retired population. B4GAL is more sparsely populated, has a high percentage of self-employed individuals and those that work from home, an evenly mixed workforce employed in a range of sectors including retailing, specialist consulting and agriculture, medium level deprivation, and a similarly large retired cohort. Both

¹⁸ See Appendix III for an overview of broadband network development processes typically used by community groups in the UK, and with particular emphasis on B4RN and B4GAL.

areas have relatively slow in comparison to the rest of the UK, unreliable broadband access and are pursuing a superfast FTTH network.

Theoretically, B4RN appears to embody an ‘activist’ response, as highlighted by Salemink and Bosworth (2014) and discussed in Chapter Three, established through stressing the unfairness of market and governmental positions, highlighted in their rationale for a community-centric approach, their overall business plan and the self-digging process. Although B4GAL is less developed, it embodies a combination of an activist response and a dialogue or negotiation response, interacting with other groups like B4RN, as well as developing partnerships with government entities including CBS, and is following a more traditional construction method. The scope of both projects aligns with what Gaved and Mulholland (2010) term a ‘cooperative’: B4RN and B4GAL both identify with a specific geography and are attempting to engage with the majority of the population, yet they operate more regionally than Gaved and Mulholland (2010) initially discuss for a ‘cooperative’. This reflects perhaps the extended mass required to be viable as an FTTH network in the modern superfast telecommunications market. B4RN and B4GAL are utilising different funding and construction models, and embodying diverse theoretical for broadband development. These characteristics will enable a relevant comparison of the findings in order to shed light on the myriad of community-led superfast broadband pathways and their relationship with resilience.

4.4 Phase I: Establishing a ‘baseline’ within study area

In this section I address the acquisition of knowledge required to develop an understanding of the community-led installation practices of superfast broadband in B4RN and B4GAL. Phase I established a ‘baseline’ in relation to community-led broadband initiatives and broadband use and the potential for individual and community resilience within the case study locations. In keeping with the longitudinal, or multi-phased, methodology, this phase of the research took place prior to the introduction of superfast broadband. This section will outline the mechanics of Phase I data collection in keeping with the established methodological approach. I first identify the objectives guiding the pre-installation phase design, followed by a discussion of the sampling strategy to achieve these aims. I then emphasise the selected method of semi-structured interviews, and outline the design of the interview guides. Finally, I describe the sample of this Phase and critically evaluate the selected data collection instruments in the context of this research.

4.4.1 Phase I data collection: Semi-structured pre-installation interviews

Following reflection on the research questions and the chosen methodological approach, the

baseline study sought to respond to the following related objectives, presented in Table 4 - 5.

Table 4 - 5 Objectives guiding the pre-installation interview design

Objective
To explore the community-led broadband process
To identify factors or pre-existing barriers that have contributed to the pursuit of a community model
To explore the interviewees current situation regarding rural economy and society
To explore the current situation regarding broadband accessibility
To explore the interviewees current situation regarding broadband use

A purposive sampling strategy (Ritchie *et al.*, 2013) was pursued to generate a sample drawn from those living in the two study areas best placed to respond to the associated research objectives and questions. This strategy placed emphasis on those that would be able to respond to the topic of this doctoral research, whilst taking into account those of different ages, gender and economic activity. Three key perspectives were identified as critical to achieve the aims of the research: the governance aspect, targeting volunteers' central to the community-led broadband movements, as well as the perspective of general subscribers or users of broadband, and their counterpart, non-users. The purpose of the governance perspective was to gain a more in-depth understanding of the minor and major processes that the community underwent to build a broadband service, and how those processes of building superfast technology influenced resilience building. It also allowed the exploration of the role of leadership within community broadband, an aspect of resilience reflected upon in the literature in Chapter Two. Users and non-users importantly were able to reflect on broadband in a personal and business context to identify how the technology itself may influence resilience building. A partnership was created with both the B4RN and B4GAL management teams to identify and seek out interviewees, through emails and word of mouth advertising, that were relevant to the perspectives being sought and were willing to take part. In essence the initiatives acted as 'gatekeepers' to interviewees (Cresswell, 2013). Local press, posters on local bulletin boards, and social media such as Twitter and Facebook were also utilised by the researcher to seek out individuals who represented these perspectives for participation in this research.

Throughout the data collection and analysis I maintained a neutral position as a researcher, acting as an objective outsider to the community broadband process, despite the partnerships created with the B4RN and B4GAL management teams for participant recruitment. I maintained this neutral position to ensure that I was not seen as part of the community-led broadband initiatives or a specific supporter of them. This was critical because it ensured that

I was able to obtain and discuss all aspects of the broadband development process openly with each of the three key perspectives. This neutral positioning also allowed me to maintain objectivity towards the practices I was analysing following data collection.

In order to respond to the objectives I had developed for this research in an effective manner, I used semi-structured, in-depth, face-to-face interviews because they produce a rich dataset for analysis¹⁹. Interviews seek to elicit opinions from the participants, and can be structured, semi-structured, or unstructured. They are considered useful when interviewees cannot be directly or easily observed (as is the case when considering personal and institutional use and development of broadband infrastructure), can provide historical information (useful for understanding the place and place-based characteristics), and allow the researcher to control the line of questioning (Cresswell, 2013). The choice of semi-structured interviews specifically was considered optimal in the context of the case study process and to appreciate the multiple research themes associated with this study relating to community-led superfast broadband development, use, and the potential for individual and community resilience. In terms of sample size for an interview-based study, multiple factors were considered including scope of study, nature of topic, quality of data, study design, and the use of shadowed data (Morse, 2000). It follows that data collection was pursued until a theoretical saturation was reached, or when no new or relevant data would emerge regarding the relationships being explored (Strauss and Corbin, 1998).

The interview guide was then developed with the input of my supervision team to respond to the objectives set out in Table 4 - 5, with an emphasis on these multiple perspectives represented in those being interviewed, including primary stakeholders, or the governance perspective, individual users, business users, and non-adopters of the community-led broadband. The unique range of voices presented required the initial creation of multiple topic guides to ensure the discussion could be tailored to relevant issues for each interviewee perspective, or 'type'. Interview questions were piloted with other researchers based in the dot.rural research hub as well as with a B4RN investor located in Aberdeen. Following this, the semi-structured interview guides were finalised prior to being deployed in the field in B4RN and B4GAL. Three topic guides were prepared in order to reflect each distinct 'type' of interviewee relevant to this doctoral research, including governance, individual use (including business), and non-adopters. The first guide for governance considered those individuals

¹⁹ Ethical approval for primary data collection described throughout this chapter was applied for under the University of Aberdeen College of Physical Sciences Research Ethics protocol and obtained in 2012 (for B4RN related research) and 2013 (for B4GAL related research).

heavily involved in the planning and executing of the community broadband project. These interviewees were ‘digital champions’ or ‘community digital pioneers’ within these rural communities, and as leaders provided an intimate perspective of the development of superfast infrastructure. The second guide, for broadband users was developed following discussions with community partners and pilot interviews. The individual user interviewee was further subdivided into private and business users, but the distinction was blurred in the minds of participations, so a single guide for the individual ‘user’ perspective was used throughout. This acknowledged the problematic nature of explicitly identifying individual public interviewees and business interviewees prior to the interview. Many interviewees chose to self-identify both as members of the public and as rural business owners, and when applicable, questions regarding the business were included. Non-adopters retained a separate topic guide to query their lack of interest in broadband or community-led broadband in particular. Several interviewees identified as non-adopters of community-led broadband although they did have some level of Internet access in the home. These guides, including consent forms and information sheets, are reproduced in Appendix VI. Broadly, each guide incorporated three areas of discussion which were best suited to relate to the research questions, but retained the open nature of ‘semi-structured’ to allow for themes to emerge with each interviewee:

- Broadband initiatives
 - Community broadband
 - Community participation
- Rural Life
 - Rural living and/or working
 - Personal well-being
 - Community well-being
- Digital Society
 - Attitudes towards Internet technology
 - Internet use and satisfaction
 - Internet knowledge and trust

The final interview sample broadly reflects the socio-economic profile of each case study. Nevertheless, given the purposive nature, and snowball and gatekeeper approach to interview sampling, the distributions described cannot claim statistical significance with regards to the B4RN and B4GAL regions. This multivariate sample has been carefully compiled so as to capture individuals who represent the range of attributes needed for this doctoral research.

A total of 39 interviews were carried out in Phase I. The interviews took place over two time periods: B4RN during the month of August 2012, and B4GAL during the month of May 2013. In the B4RN case study there were 28 interviewees (6 governance individuals, 18 users, 3 non-adopters, and 1 policymaker) and in the B4GAL case study there were 11 interviewees (3 governance individuals, 7 users, and 1 non-adopter), with the semi-structured interviews lasting approximately 45 to 75 minutes each. In three cases in the B4RN study, the interviewees were deemed not suitable for continued participation in the study (they resided outside the B4RN area and were simply interested in ICT in general), and while their interviews were included where possible in discussion, little added value was possible. In B4GAL all interviewees were considered suitable to be invited to participate in follow-up research.

Both B4RN and B4GAL interviewees ranged in age from 30 to 79, with the majority of interviewees between 50 and 69. There were more male than female interviewees. B4GAL had a smaller sample but a younger on average interviewee. In terms of economic activity, there were a high proportion of retired individuals amongst the B4RN interviewees, and a large number of self-employed in both regions, reflecting region-wide characteristics of B4RN and B4GAL. Household and personal characteristics were not known when potential interviewees were identified but were discussed within the interview. In B4RN, approximately 64% of interviewees lived in two-person households, 3.5% were one-person households, and the remaining 32% were reported as inter-generational households with one or more child or teenager. In B4GAL, 72% lived in two-person households, and 27% were reported as family units with one or more child or teenager. Many of the interviewees reported being empowered generally to take part in their community activities, even if past involvement had been limited. A smaller group highlighted feeling disempowered to engage with their community due to pre-existing social structures. This information was not recorded for statistical insight, but rather to create a complete picture of the interview sample.

In keeping with the technological focus of this thesis, interviewees were asked about their current Internet access and speeds, if known. Of those that responded (16 of the 25), B4RN interviewees had an average speed of 3.53Mbit/s, with a median of 2.75Mbit/s and a maximum of 10Mbit/s. In B4GAL (11 of 11 responded), the average was 3.07Mbit/s, with a median of 2.5Mbit/s and a maximum of 8Mbit/s. This is very much representative of both regions as a whole prior to superfast installation represented in Section 4.3.3.

Within each case study area, I sought to obtain representation across the physical, or spatial, range of the community organisations. Within B4RN, I obtained participants across the region, with a concentration in the larger villages and several outliers representing the more remote, rural spaces. Within B4GAL, an attempt was made to interview people across the nine villages that made up its scope, with participants from six being obtained. This location information for both B4RN and B4GAL has not been disclosed in detail due to the potential loss of anonymity for participants.

While this study identified a purposive sample to best respond to the research questions, targeting those of certain perspectives that could respond and then taking into account those of different ages and locations, the composition of the interview sample gives breadth and depth to the findings, as aspects including age range, economic activity, empowerment considerations, spatial coverage, and broadband conditions do reflect the regions as a whole.

All interviewees were asked to provide their informed, voluntary consent to participate in activities prior to any face-to-face interviews. This consent was either written or verbal according to the context. It was made clear to interviewees that their consent may be withdrawn at any point. In all instances, consent was obtained in B4RN and B4GAL. Interview quotations included in following chapters have been anonymised.

4.5 Phase II: Follow-up, post-installation design

The aim of Phase II is to conduct an analysis of the ‘post-installation’ atmosphere within B4RN and B4GAL, and develop an in-depth understanding of the outcomes of the community-led approach to broadband provision and the shift from negligible broadband speeds to superfast speeds. In order to respond to this aim, I conducted post-installation semi-structured interviews with the same individuals who participated in Phase I to allow for an accurate reflection of the change in access and usage, and distinct reflection on key themes by interviewees. This section outlines the process of Phase II, discussing the sample, selection of data collection instruments, the development of follow-up interview guides, and concluding with a discussion of representing change in broadband use.

4.5.1 Phase II data collection: Semi-structured telephone interviews

This Phase was again guided by the multiple perspectives discussed in Phase I: governance, users, and non-adopters. This was done in order to further the conversation of key themes and potential links with individual and community resilience, demonstrating the longitudinal aspect of the chosen methodology. All the interviewees from the Phase I pre-installation

interviews, except those excluded from further research described in Section 4.4.1, were contacted via an email invitation to participate in follow-up research. In some cases it was necessary to send repeated emails and make phone calls to confirm interview dates and times. In order to best relate the two phases, a one-page summary (a mixture of visual and written presentation) of the broad themes from the pre-installation phase was provided to each interviewee prior to the interview for Phase II. These are reproduced in Appendix VII and were structured to allow the interviewee to reflect on the study. Throughout this data collection and analysis stage, I maintained my neutral position as neither part, nor a supporter, of the community-led broadband initiatives.

The Phase II semi-structured interviews were conducted over the telephone or by Skype rather than in-person. This approach allowed flexibility given timeline challenges of the community-led process, including broadband connection delays and uncertainty on the part of the infrastructure development. It was also chosen to ensure the highest possible retention of Phase I interviewees by offering longer time scales and options for contact. Time constraints and resource limitations for the researcher make telephone interviews a viable choice, identified by Oppenheim (1992). Opdenakker (2006) outlines key disadvantages of telephone interview over face-to-face interviews. The interviewer has less access to cues such as body language, although tone and intonation can still be heard. It is more challenging to establish a rapport and ensure the tone of the interview remains 'natural'. It also is difficult to 'standardise' the setting for the interview. Due to the face-to-face nature of the pre-installation phase of the study, a rapport was established with each interviewee, so while telephone or Skype interviews are still challenging, problems associated with this approach were minimised. With respect to 'standardising' the setting, the pre-installation interviews, held in person, often experienced interruptions: for example, in one instance a interviewee had to leave to attend to a customer for approximately 45 minutes, and in another a young dog continuously jumped on the table throughout the course of the interview. This meant that while telephone interviewing may still prove difficult with respect to a loss of standardisation, the researcher had encountered it previously providing some knowledge and experience in guiding the interview back to the subject at hand.

The interview guides for Phase II were developed following lengthy analysis of the pre-installation phase of the study. Similar to Phase I, three guides were created to be used with interviewees who represented the governance, user, and non-adopter perspectives of the study. The Phase II interview guides are reproduced in Appendix VIII. Broadly, the Phase II

topic guides incorporated three areas of discussion. Similar to the pre-installation study, these were based on objectives developed to respond to the thesis aims.

- Broadband Initiatives
 - Community Broadband
 - Community Participation
- Superfast Broadband and Rural Life
 - Attitudes towards superfast Internet and the community
 - Rural living and/or working
 - New forms of connectivity
- Superfast Broadband Use and Behaviour
 - Attitudes towards personal Internet connection
 - Superfast Internet use and satisfaction

20 semi-structured post-installation interviews were conducted (a follow-up rate of approximately 55% of Phase I interviewees) lasting approximately 45 to 100 minutes each. Of the Phase I interviewees (25 in B4RN and 11 in B4GAL), 16 did not take part in a Phase II interview. Within the B4RN case study, 9 interviewees from Phase I did not participate in Phase II. Approximately 2 had provided no contact information (had been snowballed from a gatekeeper), 2 had invalid contact information, and 5 did not respond to repeated requests for information. In the B4GAL case study, 6 did not take part. Of those 6, 2 had expressed interest for a Phase II interview, but did not respond to repeated communication to identify an appropriate time, and the remaining 4 did not respond to any request for information. During the course of this doctoral research, the B4GAL project's timeline was extended beyond the timescale of this thesis. Therefore the 'post' questions for B4GAL reflected only the first two areas of discussion (i.e. could not reflect on superfast use as it was not deployed), whereas B4RN was able to reflect on actual use of superfast broadband. This unforeseen development is discussed in depth in Chapter Six, reflecting on the multiple facets of the community-broadband process and actors. The B4GAL interviewees often reflected in detail about the nature of the B4GAL community model because it was still evolving. A loss of interest in the B4GAL project because it has not yet been successful is a potential contributor to the high dropout rate. Regardless of this dropout, the Phase II interviewees from both B4RN and B4GAL provided rich information from which a small-scale but focused analysis to identify indicators of the influence of superfast broadband installation and use on resilience could be conducted.

All interviewees in Phase II were asked to again provide their informed, voluntary consent to participate. As the interviews were conducted over the telephone/Skype, interviewees were sent a consent form (same as in-person consent form) prior to being interviewed and were given the chance to specify whether they were willing to be recorded or not in advance. The information sheet and consent form were discussed verbally before the start of the interview to ensure the role of the interviewee was clear. Where recordings were taken, the procedures adopted in Section 4.4.1 and set out in the consent form reproduced in Appendix VI, were used.

4.5.2 Representing changes in perspective of broadband infrastructure

The use of semi-structured in-depth interviews through both phases of the research enabled the researcher to understand the community and individuals at the heart of the study. It is acknowledged that the role of the researcher visiting the homes of interviewees can also create and construe meanings and can therefore be a value-laden process. In order to best represent the results, the discussion will reflect a narrative, or story-telling method of research. It depicts the narratives of rural living and posits these within a lens of resilience and resilience enhancement. This style of writing lends itself to the post-installation phase of analysis for comparison. In traditional storytelling data collection methods it is acknowledged that accounts of events over time can be incorrect or biased (McGregor and Holmes, 1999). However, storytelling remains an effective approach here because it captures the themes expressed through the interviews in a coherent form. Vignettes, as part of story-telling methods have been used extensively in social science research, and are used during the research process, as a means of depicting beliefs and stories throughout discussion. Barter and Renold (2000) explored the technique of using a vignette, or short descriptive story, as a useful tool in the qualitative research process to elicit responses from children and young people. Hughes (1998) stated that vignettes are stories about individuals, situations and structures that can make reference to important points in the study of perceptions, beliefs and attitudes. Anzul *et al.* (1997) discusses them as a useful, interpretive tool, one that can construct a brief portrayal of a meaningful event for the subject, which has been learned over time. This is particularly relevant for this study, which aims to identify the practices and processes that influence communities and Internet use on a personal and collective level. Vignettes are used in this thesis in the context of the latter, as a method to depict the stories and opinions as told throughout semi-structured interviews, to relate pre-installation and post-installation views. By using quotes and data provided by the interviewees (in an anonymised manner) it is possible to paint holistic 'portraits' or 'sketches' (e.g. Anzul *et al.*, 1997) of the interviewees and their opinions on rural superfast broadband through the inclusion of

superfast technology. This allows the researcher to vividly discuss the analyses, highlight particular findings and summarise particular themes or issues in a captivating and informative manner. This method of reflection throughout the discussion will ensure that the data reflects a story of interpretation, rather than positivism.

4.6 Data analysis: conducting a thematic ‘resilience’ analysis

Qualitative data is attractive because of the ‘richness’ it provides, but finding an analytical path can be problematic (Bryman, 2012). For this analytical component of the study, there was a necessary focus on resilience ‘phenomena’ (in terms of feelings, perceptions and experiences) with corresponding emphasis on analysis of content and understanding and interpreting substantive meanings in the data. Contemporary forms of analysis for a qualitative dataset include content analysis, narrative analysis, discourse analysis, and thematic analysis. Content analysis emphasises measurement of specific phrases or codes in a very specific manner. While useful in a controlled environment, it can be difficult to extract latent content, and answer ‘why?’ type questions, making it largely unusable for this study and its requirements (Bryman, 2012). Narrative analysis, or narrative enquiry aims to construct meaning and identities through narratives, often using varied forms of textual data such as diaries, field notes and so on, and takes the “story itself as its object of enquiry rather than simply accounts, reports, chronicles” (Phoenix *et al.*, 2010, p. 3). Narrative analysis provides some insight into how to best structure the discussion within this thesis, primarily in the presentation of findings as stories, presenting personal and conflicting images of reality. Discourse analysis places emphasis on interviewee’s language (Wodak, 2004), which is unsuitable given the features and analytical requirements of this dataset. These same features lend this study towards thematic analysis. Thematic analysis, discussed by Bryman (2012) is the most common approach to qualitative analysis, and although has no distinct heritage, the searching for themes is found in many approaches, such as grounded theory, content analysis, or narrative analysis. Thematic coding is the search for themes within the textual data that emerge as being important to the overall study (Daly *et al.*, 1997). Codes are attributed to patterns as observed by the researcher during the course of the process, and is considered a highly flexible method (Braun and Clarke, 2006). Conversely, thematic analysis has a number of disadvantages including an absence of clear or concise guidelines (Braun and Clarke, 2006), a lack of reliability, particularly if coding is done within a team (Guest *et al.*, 2011), and flexibility makes it difficult to determine a focus. Ultimately, this thesis undertakes a thematic approach in order to fully encompass themes of resilience, community and technology that are not always explicitly expressed by the interviewees. The application of this thematic approach was through a research tool created from the conceptual framework of resilience developed in Chapter Two.

The application of this conceptual framework of resilience to the qualitative data analysis comprised three stages. The first entailed thematically coding the interview transcripts, which had been transcribed in their entirety²⁰. The main software tool used to support this coding process was QSR NVivo 10, a qualitative software package that is "...capable of assisting the qualitative researcher with multiple types of analyses, so that the underlying theories and relationships in the data can emerge" (Leech and Onwuegbuzie, 2011, p. 71). Within NVivo, the researcher can conduct thematic analysis by creating 'nodes' or themes identified by the researcher within the data. Extracts of text can then be coded manually to reflect the theme, or node. Using NVivo allowed for this coded information to be extracted and viewed easily throughout the process.

The qualitative data were first coded according to the broad themes identified in the topic guides, a broad first step whereby the codes reflected the high-level, pre-established (deductive) major categories of information. At this stage the themes were predominantly descriptive, reflecting those in the topic guides, but also some emergent, recurrent issues visible in the text, reflective of 'open coding'. Some sections of the text related to multiple themes, and, as such, were multi-indexed, allowing the researcher to view pieces of information in various contexts and ensure each aspect of a statement was followed up within the discussion. A second iteration of this coding involved scrutiny of each theme, through refinement and identification of links, and as appropriate, themes were grouped and nested in higher order main themes, a reflection of axial coding (Cresswell, 2013). It is through careful reading and re-reading of the data, that patterns are identified, and these themes form the backbone of discussion (Rice and Ezzy, 1999). This contributed to the more detailed coding of the data, reflecting a grounded approach to understanding the key issues (Hutchison *et al*, 2010), whereby the codes transcended from themselves. This step is aligned with an inductive, data-driven approach as discussed by Fereday and Muir-Cochrane (2006). Tobin and Begley (2004) identify this extensive level of interaction with the data as an overarching principle of 'goodness'. Through this, components of the processes, practices and norms of broadband development and use began to emerge.

The second stage in this analytical process was the move to descriptive analysis to consider what the data were showing with respect to resilience. Interview transcripts were coded using

²⁰ The researcher undertook transcription of all interviews, with the exception of the B4RN pre-installation interviews, which were transcribed by a University of Aberdeen dot.rural project Research Assistant, Brett Anne Anderson.

a pre-designed resilience coding structure, an entirely pre-determined set of codes drawn from the literature. The conceptual resilience dimensions, developed in Chapter Two, were created as codes and understood as relational to the previously identified open coding. This means that text coded using the pre-designed resilience codes could then be related to any overlapping codes from the previously identified open and inductive coding. This serves to develop an understanding of the links between resilience and rural individuals and community. The use of two sets of coding is reflective of what Hahs-Vaughn *et al.* (2007) term a Hybrid Evaluation Method. The resilience analysis is representative of a deductive approach, whereby a priori template of codes is utilised (Crabtree and Miller, 1999, cited in Fereday and Muir-Cochrane, 2006). This pre-designed resilience coding structure is depicted in Table 4 - 6.

Higher Level Codes <i>(Resilience Dimensions)</i>	Codes	Central Questions
Resources/Capitals	<i>Presence of resources – both physical and social structures</i>	In what ways do community broadband processes increase (or decrease) resources (including societal and economic interactions) for individuals and the community?
		In what ways does the use of community broadband as a resource itself increase (or decrease) availability of other resources for individuals and the community?
	<i>Capacity to develop and/or adapt resources</i>	In what ways do community broadband processes aid individuals and the community in developing current or new resources?
		In what ways does the use of community broadband influence adaptation of resources (both individually and communally)?
	<i>Capacity to engage and interact with resources</i>	In what ways do community broadband processes increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?
		In what ways does the use of community broadband increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?
Human Agency	<i>Human agency and self-efficacy</i>	Is there a strong presence of connected and proactive individuals (digital champions) and groups within the community?
		In what ways do community broadband processes enable (or hinder) proactive capacity building from individuals?
		In what ways are individual users 'empowered' (or disempowered) through community broadband?
	<i>Networked, or collective agency</i>	In what ways does the community access and develop networks? Are there any participation networks in place?
		In what ways do community broadband processes enable community-level capacity building?
	<i>Capacity to anticipate, strategise actions</i>	In what ways do community broadband processes facilitate imagining, and strategising actions for individuals and the community?
In what ways does the use of community broadband enable individuals and communities to plan for future change?		
Equity	<i>Encouragement of equitable distribution of assets</i>	In what ways do community broadband processes enable equal involvement of vision setting or encourage equal access for individuals and the community?
Sense of Place	<i>Sense of community bonds and cohesion (shared culture and vision)</i>	In what ways do community broadband processes strengthen (or weaken) local identity (both individually and communally)?
		In what ways does the use of community broadband increase (or decrease) feelings of connectedness within the community for individuals?

Table 4 - 6 Pre-designed resilience coding structure

These codes reflected upon central questions depicting a research framing technique reminiscent of Graugaard (2012) in their study of resilience and alternate currencies. This study incorporates capitals as resources and concurrently analyses adaptive capacities within individuals and communities. As this study is the first pre- and post-study with respect to resilience, the questions are thus understood in the context of expectant broadband access,

current broadband access, and future broadband access via community-led broadband. Where not explicitly stated, all questions can be coded for both positive and negative responses (i.e. 'has the community demonstrated flexibility' can be for both a positive and negative response). This was done to ensure that the researcher did not exert any undue influence on the textual data.

The third stage in this analytical process was the creation of a visualisation to enable discussion about the enhancement of resilience. The interaction between the open coding and the resilience codes was depicted within relationship models with respect to superfast broadband technology installation and use, directly addressing the research questions set out in the introduction. These were built using a dynamic network analysis and visualisation tool, NodeXL, or Network Overview, Discovery and Exploration for Excel, an open source software designed to sit within Microsoft Excel and make social network analysis and exploration more accessible (Microsoft Research, 2014). The purpose of a social network perspective is to analyse the structure of social interactions and knowledge flows; this has been highlighted in the geography discipline as applicable to regional issues, such as rural regional research (Ter Wal and Boschma, 2009). This visualisation, as a final stage in the analytical process, provides an understanding of the networks between resilience codes and open codes, allowing the researcher to perceive the dominant areas for resilience in relation to community-led broadband and technology usage and illustrate the dynamic affiliations, moving beyond its traditional use as a 'static' measure (Ter Wal and Boschma, 2009). Figure 4 - 1 provides an illustrative sample of this visualisation.

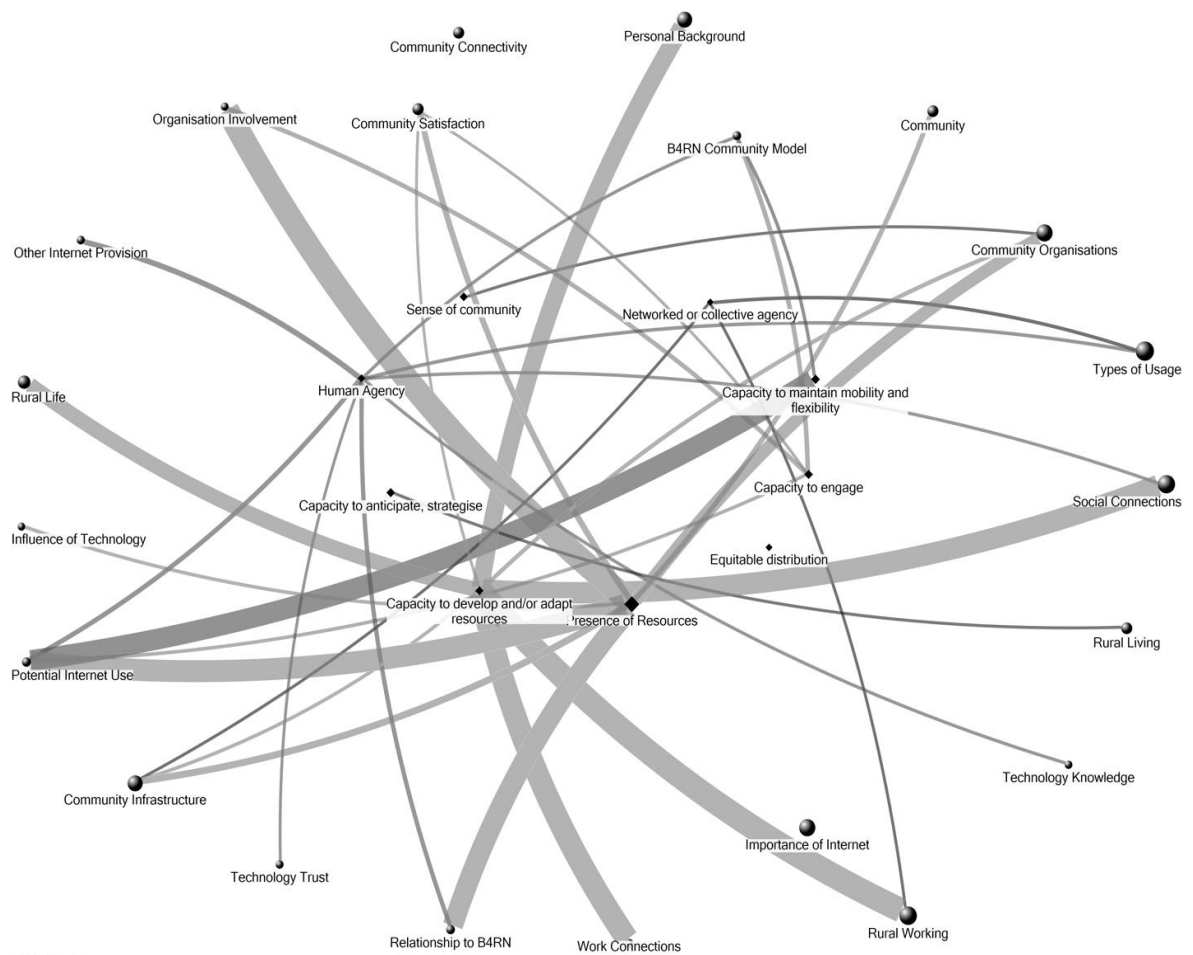


Figure 4 - 1 Relationships between resilience codes and open codes

This network map of the relationship between various technology and community nodes and resilience demonstrates clearly the complexity existing within resilience and superfast broadband technology. Each vertex depicted with a diamond shape is representative of a ‘resilience’ node (located in the centre of the image) and each depicted by a sphere is an ‘open’ node (on the outside of the image). The size is reflective of the number of codes at that node. The size and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding, demonstrating relationships. In this sample map for example, ‘capacity to develop and/or adapt resources’ has strongly overlapped with ‘social connections’; therefore, it is a larger line and potentially a more significant relationship. Any nodes that did not overlap (i.e. had a relationship value of 0) are hidden from view; their lines remain ‘undirected’ meaning the information is not flowing from one node to another and it does not occupy a spatial dimension (from one place to another). Rather the undirected nature of them demonstrates that there is a conduit when it comes to enhancing resilience, which can flow in either direction. In order to best display this data within the discussion, I create four individual network maps of the data based on the four

higher level resilience codes of resources, agency, equity, and sense of place (rather than having all nine sub dimensions displayed at once) a method that sought to simplify the visual aid for the reader.

The numerous layers of coding structures represent a multi-layer analysis, whereby differing analytical frameworks are applied to the same set of data, after which models are built to unpick relationships found within. As Hutchison *et al.* (2010) discusses, the use of NVivo facilitates the iterative process, informed by the guidance of an interpretivist epistemology, including the ability to code items multiple times and provides a transparent account of all changes through easy management of data and additional documentation. Utilising qualitative analysis software packages can also disadvantage a study, as outlined by Cresswell (2013) and Denscombe (2007). Cresswell (2013) states that the learning curve on software can be steep: it can 'distance' the researcher from the data, and not all programs are as flexible as needed by the researcher. Denscombe (2007) also highlights that the use of software can distract the researcher, fragment the data extensively so that it loses context and apply inappropriate quantitative thinking to qualitative data. Whilst these opinions and concerns are valid and are kept in mind throughout this study, the advantages of using NVivo for storage, retrieval, and the ability for the researcher to conduct an iterative coding process as outlined above have greatly benefited this study.

The culmination of this coding and multi-layer analysis is a discussion of key themes demonstrating the installation and use of broadband and its links with individual and community resilience. Through this relationship building, significant relationships were unpicked in detail to determine the potential role superfast broadband provision and technology has in resilience. This involved a close reading of the open coded data that had been identified as having a relationship with the 'resilience' coded data through the network mapping process.

4.7 Conclusion

This chapter has examined and explained the research design for this thesis, undertaking a qualitative two-phase approach to analyse superfast broadband and resilience: face-to-face pre-installation semi-structured interviews, and follow-up, post-installation semi-structured interviews. All methods have been discussed in this multi-phase project. The appropriateness of these methods was considered against all other feasible alternatives and in line with research methodologies used in previous research and importantly the theoretical framing of

social resilience. In outlining the research techniques, challenges and potential limitations were considered and addressed. The goal of the researcher was not to measure or generalise with respect to social resilience *levels* but rather to provide an in-depth exploratory study of contemporary superfast broadband technology provision methods and use and its influence on potential individual and community resilience. The multi-staged data collection process and analytical process have sought to fully respond to the distinct, yet connected aims and objectives of the thesis, and as such a discussion of the presentation of these interconnected findings has also been included. This analysis and its methods represents complex interdependent relationships between technology uses, in this case the use of superfast broadband, and a community's resilience. Although the findings will be presented here in the form of a linear narrative, in reality, its complexity was apparent throughout the research process. In order to preserve the complexity of the relationships of broadband installation and resilience, the discussion found in the succeeding chapters will include diverging and competing strands of enquiry and thought, and will not end with compatible generalisable statements, but rather will continue to address each significant thread of discussion that is relevant to the research.

The following Chapters Five and Six will now focus on the research findings, discussing in detail the impact of the installation and use of community-led superfast broadband. Chapter Five will first detail Phase One of the study, a qualitative baseline analysis of the areas prior to superfast broadband roll out, identifying potential areas of resilience enhancement. Chapter Six will detail Phase Two, a follow-up qualitative analysis with the same individuals from Phase I, to further explore the relationships between individual and community resilience and superfast broadband.

5 EXPLORING THE PROCESSES OF COMMUNITY-LED BROADBAND: A BASELINE ANALYSIS

5.1 Introduction

Chapters Two and Three outlined social resilience and its potential relationship with broadband technology in relation to individuals and communities. Chapter Three concluded with a review of the current, relatively limited, scholarship on community-led broadband as a process, emphasising the place for this doctoral research. Chapter Four has described the methodological approach adopted in this research and introduced the two case study regions within their rural, socio-economic, and technical, contexts. This chapter proceeds to set out analysis of the pre-installation semi-structured interview data from both community case studies. It generates an enhanced understanding of the elements and circumstances that affect community-led broadband development as well as its use and related impacts on rural dwellers and communities as a whole. This is described as Phase I in the methodology and includes interviews with 36 interviewees (25 in B4RN and 11 in B4GAL).

The findings discussed in this chapter are presented in the context of the two key research questions, firstly discussing the *process* of acquiring superfast broadband technology in rural areas through the community-led approach (Section 5.2), and secondly the potential *presence* of superfast broadband technology infrastructure and implications for rural users (Section 5.3). Within these sections, the findings are presented as a joint narrative, interlacing the results from both case studies. This was considered an appropriate approach as the themes discussed in the pre-installation interviews were similar in both regions. However, where local features differed the differences were accommodated in the interview topic guide and are presented within this chapter as issues unique to individual regions. Relationships between themes identified in the interviews and social resilience, are then discussed (Section 5.4). This firmly places the findings in the context of the conceptual framework of social resilience, as well as in relation to the associated digital literature. All interviewees were assigned a number to ensure anonymity and as such each quote is attributed to B4RN or B4GAL 1, 2 and so on.

5.2 Exploring broadband installation practices

This section provides an initial platform for discussing matters surrounding ‘community-led’ broadband as an installation model²¹. This generates an initial response to the first research

²¹ Please refer to Appendix III for supplementary information on the steps associated with developing a broadband network from a community-led perspective. This Appendix outlines the network development process, extrapolated from Figure 3 – 4 and initially presented in Section 3.5.2, including a description of the planning, funding, building and operational processes for a community broadband network in the UK.

question of this doctoral study, if the *process* of acquiring broadband technology plays a role in enhancing social resilience, examining both the individual and community scale. This section first discusses the importance of leadership within the BARN and B4GAL initiatives (Section 5.2.1), paving a path towards understanding how local and technology identities play a role in participation in the two projects (Sections 5.2.2 and 5.2.3). The section concludes with a discussion of the political nature of community-led broadband (Section 5.2.4).

5.2.1 Leadership and the role of ‘digital champions’

General dialogue concerning community participation and leadership, particularly within the rural setting, has been extensively studied and reviewed (e.g. Beer, 2014; Dinh, et al., 2014; Simmons and Birchall, 2005; Skerratt, 2011; Torgerson and Edwards, 2013; Woods, 2005, 2010). The presence of local leadership is important for any type of formal organisation, and is widely considered to contribute to growth of places (Beer, 2014). The critical need for leadership, or digital champions, within superfast community broadband initiatives was apparent throughout the Phase I data collection stage. These digital champions, individuals that seek to promote the community broadband agenda, play a key role in community-led broadband initiatives.

“Yes, Joe²², well he’s absolutely brilliant at running it, he obviously has all of the skills, the communication skills, the drive...” (BARN 3).

There were three core findings from the analysis of Phase I interviews relating to the emergence of leaders within the community-led initiative. Firstly many leaders adopted their role through a personal belief in their responsibility to the community and its future. These individuals, in some cases, had held posts of power or responsibility previously, such as being active in other community organisations, or because they were positioned in the community to know a majority of people. They had some level of ‘power’ or ‘influence’ in the community and believed that there was a need for their involvement.

“Being the owner of this shop [the only shop in the village], I almost feel as though I have a responsibility to something happening as a lot goes through here...and I have an IT background...so I felt as if I was the right person to get involved in it” (B4GAL 5).

It was also these general feelings of responsibility to the community that resulted in overarching support and in some cases increased participation from other members of the community in the wider project.

“You know, the community, I mean, they’ve obviously chosen a difficult and big project, and I would think they need every little help and input they can” (B4GAL 1).

²² All names have been changed to preserve anonymity.

Secondly, the recognition by community members of leaders' skill set availability often encouraged leaders into their roles. These skill sets were often known through word of mouth and local village history, and this identification and access to skills was able to push the project forward. We can therefore infer that leaders were critical in identifying other skills and assets in the community, often acting as conduits for individuals to network, participate and in turn become 'empowered'. This is reminiscent of the internal social capital identified by Wallace *et al.* (2015) in their study of community broadband.

"But on the digging side of things, the actual laying side of things, obviously Mary, she's in farming and knows lots of farmers and lots of people who do this sort of thing" (B4RN 18).



Photo 5 - 1 Partially completed fibre cabling, being installed by B4RN volunteers

Source: Author

Finally, past individual involvement with, or knowledge of, the leaders also encouraged participation by community members in the community-led broadband scheme. Those who were already connected to the leaders through social or economic means were likely to participate, often without requiring much encouragement or additional information. These participants occasionally took on responsibility themselves, in effect creating more strands of leadership and participation. Leaders then are more likely to emerge as those who already have extended local and extra-local social and economic networks in place to engage.

"...what I latched onto was that it was Matt running it...they were pioneers in that field...if anyone can deliver it, he can" (B4RN 7).

These core findings about the emergence of leaders highlight that the governance practices within each of the community-led broadband case studies were largely informal. It appears that leaders' personal history with the villages and regions contributed to generating trust in the aims of the project and in the people delivering them, limiting the need for any formal mechanisms. This is perhaps reflective of what Woods *et al.* (2007) calls 'good citizen' communities, whereby communities are able to engage with endogenous resources and contribute to a strong history of securing funding for local projects. Here, the community-led broadband initiatives are clearly engaging with a historic trend of activism in their community to achieve superfast broadband. However, this was far more evident within the B4RN interview data than in B4GAL, perhaps a reflection of the latter's relatively earlier stage of development at the time the interviews were conducted.

Sitting alongside these core findings are nuanced details that remain relevant to understanding the role of leadership within community-led broadband. The presence of leaders and the chosen method of 'community-led' practice, the very nature of both projects aiming to be 'for the community, by the community', also appeared to engender trust: trust in the leaders, in the service that would be provided, and trust that although there may be uncertainties, the aims outlined would be accomplished. It ultimately meant that some subscribers were not truly concerned with the timing of the broadband arrival. The lack of specified arrival of the new services was acceptable because it was a *local* community effort.

"I'm actually one of the founding shareholders...when it will reach here we don't know and it's possible it might not come via here" (B4RN 8).

It was highlighted earlier that leaders acted as a resource, offering their skills, as well as being key conduits to networking and identifying skill sets within the community. B4RN benefitted from direct access to an experienced network mapper²³, and to others who had successful experience of preparing grant applications to funding bodies. There was also access to knowledgeable, tech savvy individuals willing to act as local recruiters to round out the skills set contained within the leadership structure and generate the required new local and extra-local networks needed to succeed in community broadband. B4GAL, while not having a network mapper within their community, found that by opening up the project to the

²³ This refers to an individual or group of individuals who have technical expertise to conduct several critical steps to planning a broadband infrastructure project. These tasks include conducting a technical options review, determining the best service delivery options, and, critically, mapping how a physical network, cable-based or otherwise, could be built and actually function for consumers. These tasks then contribute to the capital and revenue financial projections (which are vital for business plans and grant applications), and set out what required permissions are needed for the infrastructure, such as planning approval and so on (CBS, 2013)

community through public meetings, the leaders could hope to find and harness skills they did not realise existed amongst local residents. This represents another pathway to skill identification and development, standing apart from leaders accessing existing social networks or past history. However, this was very time intensive and required active leaders to remain in constant contact with their community.

“Before we officially started, when I talked to Michelle at B4RN, I said, it’s all very well for you guys, you’ve got all these people on your board, you’ve got all these people living in your community with all of these skills, you know, and it’s amazing, but we won’t have that! And Michelle said, ‘don’t say that until you’ve talked to everybody in your area! You’ll be surprised at who you’ve got’” (B4GAL 11).

Interestingly, although specific skill sets were desirable (i.e. funding proposal writers, technical individuals) it was highlighted in both B4RN and B4GAL that the critical element was the leaders who were motivators; they sought volunteer involvement, kept enthusiasm for the project high, and were able to mobilise the community into action. In many cases, this was thought to come above and before the need for any other skill identification or development.

“And that’s the other thing, not everybody’s got a Jessica!...if we didn’t have somebody like Jessica, we probably wouldn’t have all...we wouldn’t have pushed it so far, we would’ve wanted it, but not everybody would have had the knowledge...and that’s the thing” (B4GAL 8).

The leadership of community-led broadband initiatives must also reflect on its influence on general community participation and the associated development of a strong volunteer base. This was first introduced when considering leaders as ‘conduits’ to skill identification and development, and will be further detailed here. The role of leaders was firstly identified as potentially problematic. When asked about how potential leaders and other interviewees in the project were identified, interviewees mentioned that the use of pre-existing social and economic networks to encourage participation and disseminate knowledge about the project was potentially generating a cycle of the ‘usual suspects’ taking part. This has the knock-on effect of embedding existing social dynamics within the broadband initiative. While many interviewees supported the community-led process, some people thought that the leadership had entrenched existing social structures, which continued to leave certain community members out, feeling that they had no place for input.

“...Broadly it’s for the community benefit, but there are certain people that are there who are going to run it wherever. And even if you had some input in a small way, they don’t really want to know, they want to do it their own way. So I’m somewhat skeptical of the leadership...” (B4RN 9).

“I mean, I’m slightly anxious about it, they’ve been very poor at providing information...I don’t think I’ve had any information to my house...” (B4GAL 2).

This sentiment was expressed in relation to the viability and sustainability of projects such as the community broadband initiatives. With project leaders in relatively powerful positions, positioned there often of their own accord, and acting as conduits to individual participation, the future of the project without them was thought to be fraught with uncertainty.

“...what’s the structure...when the dynamic figureheads like Mary have gone, and maybe Alan has moved on, I don’t know...when they go, who is going to stop the whole thing from falling apart?” (B4RN 3).

The potential for waning enthusiasm when moving from the early stages of the project into the future running of the community ISP on a daily basis also presented itself as a source of skepticism. It was discussed that perhaps these leaders, or digital champions, were relying too much on the enthusiasm of volunteers and that would diminish into the future. As both B4RN and B4GAL are fully volunteer-based organisations, the presence of engaged individuals was critical, and the potential waning of that enthusiasm presented new challenges for the process.

“...it’s sort of the project management later that concerns me...I’m just wondering whether they’ve thought through the boring day-to-day admin that will happen in 10 years and what’s the structure...” (B4RN 3).

There also was a concern, consistent with the concern over the future running of such services, about more technical aspects of the community ISP such as the training and response rate to line breakage and failure once the system is in place. This stemmed from the informal leadership structure, reliance on volunteers and uncertainty about the availability of these individuals as a project resource once the service was fully developed.

“If a farmer ploughs through a cable or they get damaged, I know there’s trained people to sort of repair and splice cables, but you know they might be busy, they might be harvesting, or on holiday...” (B4RN 3).

This issue also had a positive element. For example, as a local service, the response might be more immediate, rather than requiring an engineer to visit from a central company that is based in another part of the UK.

“...when it goes wrong, you expect that a local service will be able to give a much quicker response to support” (B4RN 7).

Concern was expressed that if the project lost momentum, due to any number of factors including weather, loss of critical leaders, or lack of funding, the enthusiasm would be inherently difficult to maintain and thus there may be unknown challenges in the future with

fewer leaders and interested interviewees. This was an issue not simply for the physically involved volunteers or leaders, but also in terms of recruiting future subscribers to the ISP.

“There’s a lot of people out there, thinking, ‘oh this is never going to happen, oh it’s taking forever’. And it’s getting people to realise that it’s a good idea to join in”. (B4RN 15).

The leadership structure of community-led broadband, as briefly discussed above, appears to be relatively informal, and although the practices enabled some different levels of participation, it also compounded concerns that there was often no official place to go for information. This highlighted for one interviewee the potential to exclude individuals who are not the ‘usual suspects’.

“I mean, I don’t know anything about the cost, I don’t know about...can I keep my btinternet.com email address if I jumped ship and signed up with these guys?...What if I say I’m not signing up...can I come in at a later date? Will they say, ‘sorry, the network’s already in?’ Nobody’s telling me these things” (B4GAL 2).

The heavy reliance on volunteers in the initial phases of the development of both B4RN and B4GAL was also a concern for interviewees, and due to this voluntary, patchwork structure, many had experience of receiving incomplete information, or felt that there was a lack of consistency within the information being provided. This detracted from the ability and desire to participate or sign up for the superfast offering.

“Well...when we were trying to put the ducting through we did have some problems and I tried contacting them by email and got no response at all, but I think that was possibly because they were on holiday or something” (B4RN 17).

A lack of guidance and a clear leadership structure, including notification of formal points of contact within the project team, was also problematic from a volunteer engagement perspective. Recruitment was less successful without concrete information and timescales, information that ultimately needed to be cascaded down from the project leaders.

“...we haven’t been given enough guidance. We were a group of volunteers...and we had one page sheet which wasn’t really, didn’t really fit the bill” (B4RN 14).

The lack of information hindered the process of interesting and signing-up local people to the community broadband service, particularly amongst community members with low levels of current Internet knowledge and education. Low take-up of registrations for the community broadband services were occasionally blamed by the leadership on ‘Internet illiteracy’, and a lack of forward thinking in terms of Internet usage and potential broadband connectivity options amongst the wider community. This created lengthy dialogue between the volunteers

attempting to get people to register an interest or volunteer to help with the project themselves and the project leaders who were responsible to providing information about the project.

Community leadership and the participation of volunteers in the projects in a wide range of tasks, including individuals undertaking physical labour (i.e. digging ducts to lay fibre), spending time going door to door to spread information or recruit new volunteers, grant-writing and encouraging new subscribers to the service, is a critical part of community-led broadband, but, similar to other community initiatives, poses ongoing challenges.

“The weakness I think is going to be...that they are reliant upon volunteers. Anything that relies on volunteers has inherent problems...” (B4RN 1).

“The biggest challenge of any community group is cohesion. It’s that cohesion and sticking together and supporting each other, rather than, you know, everyone going off on their own that is important. That’s really hard” (B4GAL 11).

“...When I read their financial projection...I was horrified. As a financier myself, I’m thinking, ‘you haven’t thought this through’. To me...the whole thing has been done very amateurishly” (B4RN 9).

This challenge is exemplified by the well-developed research on volunteerism and professionalism (Cavaye, 2001). Volunteerism can reflect both long-term and short-term, or episodic, engagement, with the latter often leading to fluctuating and conditional participation patterns (Rochester, 2006). Some interviewees discussed that high-tech infrastructure development requires stability and professionalism to ensure that the network runs smoothly, which stems from having in place permanent, more formal organisation practices and procedures.

“...if they’re only doing it on a voluntary basis, I think it’s going to be difficult to maintain the enthusiasm. Again I don’t know...” (B4RN 3).

The result of experiencing such issues was that work on developing the community broadband service was slowed and enthusiasm dampened for the project from an individual level, which potentially would limit any influence leaders could have in empowering volunteers.

“I think the plan looked reasonable...some of the implementation hasn’t worked as well as it could have been...” (B4RN 14).

“...the timescale, everybody always thinks it should be a lot faster, and I think people are disappointed it’s not already in the ground...” (B4GAL 11).

Although this was a frustration, the uncertainty and inability to access knowledge about likely project timescales, which led to a feeling of ‘floundering’ as one interviewee recalled, there was a prevailing sense overall that as a community volunteer project, it was all right to have less defined goals and tasks occasionally, and to pursue the project via an informal process.

“...we’re all amateurs you know. Which is nice as a community project” (BARN, 3)

Finally, the potential for a community-led model to be transposed to other rural areas was met with some enthusiasm, tempered with a healthy amount of skepticism, particularly due to the dominant role and importance of these leaders.

“I can see a fundamental flaw in this community broadband thing, and that is that not all communities are equal. There are rural communities all over Scotland, these former mining communities...you know everybody in B4GAL has been all over the place, ended up here as part of you know, whatever, there is a lot of techies, a lot of degrees, a lot of education, which wouldn’t be true out in the boondocks” (B4GAL 9).

The presence of such skills, even simple interest in technology, was identified as a critical component, encouraging interest and leadership.

In summary, the emergence of leaders, in this context digital champions, often hinged upon feelings of responsibility to or influence on that community, the availability of an appropriate skill set (such as knowledge of technology), and the accessibility of existing social and economic networks. The presence of ‘digital champions’ lent the project credibility and traction, was critical to motivation and enthusiasm, and they were able to act as key conduits to networking and identifying skill sets within the community as a whole. Leadership practices also presented challenges to the community-led process, potentially entrenching social structures and creating fractured opinions through informality, both in terms of informal communication processes, and informal organisation structures. The role of these digital champions is more widely thought to hamper the potential replicability of community-led superfast broadband approaches. This chapter will now discuss concepts of social identity and its role in the community-led broadband participation process.

5.2.2 Local identity and community-led broadband initiatives

Participation in community organisations is often heavily linked with local community-level identity politics. Rochester (2006) identifies that more long-term volunteerism is based on traditional cultural identities, emphasising that place and place identity are relevant for participation in a community initiative. So while leaders within the initiative can encourage and motivate volunteers, influencing participation through their networks, it is relevant to also

develop an understanding of local identity politics and the potential impact that has on participation in the community-led broadband initiative. In B4RN and B4GAL, existing social interaction was present, but was often not extending beyond specific groups.

“...people don't really talk to each other that much! I mean really, there just isn't much of a community around here at all...on the school run, they talk to each other, but other than that people are, not necessarily isolated, but they'll have groups already...” (B4GAL 3).

However, in general, those who joined or took part in the community broadband initiative felt that they became a more active member of their community, effectively fostering a continued or new social connection with the place in which they lived.

“I'd prefer to go along with this, help with research and help with an ongoing thing in my village, which I think is very special” (B4RN 2).

Other interviewees viewed their participatory role as more active and were more interested in mobilising the community through the community-led broadband project. This in turn enabled interviewees to not only foster existing networks, but also play an active role in creating what they perceived as their community image and sense of place, thereby developing new understandings of ‘community’.

“So rather than it being nine villages, we effectively think it is one village, and then of course the vision is to restore some of the heritage within the area and bring in some of the other businesses. Or develop new businesses” (B4GAL 1).

This demonstrates the potential of community broadband schemes to widen interviewees’ understanding of community, a notional spatial construct developed in Chapters Two and Three.

The concept of community-led superfast broadband was presented by many interviewees as a means by which the community as a whole could ‘stick together’, to respond to change on their own terms in a local fashion, rather than relying on exogenous forces. The overarching concept of a ‘social’ project, or a ‘by the community’ project was often more enticing than the technology, the superfast broadband offer, and introduces the idea that community interest acts as the principle incentive for participation in a community broadband scheme . Often interviewees expressed the view that the community element was primary, and technological benefits were wholly subsidiary to them.

“To support the effort mainly, even if it was a bit more expensive than BT [British Telecom] or whatever the alternatives, more to support them” (B4GAL 6).

This concept of ‘community belonging’ as an incentive to an individual becoming involved in a local initiative can be understood in multiple ways. Firstly, it was significant as the community-led broadband initiative enhances an already existing sense of community spirit or belongingness in general.

“As soon as I saw that it was something that was local, I thought ‘oh, right, this looks interesting’” (B4RN 6).

“I think it’s an inspiration, I know, although I’ve not been very involved...what I’ve found was that it’s important because it’s people that are trying to do it for the right reason! They know what we need here and they are trying to put it in” (B4GAL 1).

Similarly, it followed that involvement does not need to be ‘claimed for’, in the sense of repayment for volunteer efforts, as participation in itself was considered satisfactory recompense.

“I think if it’s a community thing then everybody mucks in...It’s the sort of thing that I would expect to put a few days in but not expect to claim for it” (B4RN 17).

Secondly, participation was also important as it could encourage those new to the community, or those who had not always been involved in the past, to become involved in a local activity, thereby forging new community links and connections for individuals, potentially increasing their internal, or local social and economic networks.

“B4RN was a great help because now we have something to chat about with our neighbours and a reason to meet. We’re enjoying the project, whether it works or not” (B4RN 16).

“It’s the first time I’ve felt like part of the community. We’re so remote. That was my community, this house and those two over there! But now it’s much broader!” (B4GAL 9).

Finally, the ‘by the community’ aspect of community broadband projects was important in its relationship to larger, global companies. This discourse was evident through discussing current and historical provision of broadband in the B4RN and B4GAL areas, with interviewees repeatedly noting that they felt ignored or misled by providers over the broadband options available to their household, and that they were left powerless to the whims of the higher level telecommunications industry.

“...enough is enough, we can’t wait for [national broadband provider] or local government or anyone else...” (B4RN 6).

“[National broadband providers] have let us down. They have let us down big time” (B4GAL 8).

Frustration was expressed regarding the unreliability of current broadband services to lack of any coverage or options for fair competition from alternative providers. Many interviewees felt that in terms of signing up to a broadband provider their options were negligible due to their place of residence. It was hoped that these frustrations would be largely eradicated with a community-led initiative.

“We were very determined it was going to be a community thing...if we went the commercial route, we would be under duress in a way to not provide for everyone. Some of the outlying farms and buildings...you could never make a business case to provide for them! We determined that we were going to. So it’s very important” (B4GAL 9).

In many ways then, the concept of a community initiative such as B4RN and B4GAL was structured conceptually as a counterweight to large telecommunications companies, as opposing forces on the digital infrastructure provision scale. This is evident in the terminology used by project volunteers, leaders and general users, where wording about current provision was often structured in a manner that represented antagonism, or deviousness or incompetence on the part of the ISP.

“...it sounded like one way to beat [national broadband providers]...” (B4RN 7).

“I had all the discussions with the local provider...and they weren’t really...I’ve been promised everything and delivered nothing” (B4GAL 10).

“[National broadband provider] admitted there was no way that they’d get to us if we relied on them” (B4RN 15).

In terms of the broadband technology itself, the idea of community broadband being ‘local’ was seen to generate more ‘goodness’ in the product and services being offered, and reflected in some cases a perhaps more political decision to support local, a means of retaliation against larger scale, anonymous external bodies. Those working for the community broadband projects are ultimately trying to collectively bring back power from higher up to the local level to be able to engage with those services and the way services are provided in a more direct way.

“Because it’s a community run thing, rather than a ‘big cats’ – like BT [British Telecom] and TalkTalk²⁴. I just think it’s local people trying to create something good. And that’s why I am all for it” (B4RN 2).

This level of local goodness generated from a community initiative was highlighted as being compatible with those communities that already have some level of participation and involvement in other domains. This highlights an opposing effect of community-led broadband: that community broadband may not be increasing a ‘community’ identity, and that

²⁴ BT and TalkTalk are both national telecommunications providers in the UK.

participation may not be moving beyond already active individuals and groups, but it serves to continue such activities.

“...it is a not-for-profit organisation, a community organisation that also makes a lot of sense. This, [village], is quite a community spirited village really...” (BARN 12).

This perspective enabled a reflection on the differences between a community infrastructure project and a larger, national infrastructure project. An interviewee spoke about how individual expectations of the local community broadband project should be managed more in line with a general ‘community-led’ ethos, rather than from the perspective of the project being one of high-tech infrastructure implementation, which could be compared unfavourably to large telecommunications companies’ processes.

“I think they are doing the best they can...it’s almost like they’d like BARN to be O2...so they have all the benefits and a weekly letter and updates on when things are going to arrive. It’s a community-based project. It’s running on limited funds, you’re not going to get all that...I think they’re doing a brilliant job with the resources that they have” (BARN 8).

For many interviewees, the abstract social benefits accrued through engendering community links and new understandings of community, could also be discussed in terms of very tangible, short-term benefits. The process of building a physical community asset was associated with hiring new local employees and creating job opportunities for the rural community.

“I like this idea of training individuals to basically do maintenance...some of whom are going to ultimately, if it all works out, be apprenticed as employees...” (BARN 12).

“I think potentially as well when we are contracting other companies in, we can make it part of their contracts to take on local workers, and that’s all for community benefit” (BAGAL 4).

Local identity ultimately plays a strong role in the development and operation of community-led broadband projects. For individuals, current links to a ‘community’ identity can be the very reason for participation, or can be created through participation. This identity can be enhanced or expanded for the individual, fostering new or existing networks, and potentially empowering individuals to contribute to place-shaping. Conversely, some villages in the case study areas struggled to encourage participation in the digital project despite having active participation and a sense of community identity revolving around other areas of life. The unreliability of previously available broadband services, and the continuing dialogue of ‘us versus them’ with respect to telecommunications access have perpetuated feelings that being ‘rural’ meant having to fend for oneself. This encouraged the community’s interested parties (primarily the digital champions and active volunteers) to obtain services that they desired through collaborative, locally-based, hands-on approaches. These have the potential to

engender equal access to services and highly linked locales, but do not specifically address the creation of any extra-local linkages or future collaborations. This contentious relationship between higher-scale commercial telecommunications providers and local providers has the potential to entrench ideas of rural self-sufficiency, whereby rural communities are perceived to always be able to band together on their own and, in this case, gain the technology they desire. This could potentially lead to overarching policy frameworks that assume the presence, and success, of such community initiatives for superfast broadband installation. In turn, this can limit the opportunities available for communities that are historically inactive, and casts doubt on whether all communities would be able to engage with this method of installation.

5.2.3 Internet technology identity and community-led broadband initiatives

While concepts of community identity and belonging took a prominent position within the interviews conducted in both case study areas, another facet of the discussions that took place during interviews was that of people's Internet technology identity, or culture, and how that identity plays a role in their interest in community-led broadband. By this I mean the broad Internet 'culture' with which each interviewee was aligned, and their relative, self-reported technical knowledge and interest. I reflect on five 'cultures', or clusters of Internet users, as developed by Dutton *et al.* (2013):

- E-mersives - comfortable online, use the Internet to increase efficiency and pass time got enjoyment (12% of UK's Internet users).
- Techno-pragmatists - use the Internet to save time and make lives easier, rarely used as an escape (17% of UK's Internet users).
- Cyber-savvy - relatively ambivalent, enjoy being online and exploit the Internet as a pastime, efficient information source and a social tool. Acknowledge that the Internet can waste time and invade privacy (19% of UK's Internet users).
- Cyber moderates - moderate in their views that it is a useful pastime, information source and social tool. Less fearful about privacy and wasted time (37% of UK's Internet users).
- Adigitals - do not particularly enjoy being online, nor is it viewed as increasing efficiency (14% of UK's Internet users).

Those interviewees who were uninterested in obtaining superfast broadband, for the most part, had, at the time of interview, limited Internet usage, and potentially a lack of interest in increased use, often linked with the 'cyber moderate', where the user can be moderate in their

view of its use, or ‘adigital culture’, where the Internet is not viewed to increase efficiency in their employment or personal life, nor is it an enjoyable past time.

“No, I don’t feel the need to upgrade...I don’t know...I mean maybe it would be good to be a bit faster sometimes...” (B4GAL 2).

In some cases this moderate position was linked to existing levels of knowledge about Internet technology, often a self-taught process. The lack of knowledge did not detract from current online activities but did not encourage any additional interest.

“You’ve got people who really don’t interface with it much, don’t know what it can do, their experience is very coloured by what they’ve been able to use so far” (B4RN 12).

Participation and interest in the community-led broadband process was highlighted as being contingent on education about the capabilities of a superfast broadband offering and its potential to provide services such as high capacity video services, the potential for additional Internet-linked devices (such as Smart TVs), and increased efficiency in employment or personal social activities. The level of involvement in working to drive this investment often stemmed from personal interest and use patterns. For example, interviewee B4RN 18 used Internet connectivity to run a home-based video business that was heavily reliant on upload speeds, and this interviewee was therefore happy to spend time lobbying for registration and village participation in the community broadband scheme to ensure successful adoption, reflecting the ‘e-mersives’ culture. Interviewee B4GAL 8, who worked for a global company, relied on broadband for her ability to work from home and without a better home broadband service, would have to reconsider relocating. She is reflective of the techno-pragmatist view that the Internet will enhance the efficiency of day-to-day life. The fact that key actors in the community broadband scheme illustrate different Internet cultures demonstrates the importance of projects not only relying on volunteers, but that volunteers with specific personal attributes such as being technically savvy is important. Those that have a well-established Internet technology identity are more likely to participate or subscribe, and education on broadband and its capabilities was needed overall to make community-led broadband successful.

“Things like iPads and stuff like that they don’t see a need for and I think one of the bigger issues about broadband is education (B4RN 11).

“As for B4GAL challenges, yeah, it’s trying to get people to understand what’s going to happen to them in the next five years. Because as Laura said, people are pretty happy with what they have mostly” (B4GAL 8).

It is difficult for rural Internet users, used to a slow upload and download broadband speeds, to envisage what a difference a superfast connection could make to their use of the Internet. This difficulty meant, in the case studies, that while participation in the projects perhaps hinged in part on current Internet technology identity, any future or additional interest from the community also potentially hinged on being able to communicate the potential of superfast broadband.

“Until people are connected up in one area...we can go and actually see in a local village hall, take along our laptops and plug and see how fast it is. I don’t think it’s going to be until then that most people are going to be ‘ah, yes’” (B4RN 14).

“Have you ever seen that Field of Dreams movie? ‘If you build it, they will come’. That’s where we are at...once the neighbour gets it in, seeing their kids playing games with people all over the world, that’s the pressure, the peer pressure...the kid pressure! That’ll do it” (B4GAL 9).

Through the interviews it became evident that attitudes about the Internet, and specifically the adoption of superfast broadband, are heavily dependent on personal, individual contexts, and on an individual’s Internet technology identity or culture. This idea of individuality ran through the discussions, leading the Internet to be broadly understood as an individual tool, reflected in both economic and social contexts.

“I think that the impact on community life communally it will not have a significant impact, individually it will make a significant impact” (B4RN 1).

“...outside use, rather than internal use. Your bank, shopping, doctors...those sorts of things, but not in terms of the community” (B4RN 4).

The two quotes above highlight that it is an individual’s technology identity or culture that will play a role in their participation in community-led broadband. Running alongside this, there were many interviewees who got involved in their local project through online means, which again highlights how both of the projects may be appealing to current Internet users, or those with developed Internet technology identities, reflecting Dutton *et al.*’s (2013) first three cultures, e-mersives, techno-pragmatists, and cyber-savvy individuals.

“I think I saw something on the Internet referring to it...then I did a search and found out more information on the Internet and got engaged via that route” (B4RN 12).

The necessity, then, of obtaining or supporting a superfast connection is dependent not only on spatial identity and community belonging, but also on personal perspectives and existing knowledge of Internet-enabled services. If those individual-level attributes are either not well understood, or not present, for example reflecting an adigital culture, there will be less interest

by individuals to treat a superfast connection as a necessity and engage collectively in a community-led process.

5.2.4 The politics of community-led broadband initiatives

Community-led broadband is inherently political, at local and national levels, particularly evident given the involvement of policy and politics in rural broadband provision in general (see Chapter Three). There was a strong discourse of the importance of ‘rural rights’, and taking action for those rights, running through the interviews, particularly as the national digital agenda gains media interest and the challenges faced in rural areas of the UK become more widely understood and articulated. Community-led broadband, a profoundly rural phenomenon in the UK, was seen to progress these rural rights. It was depicted by interviewees as a demonstration of encouraging equality through enhancing social connections and economic opportunity through universal community superfast broadband access.

“I would rather that the government led this...I think they’ve unfortunately focussed on the many as usual and the few are left behind...and those few are invariably in hard to reach rural communities who will only become more isolated because they haven’t been supported....” (B4GAL 7).

The Internet was conceptualised by some interviewees as being an essential service, perhaps leaning more towards an enabler of rights, one expected by all residents regardless of rural status.

“What do I want from it? I want to get exactly the same kind of services, you know [as] the privileged folks that live in cities to be honest. I think there should not be an economic disadvantage of being in a rural community or living in a rural community. I think there should be an equality of provision...without it we will become just economic deserts and will just die on their feet” (B4GAL 7).

The social construction of the Internet in general as an essential service thus changes how it is presented within a political discussion which has repercussions at the local level. It is about equality, and recognition of payments made for all public services, and should not be limited to such an extreme degree by geography.

The practicalities of community-led superfast broadband installation also resonated with some individual interviewee’s rural values, or the idea of a rural scale, being full of neighbourly activities and non-traditional payment for services. This resonates with the notion of the rural idyll, a concept that historically “reinforces healthy, peaceful, secure and prosperous representations of rurality” (Little and Austin, 1996). Thus a community-led solution to improving broadband infrastructure was considered suitable by some interviewees for the ‘rural’ nature of B4RN and B4GAL.

“[B4RN] is a practical, pragmatic rural solution, I grew up in the Dales and it’s no different really to you buying the farmer a few beers for clearing the road of snow...” (B4RN 19).

At the community scale, the complexities of fibre-optic cables and laying such cables, particularly in the B4RN area where they ran across privately owned and managed land was identified as a local layer of politics which could alter timescales and create complications to achieving coverage.

“I saw the first map that came out...I looked at it and thought, ‘that looks like a couple of years, not just a year’...It’s got to come down the lane, which to my knowledge has three different owners. It’s got to come across the bridge, which is owned by the National Rivers Authority and us...that’s not done in a couple of weeks” (B4RN 8).

The challenge of laying cables in private land was also discussed in B4GAL, primarily due to the presence of large landowners who had little interaction with members of the local resident population.

“The immediate problem here is the availability of land. So that goes to the landowner, he doesn’t want to allow tourism projects here to develop...so he doesn’t give you land. You want land to build a house or extend your garage, he won’t let you” (B4GAL 6).

Land ownership and associated access issues as well as the lack of rural broadband connectivity options from larger telecommunications companies quickly became entrenched in local level politics as both case study projects took off.

Within the B4GAL study area, additional facets of community-led broadband as a political movement were highlighted. Local physical features played a strong role in dictating how the community-led process should go. Due to the presence of the Clyde Valley Wind Farm in the areas, one of the largest onshore windfarms in the UK, there was an understanding within the community that they were due ‘compensation payments’ for living near something that was often described as ‘ugly’ or an intrusion.

“...need some stuff around the wind mills, I mean, give us some money...” (B4GAL 5).

It is relatively common for renewable energy providers to have ‘community funding pots’ available to the local regions where they have built renewable energy projects, namely wind farm installations. These funds are then accessible to community groups for the support of local projects. These funds are often put in place to help fulfill the requirement for wind farms to provide ‘community benefit’ to those areas that host renewable energy installations (DECC, 2014). Commercial industry examples include SSE Renewables, which includes the Clyde

Valley Wind Farm. As an organisation, SSE Renewables sets up community funds for each wind farm it builds²⁵. Other commercial examples include the Rhyl Flats Offshore Wind Farm Fund off the north coast of Wales run by RWE Innogy, the Blackhill Windfarm Community Fund in Berwickshire, and the Grange Community Wind Farm Fund in Lincolnshire²⁶. The B4GAL project hoped that payments from the Clyde Valley Wind Farm could assist their community fundraising endeavours.

Extra-local linkages with, for example regional and national government, were often considered when interviewees were asked to consider how superfast rural broadband should be funded. BDUK, the main funding source for rural broadband subsidies, is a national framework that is primarily delivering superfast broadband on a *regional* (county or local authority) level. Each county in England, for example, engages with its communities to determine demand and necessity, and then with the national government to ultimately stimulate, via subsidies, commercial broadband installation (DCMS, 2014). Within BDUK, additional funding programmes targetted rural community-led broadband endeavours, linking rural communities directly to the national BDUK framework to *locally* deliver broadband to particularly hard-to-reach locations (CBS, 2013; DEFRA, 2014a). However, rural communities could not engage with that option if regional funds were already secured to that same area (Garside, 2013). This then necessitates community interaction with the regional bodies as well to determine existing commercial broadband installation plans. These relationships had bred discontent with some interviewees, particularly in B4RN where they were considered to have hindered community broadband aspirations.

“...The money for rural Lancashire, our part of it, has been lost...I think B4RN ought to get the politics right and made sure it was B4RN that was the supplier of choice for everybody...” (B4RN 3).

In particular, those interviewees who had been in contact with national government departments in their role as leaders in the community broadband projects felt ignored and believed that the high level subsidies being publicised as being available to support rural broadband would not come to their region. On a larger scale, the barriers to becoming part of what one interviewee referenced to as the ‘Big Society’ were making life difficult for small community companies, and instead favoured organisations that could fulfill certain requirements including, for example:

²⁵ See <http://sse.com/beingresponsible/responsiblecommunitymember/localcommunityfunds/> for more information.

²⁶ See <http://www.rwe.com/web/cms/en/478728/rwe-innogy/sites/wind-offshore/in-operation/rhyl-flats/local-community/>; <http://www.blackhillcommunityfund.co.uk/>; and <http://lincolnshirecf.co.uk/grants/grange-community-wind-farm> respectively for more information.

“...being a company that can demonstrate three years of previous accounts, being multinational in terms of your current business and be turning over an excess of £3 million pounds...” (BARN 5).

Therefore, community-led broadband proponents were discouraged by past relations with these higher-scale governmental bodies which had left them with little interest in further associations or making funding applications to support the broadband schemes.

Community-led broadband has been structured by the interviewees as inherently political, sitting outside the auspices of much government subsidised rural broadband roll out. Local level politics including access to private land also contribute to its political nature, and highlight challenges that may hinder progress in the installation stages for all community-led broadband initiatives. This demonstrates not only that those local features are key elements within the community broadband process, but also that it maintains a complex and often resistant position in relation to higher-level government policies.

5.2.5 Summary

Leadership, participation, identity and politics in community-led broadband develop the pathways for, and influence the potential of, individual and community resilience. The emergence and presence of leaders lent community-led broadband projects credibility and traction, and were critical to collective motivation, acting as key conduits to networking and identifying skill sets. This resonates with work completed by Hudson (2010) about the importance of key actors in contributing to regional resilience. These leaders represent resourceful individuals who exhibit pro-active capacities to further a collective aim, harnessing their human agency (critical for resilience as identified by Davidson (2010)), and past bonds with the community. Scholars working with resilience theory have continued to emphasise the importance of pro-active capacities, both individual and collective (Berkes and Ross, 2013), and leaders in community-led broadband embody this facet of resilience. The aim of these leaders is bound up in achieving collective equality, a facet influencing community resilience, in this case equality of superfast broadband provision. Leaders also challenged the community-led process, potentially entrenching social structures and creating splintered opinions through informality, which would reduce other individuals' ability to engage and interact with resources, and thus their resilience. This identifies a realistic outcome of community processes, whereby some individuals are empowered and some are similarly disempowered. Newman and Dale (2005) identify this potential vulnerability in their research, emphasising that potentially unequal social networks can reduce resilience. It also highlights the potential conflicting influence on resilience at differing scales. Berkes and Ross (2013)

identified that resilience is likely to ‘scale up’, i.e. when an individual is personally resilient, they are likely to contribute to that community’s overall resilience. However, in this case, local leaders have the potential to reduce others’ individual resilience and therefore any additional impacts would not promulgate.

Local, geographically rooted identity played a strong role in community-led broadband participation, and can be created, enhanced or expanded. While a level of local identity played a role in participation in the two community broadband projects being studied, individuals’ Internet technology identity, or culture of use, was also a determining factor for participation. Both of these facets of identity can alter an individual’s resilience. The specific dialogue about community-led broadband as counterweight to related commercial telecommunications provision has the potential to play to the rural idyll, to entrench ideas of rural self-sufficiency and casts doubt upon the transferability of this method of deploying superfast broadband infrastructure, diminishing potential for extra-local resource accessibility and engagement. This mirrors in a practical way the ‘activist’ approach to community-led broadband, identified by Salemlink and Bosworth (2014), whereby the community initiative is set against a common unfairness, in this case the perceived unfair national commercial providers. Community-led broadband not only engages with politics, but also is an inherently political entity and these politics are a central part of resilience. This is reflected upon when considering a critique of resilience theory: that its focus on the local and ignoring potential national or global institutions or structures is detrimental to understanding and influencing that community’s resilience (Walsh-Dilley *et al.*, 2013). As I argued in Chapter Two, it is relevant to consider the range of structures and scales that contribute to community, and in this case the potential linkages (damaged or intact) with commercial telecommunications providers and digital policy and politics can potentially alter community resilience.

5.3 Going superfast: Implications for rural Internet users

The previous section reflected primarily on the community-led process for deploying superfast broadband, focussing on leadership processes, identity narratives, and finally the political nature of community broadband. This section will delve into the usability of superfast broadband from the perspective of the individual rural user and the wider rural community. The desire for superfast speeds across the UK has been highlighted from a policy perspective at supranational, national and regional levels. This research seeks to investigate the role of speed in rural communities’ broadband access, and identify the potential relationship rural users and communities have with speed and superfast broadband access. This section will lay out the relevance of the ‘need for speed’ (Section 5.3.1), the relationship broadband use has

with power and empowerment (Section 5.3.2), structural implications of the move to superfast broadband (Section 5.3.4), patterns of Internet usage and potential change through superfast accessibility (Section 5.3.5), and, finally, the relationship that rurality, and more theoretical understandings of rural, have with superfast broadband use (Section 5.3.6).

5.3.1 Superfast technology and the ‘need for speed’

The push to obtain superfast broadband is the product of several key motivators. Firstly, interviewees noted the desirability of such high speeds, of maintaining broadband connectivity in line with, or perhaps above, the averages reached across the UK: in other words, having an equality of provision.

“...you do need that technological bridge. You know you need to be able to communicate efficiently and effectively with everybody else” (B4GAL 1).

“I want to...keep up with the rest of the UK...” (B4RN 18).

Sitting alongside this desire to ‘keep up’, was the need for future proofing, for installing a service far above the average capacity of a UK network to ensure future Internet connectivity requirements would be adequate and that engagement would not be limited. This was viewed as critical, particularly as the ‘rest of the world’ came online, and online services and websites were no longer optimised for lower speed connections. This point of view is another representation by interviewees of a need for an equality of provision.

“My biggest fear that pushed me to sort of really help out with B4RN as much as I could was that this might be the only opportunity to get these kinds of speeds” (B4RN 18).

Superfast broadband infrastructure, the ‘need for speed’, was considered by interviewees as being necessary to ensure the future viability of the study areas in a broad sense, both for economic and societal interaction. Having speeds meeting or exceeding national average speeds provided a level of security for users. This need for security, or reliability, in broadband connectivity was discussed frequently from both a personal, social perspective and for economic/business activities, where it was represented as something exceedingly important to maintain reliability for customers.

“I want it more reliable than it is. I don’t want to be downloading films or this sort of thing. I think it’s a reliable service I want” (B4RN 2).

“...In our case, reliability is a thousand times more important than speed...we get penalties if we don’t fulfill our orders...” (B4RN 3).

A reliable broadband service was considered to come at first from having superfast speeds. It was also believed to be something that would stem from the physical structure of the B4RN and B4GAL services, both of which offer a FTTH service with multiple connection points and are not reliant on the older, copper lines, which until now have provided an unreliable, patchy service. The dominant narrative about superfast broadband connectivity then is its relationship with reliability and security: superfast broadband connectivity equates to a reliable and, importantly, usable service that can fulfill the anticipated needs of rural users, both socially and economically. In this manner, the need for speed is in reality a need for reliability.

Despite these strong indicators of the positive influence that superfast broadband may have on people's activities, there was skepticism about the general importance of speed that must be considered. This was primarily evident in the B4RN region, where 'the faster, the better' speed ideal dominated. This project offered speeds of up to 1 Gbit/s, far higher than any other alternative in the UK.

"I didn't feel there was a need [to register]. I've got a reasonably good [national broadband provider] connection, admittedly I've only had it for the last couple of years...now I'm not that computer dedicated type" (B4RN 9).

Some interviewees discussed the concept that, in reality, superfast services of up to 1 Gbit/s may not be particularly useful to users. The reasoning for this is two-fold. Firstly, there is lack of understanding about what 1 Gbit/s speeds can do and their applicability to the average user.

"And that's something that has come out of this as well, some people don't know what they could do with 1 Gbit/s." (B4RN 12).

Secondly, there was a perceived lack of necessity for 1 Gbit/s speeds given current usage patterns, although expected patterns were an unknown entity with respect to speed desirability.

"I'm still not sure that the actual people that they're delivering to will use those high-speeds, apart from a small percentage. If the world is going to a standard of 30 Megs there's very little point being above it because you're not going to be able to use it in a meaningful way...I don't see many people wanting the B4RN speeds, I just don't" (B4RN 3).

Some interviewees reflected on the future needs of broadband services, and it was noted that a relative digital illiteracy with respect to hardware and hardware capabilities could also limit the usability of such speeds, in effect, limiting any potential user benefits. One user noted that,

while they could have a superfast broadband connection to the home, his actual machine would not be capable of realising that speed:

“I mean, my computer will never handle that speed anyway, it can hardly cope with 2.5 Mbit/s. So it’s not really going to deliver those speeds of actual use, so it’s a little bit of dishonesty about that, most people probably don’t realise their own equipment is going to limit them” (B4RN 3).

In concert with this concern came the increased interest in improving digital literacy. Not simply for software, but also about how the technology works and what limitations hardware may have for future usability.

Interestingly, despite current Internet connectivity challenges, and any consideration to the future speed options, most interviewees owned multiple devices and accessed the Internet in a multitude of ways in their homes and their workplace and this flexibility was increasing in its importance.

“...as a house we have about 4 computers working at any given time, and I can’t even use things like iPlayer!” (B4GAL 10).

In relation to businesses, this use of multiple devices enabled flexible working patterns that could be altered to suit changing economic conditions, an illustration of individual economic resilience.

‘...more flexibility...we desk share...people are out on the road and they need to communicate when they are out on the road...we trying to embrace a bit more home working...’ (B4GAL 7).

Interviewee B4GAL 7’s observation highlights a key theme that relates to the need for speed, that of efficiency. Most interviewees wanted to be more efficient, to be able to use multiple devices and to have all family members able to use their devices simultaneously.

“I think what’s really come out to me is the ability to use multiple devices and not have problems...they want to work simultaneously doing multiple different things” (B4RN 18).

The construction of ‘necessity’ in obtaining superfast services was thus heavily dependent on past knowledge and experience, current usage patterns and desired usage patterns, which will be discussed in more detail in the following Section 5.3.2. The importance placed on the Internet in relation to community viability, very much based on the personal understanding of digital connectivity, is also integral to structuring the perceived necessity of superfast broadband.

Ultimately, the complexity presented above demonstrates the difficulty in understanding the necessity of superfast services for the rural user. It is clear that reliability is integral to Internet connectivity, and was closely linked to the technical solution; reliability would come from it being a superfast, fibre-optic connection. The speed of superfast services, then, was tied to ideas of efficiency, of particular importance to individual businesses, which operate alongside external economic networks running on different speeds, as well as family units, whereby multiple individuals are on multiple devices simultaneously.

5.3.1.1 The power of access

Accessibility to the Internet via superfast broadband is often depicted as giving more participative power to the user: power to the user to access and participate in various activities online and to use the Internet in the way they see fit (e.g. Dini *et al.* 2012). The high level of significance placed on the Internet could be seen through discussions with interviewees of everyday activities and the embodiment of freedom that the Internet provides as a tool of accessibility. It conveys freedom and control over media choices, services used, such as personal finances, and so on. Smaller, everyday activities were also highlighted in this manner, for example, using online services such as shopping through the myriad of online outlets and catalogues allowed interviewees control over how they planned their physical shopping excursions.

“Our nearest video shops are miles away, to pick up a DVD, there’s plenty of stuff you could stream to your TV...” (B4GAL 7).

One interviewee discussed the previous use of a financial planner, and the switch to using the Internet to manage their personal finances which was made possible through high-speed Internet access.

“I mean...I have at least five to six online companies, a stock broker, all these different platforms...and it’s just wonderful to have your own control, full control” (BARN 18).

This depiction of power and control over one’s own shopping and dynamic household or familial processes demonstrates the importance that people place in the Internet and its potential for enhancing individual empowerment. The Internet as a communication tool was a dominant discourse, one directly reflecting processes of empowerment. The increased communicability of interviewees enabled by Internet access was related to giving them control over how and when they communicate with their social or business networks.

“We’re pulling people from further away, you know Edinburgh, Glasgow, London, and they find the website and then taking a trip out and coming to see what we have... I would say, sort of 50% of our sales are done from the Internet, so it’s very important” (B4GAL 1).

The importance of capacity of the communications network for download and upload is highlighted in the two quotes that follow. A superfast, reliable connection was seen as being cable of enhancing online capacity.

“I need to do group emails to dozens of groups and I need to download and upload documents, so which are quite large documents...” (B4RN 6).

“I get absurd numbers of emails...40 or 50 [in a day]...just that in itself is important” (B4GAL 2).

Obtaining superfast broadband was seen as a benefit to local entrepreneurs and businesses (i.e. through customer communication options) as well as to individual residents (i.e. remaining in control of financial assets).

“I found out how important it is in terms of communications...” (B4RN 4).

Accessibility through superfast services is constructed simultaneously as the identification and the development of control over one’s everyday activities – an empowering aspect of rural life that can contribute to individual perceived resilience.

5.3.1.2 Structural implications of superfast broadband

The benefits of superfast broadband are at a national policy level, often discussed in terms of economic stimulation, population growth, and positive influences on social networks, as discussed in Chapter Three. This section sets out how interviewees from the B4RN and B4GAL areas discussed community structures and potential changes through superfast community-led broadband use. Interviewees often discussed benefits of superfast broadband in terms of increasing the value of rural assets, often in the form of increasing housing prices. It was understood that people would see how *“...incredibly attractive 1000 megabit broadband would be...” (B4RN 18)*. While these discussions were, in general, theoretical, the concept that superfast broadband would add value to individual properties was an attractive facet of the service.

“It’s number one on the housing list! And people are buying houses now, and it’s the first question, you know, do you have broadband...” (B4GAL 10).

This was almost simultaneously linked to the economic and social structures and opportunities within the rural communities. Firstly, it was understood that superfast broadband would provide more options for people to work from home, thereby increasing the attractiveness of

moving to the rural countryside, countryside represented as idyllic, with high quality of life and social wellbeing. This could, in turn, influence the resilience of individuals, providing alternative work-life models, and new opportunities for economic endeavours.

“I think that if we can get the BARN project up and running, we can improve some of the services then I think there’s potential to grow the community a little bit...” (BARN 5).

Interviewees reflected on their expectations of community-led broadband use, and concluded that the beneficiaries of superfast broadband will be the younger, future generations.

“I’m thinking of the younger people in the village, not so much myself, but I think broadband will be the most important thing for the future” (BARN 2).

“...if you want to bring young blood, talent, to places like this then you need that infrastructure” (B4GAL 6).

It was through this perception of the Internet as a tool for future generations that interview discussions widened to reflect on community-level resilience and demographic change. Several interviewees postulated that the community could see fewer people commuting and more working within their village itself, possibly from home (a scenario highlighted above), and this could cascade to a potential renegotiation of the local economic interactions and social structure of the village, supporting the development of ‘active’ rural communities.

“...if we’ve got younger communities and they’re working in the community as well...I mean potentially they will have to reopen schools, not close [them]...doctors’ surgeries will be better supported...” (BARN 17).

The potential for community growth and age diversification, tied to the presence of superfast broadband infrastructure, was seen as something that could support rural communities to become more diverse, living communities, as opposed to commuter hamlets with relatively little economic activity.

“If we had a local shop...or more regular buses or even just a variety of buses, then that would be great” (B4GAL 10).

However, one interviewee noted that this potential alteration to the community structure could be a double-edged sword, particularly in reference to the house price debate. It might further exclude individuals from owning property locally.

“Some people believe we should have cheap housing...but at the same time there’s plenty of people here who can come in driving the Range Rover or whatever. They’re more interested in the house prices going up” (BARN 18).

This potential division of affordability could, alternatively, hinder diversification of the village, thereby depleting the potential benefits discussed above and limiting the ability for younger generations to move to or remain in these attractive rural areas.

The arrival of superfast broadband was thus linked by interviewees with potential structural change. Increasing values of rural assets such as property was thought of as a benefit, but also as something that could dampen opportunities for people to either move in or remain living in the community. The potential for economic opportunity was linked to the potential for changing working patterns, and the creation of lively social structures throughout the communities, potentially leading to a renegotiation of the village, and increasing the overall community resilience.

5.3.2 Internet usage patterns

This section will explore in more detail the specific use of Internet-enabled applications by people living in the B4RN and B4GAL areas and the relationships these online activities have to wider rural society and economy.

5.3.2.1 Rural society

Interviewees repeatedly reflected on their anticipated uses of superfast broadband connectivity as a method of verbalising the relevance to them of Internet access. A simple exercise was conducted with all self-identified ‘user’ pre-connectivity interviewees (i.e. non governance individuals) to explore what types of Internet-enabled services they used, and which they might like to access (or access more of) when Internet speeds increased to superfast. The aggregated results depicted in Figure 5 - 1 are drawn from the responses of 29 interviewees²⁷ and depict a clear picture of Internet usage in the two case study communities.

²⁷ As this is a small sample, this is not meant to be representative of broad rural Internet usage patterns, rather it serves to illustrate the discussions that took place and create a snapshot of some of the key themes surrounding Internet uses in relation to speeds available. Internet services were determined based on brainstorming activities and were added upon as interviewees considered their usage.

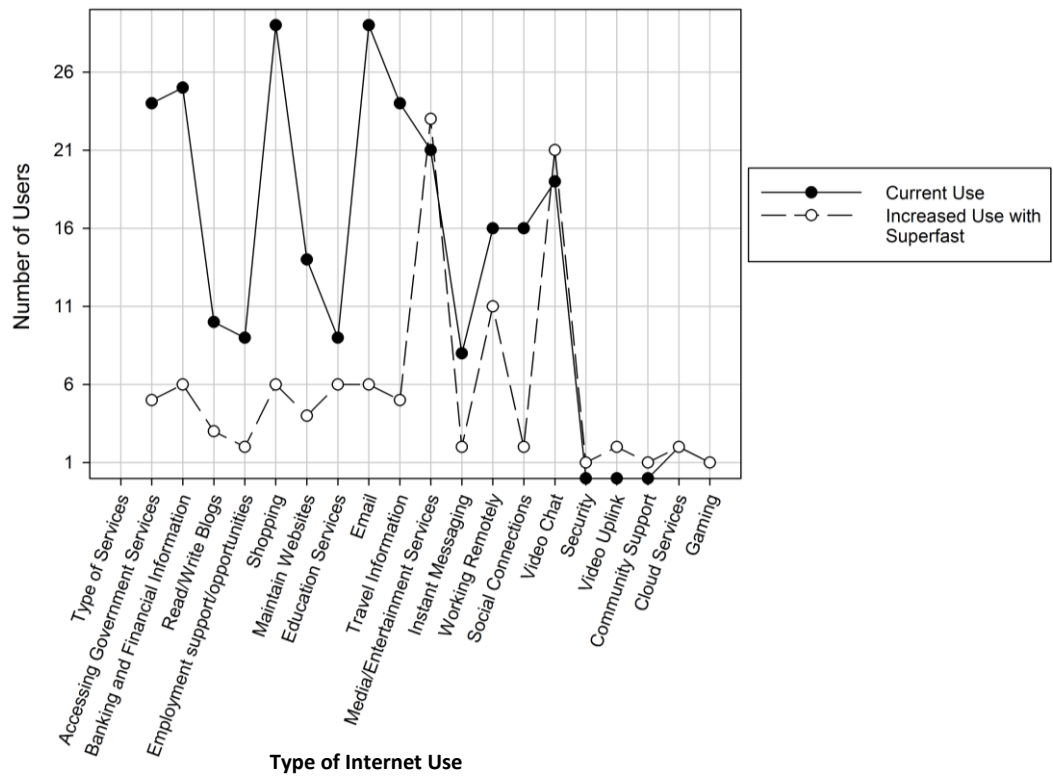


Figure 5 - 1 Current use and expected internet use change by B4RN and B4GAL interviewees

Prior to obtaining superfast broadband, most interviewees reported high usage of public services (for example, DVLA to tax a vehicle, the submission of farm paperwork), banking, shopping online and email. Following these, working remotely and streaming video services were also common activities. In terms of what superfast access would facilitate in the future, most interviewees identified two areas where they thought their use would increase: media and entertainment services (for example, accessing the BBC iPlayer) and video services, including VoIP services such as SKYPE and uplink for working remotely. This video element of Internet access was highlighted in many interviews as something that may or may not be currently used in a limited form, but would certainly be accessed more readily under the auspices of superfast technology.

“...we’ve just got a new baby niece in Reading and we’ve been facetimeing and it just stops, and you’re talking to them and suddenly it stops because it’s just too slow” (B4RN 12).

Personal activities and options became limited if online video was the preferred method of communication by third parties (i.e. training videos), perpetuating a sense of isolation and existence as a digital ‘have-not’ in a rural community.

“I sometimes feel we’re excluded from certain aspects of what you might call modern life because things come on iPlayer...you sort of feel a bit excluded from things that a lot of people take for granted” (B4RN 14).

"I can't bloody wait for it! I mean, as well, there are loads of things out there that we could use, that we don't use. It's just you don't even entertain it, it's just not worth it!" (B4GAL 1).

This perceived exclusion detracted from individuals' feeling of empowerment, and their perceived ability to engage with wider society, which relates to that individual's ability to remain resilient through shocks such as economic shifts (i.e. loss of job), and changes in social connections (i.e. friends moving away). In relation to this household scale, superfast access was perceived to contribute to proliferating social connections, education opportunities (through video) and a general feeling of connection with urban or individuals and communities outside of the study areas. Future use of superfast broadband could act as an alternative to lost public services, particularly those that previously had been offered at the village level (shops and so on) and have since declined. This perceived contribution to household life was similarly linked to a sense of personal wellbeing and empowerment, and enablement of personal skill building and self-sufficiency, thereby increasing perceived resilience despite being in a geographic location that may lack access to physical services.

Broadly, overall broadband use was conceived as connecting to the 'outside' world but current connectivity was slow and limiting. Broadband allowed interviewees to remain connected to urban centres for business and personal reasons, to friends and family, and to distant connections, often abroad. In this context living and working in a rural areas was defined or understood almost solely in terms of physical distance.

"...we've got three children, one is away at University, he is at [name], and he comes back from [university] and he is absolutely pulling his hair out. He just hates the Internet here, and I'm like, 'it's not too bad,' but that's because I've got used to the idiosyncrasies of it, and working around it, and knowing when to go on it..." (B4GAL 1).

The service to be provided by the community broadband project was conceived by some interviewees as being crucial to maintaining global-scale connections, such as interacting with friends or family groups abroad. While social interactions online were spoken of with some caution, particularly with respect to giving out personal information, interviewees were still keen to create and maintain social connections using a reliable superfast broadband service. The potential use of Internet-enabled applications, such as video calling, was highlighted as a method of maintaining this connectivity.

"...there are quite a number of older people in the village who have family away from home, the number who can't use Skype or anything of that nature because it's just too slow" (B4RN 1).

Through broadband, and the future superfast broadband, these connections are not simply enabled but also proliferated and enhanced, influencing individual resilience. This is taken to the point where broadband is viewed as essential for living, reflecting its social construction as an essential service.

“We wouldn’t live somewhere where we couldn’t get the Internet – we have children living away, we have relatives abroad in America and Europe and we Skype them, communally with them...so it would be vitally important to us...” (BARN 2).

When considering how they would feel if they lost their current broadband or Internet service, it was evident that the social connectivity it brings was very important and would be missed. Broadband was seen as an essential service what had a high level of influence over everyday activities.

“It wouldn’t be the end of the world, but it would be very inconvenient” (BAGAL 6).

“It would be pretty disastrous” (BARN 13).

“Oh my god, move house” (BAGAL 7).

“I’d go quite mad...what an awful prospect” (BARN 16).

Broadband connectivity was not thought to be something that had changed the level of engagement within the rural community. In person interaction, for example going to visit a neighbour, had not been supplanted. However, outside connections were thought to be something that would be maintained at a virtual level through the superfast service.

“I don’t think it plays any role, because people use it individually to do their own thing. There isn’t any use of the Internet to arrange village events, or to circulate things” (BARN 3).

There were two tangible benefits identified by interviewees at the community-scale. Firstly, with superfast speeds, one interviewee hoped that they could have an online village market, or online tourism site to promote the place where they lived. Secondly, interviewees emphasised the potential ability to strengthen communications within their specific localities.

“...when we first came here, someone would go, ‘oh there was a great concert last Saturday night at ‘x’, and we would think, well had we known that we probably would have gone!...So that is something we are trying to do with the website that is the big thing I was pushing...” (BAGAL 3).

Potential new uses of the Internet, such as telemedicine via broadband, were highlighted as future applications that could prove useful to the case study communities. Interest in unknown technologies was expressed, although interviewees could not foresee using them immediately, nor could their impacts be fully articulated.

There was some skepticism expressed about the potential impact of broadband, and this again reflected that usage patterns tended to be perceived as highly individualised, and also that current usage would not change so drastically as to have a broader influence.

“I mean, I can see it having high use, whether it would have any actual impact, get cheaper phone calls, would it impact on everyday life? Don’t know...can’t quite see a link there...” (BARN 1).

The current and desired usage patterns of Internet-enabled services discussed with interviewees and presented above focus on individualised activities, such as personal media, skill-building and individual economic diversification. More personal connections, such as contacting family or engaging with economy located outside the spatial scope of the community were also highlighted, and again reflect an inward, personal orientation to the use of the Internet, one that sits outside engagement with their spatially constructed rural community. The level of engagement within the rural community itself was thought to remain at the physical level, for example going to visit a neighbour, whereas outside connections would be maintained at a virtual level through the superfast service.

In the context of their current use of Internet enabled services and applications, interviewees expressed a strong desire for these uses to be more efficient and for the use of multiple devices and multiple access points simultaneously in the household unit, highlighted in Section 5.2.3, to be easier. Therefore, when discussing anticipated uses of superfast services and its relation to resilience, it is relevant to look not just at the new broadband-enabled applications and services that are going to be accessed, but also the potential changing usage patterns within the household, acknowledging a potential increase of multiple access points through multiple different devices. This could alter how much influence broadband has on adaptive capacity building, a key facet of individual and community resilience.

5.3.2.2 Rural economy

The rural economy was a theme that ran throughout the interview discussions in both case study areas, and is of critical relevance for discussions of resilience as the economic interactions of rural individuals and communities are important for their overall sustainability. A simple exercise was conducted with all self-identified ‘business’ pre-connectivity interviewees (similar to that recounted in Section 5.3.2.1) to ask what types of online services individuals were currently using, and which they may wish to access (or access more of) when

Internet speeds increased to superfast. The aggregated results depicted in Figure 5 – 2 are compiled from the responses given by 10 interviewees²⁸.

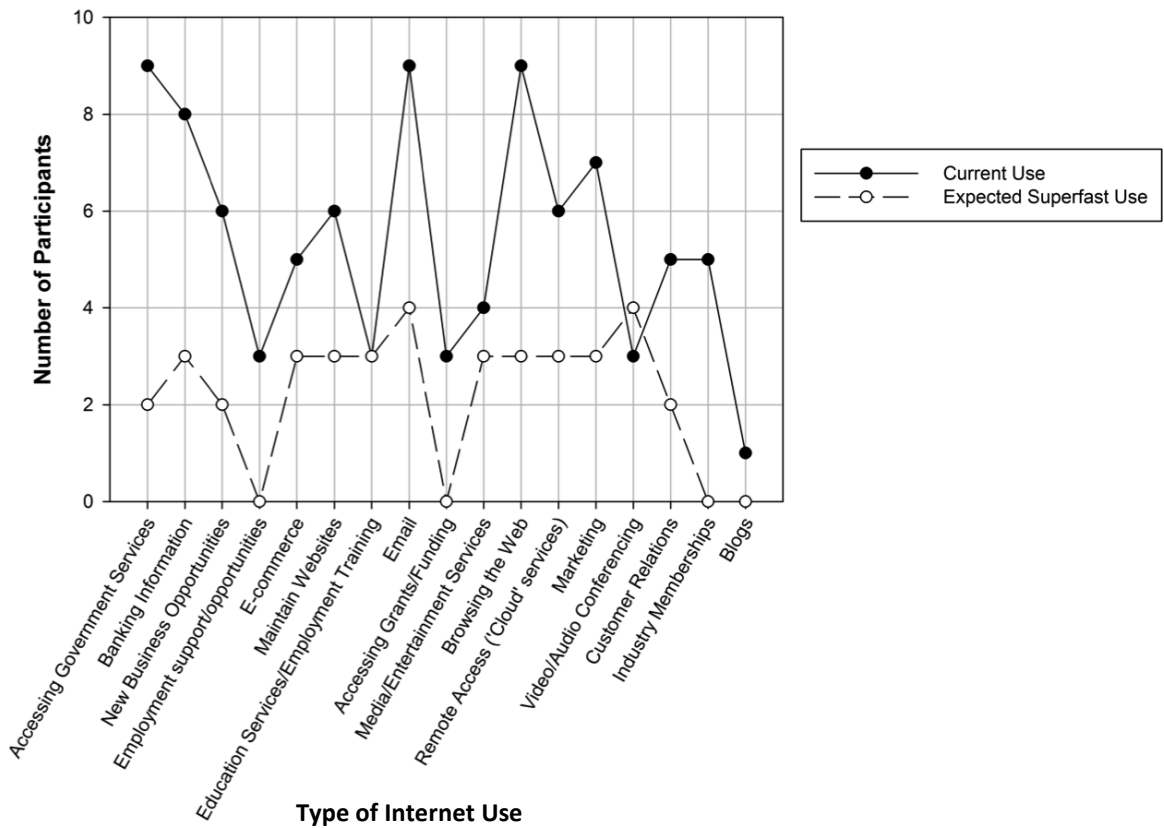


Figure 5 - 2 Current use and expected internet use change by B4RN and B4GAL business interviewees

There was a marked desire for increased usage in video/conferencing capabilities, a finding that has also been reflected in Laco  e and Phippen’s (2013) study in Cornwall.

“There are inherent issues with running a business in a rural environment...from a business point of view it means you can’t effectively download videos, transmit video clips, effectively anyway. Or use video conferencing, it’s just not practical” (B4RN 1).

Interviewees in B4RN and B4GAL did not envisage a significant change in their usage of the other specific broadband-enabled activities following superfast broadband adoption. As this sample is both small and not representative of the rural case study areas as a whole, these findings could not be considered reflective of rural businesses in general. Other identified changes in usage for businesses following the inclusion of superfast broadband include increased use of cloud computing services, reduction of travel time and overhead costs, and

²⁸ Similar to Figure 5 - 1, this small sample is not meant to be representative of broad rural Internet business usage patterns, rather it serves to illustrate the discussions that took place and create a snapshot of some of the key themes surrounding Internet uses in relation to speeds available in a business context. Internet services were determined based on brainstorming activities and were added upon as interviewees considered their usage.

more abstractly, the increase of collaboration opportunities and remote working (Lacohée and Phippen, 2013). Despite this rather surprising finding in B4RN and B4GAL, in relation to the economy in general (across various economic sectors), interviewees identified that access to superfast broadband was aligned with the potential for new business creation, and for creating new opportunities within existing businesses. These benefits are considered due to the higher capacity a superfast broadband network can provide, with relatively unlimited download and upload capabilities to additionally support new and advanced broadband-enabled applications. These network features (higher capacity, unlimited upload and download capabilities) were often discussed by interviewees as critical for the rural economy, supporting, in theoretical terms, business growth and competitiveness. However, they were not directly linked by interviewees to specific online, Internet-enabled activities, and therefore not directly identified in Figure 5 - 2. This potential for superfast broadband to contribute to economic growth was discussed by interviewees in an overarching manner, reflecting on the potential for individualised skill building and building new wide-ranging economic resources across the community, which again can enhance individual resilience in times of ongoing change.

“I imagine that working is learning more and learning faster potentially, new skills and finding new ways of learning, to develop my business and to develop my professional skills, but also in terms of finding new services I can offer” (B4RN 18).

This is reflective of similar wide-ranging findings discussed following the implementation of superfast broadband in Cornwall, where it enabled businesses to work more effectively, creating a competitive edge and improving business agility (Lacohée and Phippen, 2013).

If no improvements to local broadband services were forthcoming, any opportunity for such endeavours from the standpoint of rural businesses would not be facilitated.

“...I am a company consultant, we do sales, leadership, and training for companies, and one of the things I do is run webinars with clients all over the world, and sometimes its public, so when I'm sitting there and I'm the main speaker, and I've got half meg connection, it doesn't allow me much opportunity” (B4GAL 10).

The importance of superfast broadband was also highlighted in relation to external business networks, increasing what Lacohée and Phippen (2013) also identified as collaboration opportunities, again demonstrating the importance of superfast broadband for ‘outside of the area’ connections.

“First [broadband] enables you to connect to the business world...” (B4RN 1)

“It would be great to have more services so we could have it play an even bigger part...I could communicate via web conferencing with work...” (B4GAL 7).

A few of the interviewees who classed themselves as self-employed or working from home were involved in the agricultural sector, which offers its own challenges for living in an Internet-limited world, as illustrated in the following quotation.

“Milk recording...every month they do the recording and they have to send us the results by, well we still get it on floppy disk because we can’t access the online service proper” (B4RN 14).

The push for government mandated online recording for the agricultural sector has had a detrimental impact upon those in the farming community with poor connectivity. . Not only is online the preferred mode for filing records such as the milk recordings, for some services it is the only way in which farmers can communicate and fulfill regulatory requirements.

“The farmer over there, every time he has to move sheep or cattle, he has to put it in a form. All of these forms are online these days. So if you’re a farmer you can’t work without broadband” (B4GAL 9).

This presents the challenge farmers or farm workers face when considering the regulatory and legislative requirements for their business to operate. Broadband has become a necessity to function within the agricultural sector. A slow connection can, in some cases, fully prohibit farms from completing regulatory paperwork as the files are often too large to successfully submit online. This may result in the requirement of outsourcing to consultants who work from locations where connectivity is better.

Those businesses that were interviewed that suffered from low Internet speeds and limited bandwidth did not identify whether broadband had any influence on profits, although increased marketing opportunities and accessing a wider customer base, made possible by potential superfast broadband accessibility, were highlighted.

“No, I don’t think it impacted profits, I think...hmm...it’s not impacted profits, but it has possibly impacted the effectiveness of electronic marketing” (B4RN 1).

An extreme consequence of poor connectivity amongst the business community was illustrated through repeated comments made about the viability of remaining and working within rural communities. Although this was not as evident in B4RN, in the B4GAL region, many interviewees discussed the concerns they had for their future economic options if internet connectivity did not improve and they mentioned that they may leave if broadband services did not improve. Lacohee and Phippen (2013) found similar sentiments in Cornwall

prior to the installation of superfast broadband, with many businesses investigating relocation due to the strain created by rural infrastructure issues.

“...If I didn’t get an improvement, I reckon in about five years I’d have to sell because people will be sending 50 Meg files and I just can’t do it. There’s been a couple of times where I’ve had to go down to the hotel in Abington to get their free Wi-Fi to connect through them” (B4GAL 10).

While this extreme was expressed by a small minority of interviewees, it is important to highlight the potentially severe outcomes to rural economic activity if access to a fast and reliable Internet services is not available.

The rural economy is influenced by broadband access. Current and future use, as reported by interviewees from the business community, emphasise that broadband is a necessary tool for engaging in current, and developing new, economic opportunities. Specifically broadband was used for remaining connected to external business networks, and as a tool for marketing. The potential increased network capacity and upload speeds of superfast broadband were viewed as critical to the future resilience of the rural economy in general. In terms of specific services, use of video, and video-related activities such as web-conferencing, were activities interviewees thought increased use could be made of if faster broadband speeds were available. The agricultural sector presented a unique challenge for the farming community due to government-regulated activities only being available in an online mode. An extreme consequence of poor broadband speeds was the potential that those who ran a business would have to leave the areas and relocate somewhere that had a more acceptable level of broadband provision.

5.3.3 Understanding ‘rurality’ and superfast broadband technology

Reflecting on the entire sample of interviews in B4RN and B4GAL, this section will now reflect on more theoretical understandings of rurality, of rural life, and its relationship with the use of superfast broadband technology. The charm and often-idealised representation of rurality, captured by the term ‘rural idyll’ (discussed in Chapter Three) permeated the data collection process, and was mentioned by interviewees from all three groups (governance, individuals and non-adopters) represented in the sample. Often this charm existed in spite of, or in opposition to, the lack of superfast broadband technology. It seemed that both the rural idyll and superfast broadband were idolised by a majority, and the potential intersection of rural life and superfast broadband connectivity was the new ‘idyll’.

“...it’s a really good way of life, you know, it’s pretty crime free, you know you can go out and leave your doors unlocked...” (B4GAL 5).

“So much of the quality of our lives, the richness...there’s a great inspiration that people get from being in a rural environment...” (B4RN 7).

Many of the settlements within the two case study areas had regular social events and active community organisations including, for example, coffee mornings, walking groups, bowling groups, and so on. This demonstrated some level of community resilience and cooperation, possible engaging with community resources, such as a village hall, or the surrounding physical environment. However, these events and organisations were not wholly inclusive. If you had not lived in the village with school age children at one time it could be difficult to get ‘in’ to the community life embodied by social activities and organisations. Similarly, interviewees recognised that participating in local activities and organisations was contingent on certain personal capabilities, such as transportation.

“We have no public transport in our village...tends to mean that the very elderly have to leave...for those of us that are active and can drive, it’s just one of those aspects of living in the country...” (B4RN 1).

These social connections seemed to be built at the very local level, rather than being reflective of the entire geographical areas covered by B4RN and B4GAL.

“...well, you’ve been over to Quernmore, for instance. And I don’t know the people there; they’re nice people I suppose...” (B4RN 10).

“...we were welcomed very very quickly, it’s a very welcoming and open community! I think Cheryl has had a completely different experience, so it’s fascinating isn’t it how these things are different. But she says that nobody speaks to anybody else in the village. You know they know who they are, but nobody goes round to anybody’s house for drinks or anything” (B4GAL 7).

Interviewees recognised that there are downsides to living in a rural area. Low levels of service provision, including access to shops, post office and so on are common. It was acknowledged by some interviewees then that the expectations of broadband in rural areas should be less than urban areas, similar to how you may expect fewer public services.

“I like living in a rural environment, I chose to move here...you just accept, well I did, when you move there wouldn’t be resources or services available that you might enjoy in a more sort of urban area...it’s a trade-off” (B4RN 5).

“Me, I like the nature of the village, if you live in a rural community, you cannot always have all the amenities that you want, and that is a tradeoff that you take” (B4GAL 7).

The lack of services, or indeed the continued loss of services over time in rural areas also affected village life in that economic activity in some communities was eroded to the point that the settlements only fulfilled a residential function.

“We have virtually no economy in the village, in that sense. The farming community is reducing quite rapidly” (BARN 1).

A contrasting option was expressed by other interviewees who did not see poor broadband services and the declining physical presence of economic activities in their community as inevitable. Rather, superfast broadband should become available to the rural population.

“Don’t see why our community should be left behind, if there’s people willing to do the work” (BARN 2).

These conflicting views begin to illustrate relationships between the concept of ‘rurality’, Internet technology and service provision. The idea that the idyllic rural is marred by a lack of connectivity, and that connectivity should be considered an essential service, sits in contrast to the assumption and in some cases expectation of service decline often found in rural communities.

5.3.4 Summary

These perceptions of superfast broadband and its role in relation to rural users and communities from a personal and an economic standpoint represents a complex picture, one dependent on not only personal perspectives and knowledge of broadband services in general, but also the implications it may have for individual well-being, empowerment and resilience. Reliability is a desired feature of superfast access, and is tied to ideas of efficiency and control. Superfast broadband use has the potential to empower individuals through being able to participate fully in online life, from simple media choices to economic opportunities. This could influence aspects of pro-active capacities and the potential for human agency, critical to resilience thinking (Davidson, 2010). On a structural level, broadband is thought to improve rural assets, acting as an element of the community’s built capital itself, an addition which, on a basic level, enhances community resilience (Magis, 2010). It also may provide new opportunities for community growth and there is scope for reflecting on superfast broadband in relation to community enhancement through renegotiating patterns of living and working, and possibly supporting the development of new resources and capacities. This emphasises that becoming more resilient is a *process*, so while broadband as an asset is beneficial, the associated social and economic community processes that may be influenced by its presence are multi-dimensional (e.g. Skerratt, 2013).

From the perspective of private individuals who use the Internet in their personal lives and from a business perspective, the Internet was perceived as an individualised tool whose use was conceptualised at the individual household and/or business scale. This ‘tool’ can enhance

individuals' social connectivity and perceived empowerment, as well as facilitate skill building and economic empowerment (which can, in turn, be influential to an existing business, or lead to the creation of new entrepreneurial ventures), and is heavily dependent on personal background, interest in technology, and relevant education. This could, in turn, enhance community resilience after installation, reflecting the argument made by Berkes and Ross (2013) that individual resilience could 'scale up' to enhance community resilience. The opportunity to increase the use of video, in both personal and business domains, was seen as a benefit of the switch to superfast broadband. Superfast broadband presents an opportunity for individuals, communities and businesses to better engage with external networks, creating or enhancing existing extra-local linkages, which is a critical component to resilience building (Walsh-Dilley *et al.*, 2013). The concept of 'rurality' has a contradictory relationship with broadband technology and service provision, whereby services are often expected to be lacking in a rural area and it is a 'trade-off' to live rurally, yet communication technologies are a required element for modern society.

5.4 Discussion: Resilience and superfast technology

The findings from the pre-connectivity interviews presented above reflect on installation practices and implications, discussing the *process* of acquiring superfast broadband technology in rural areas, and the potential *presence* of superfast broadband technology infrastructure and implications for rural users and their communities. It is now relevant to consider these findings explicitly in relation to resilience theory, to provide a nuanced analysis of the influence of community-led superfast broadband on social resilience, reflecting on both the individual and community scale. The preceding sections of this chapter have presented findings from the analysis of pre-connectivity interviews whose themes were derived from the first 'open coding' approach to data analysis. This final section of the chapter reports findings from another phase of pre-connectivity interview analysis. Here, in order to best reflect on resilience and resilience enhancement, the interview transcripts were interrogated in search of evidence of material that could be categorised under a second set of thematic codes, derived from the resilience literature. Discussed in detail in Chapter Four, this was based on 4 broad resilience dimensions, with nine resilience 'codes', which were then analysed in relation to their overlap with the grounded coding structure. In order to best reflect on the potential relationships, I have concentrated the discussion here on the strongest relationships presented²⁹.

²⁹ See Chapter Four for a full discussion of the network analysis maps, their creation and additional meaning.

The discussion that follows considered the four dimensions of resilience, and outlines the relationships they have with individual and community and superfast technology. Each dimension of resilience begins with a visualisation of the data, highlighting the strength of each relationship with that dimension of resilience through the use of social network analysis techniques³⁰. The coloured nodes on the exterior of each visualisation are inductive, developed through layers of grounded analysis within the interview data. The interior, black, resilience codes were themes developed through the systematic review of literature (see Chapter Two) and represent deductive codes. The opacity and thickness of each line is linked to the 'relationship' or the quantity of coded extracts that overlap. No directionality is assumed (with respect to a technology code influencing resilience, for example) because influence may be attributed in either direction. No relationship is assumed to be positive or negative (similar to how resilience can be both a 'good' and a 'bad' as established by Armitage *et al.*, 2012). The lines simply identify the strength of a relationship, and often encompass both positive and negative views. The complex picture continues to demonstrate the intersecting and often conflicting relationships between resilience, individuals, community, and superfast broadband.

5.4.1 Resources and resilience

To begin the discussion, I examine the dimension of resources, or capitals. To situate this analysis in resilience thinking, I broadly reflect on the central questions developed in Section 4.6.1 to aid the analysis. The questions query:

- In what ways do community broadband processes increase (or decrease) resources (including societal and economic interactions) for individuals and the community?
- In what ways do community broadband processes aid individuals and the community in developing current or new resources?
- In what ways do community broadband processes increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?

³⁰ Each network map was made using NodeXL, an open source software for social network analysis (see Microsoft Research, 2014).

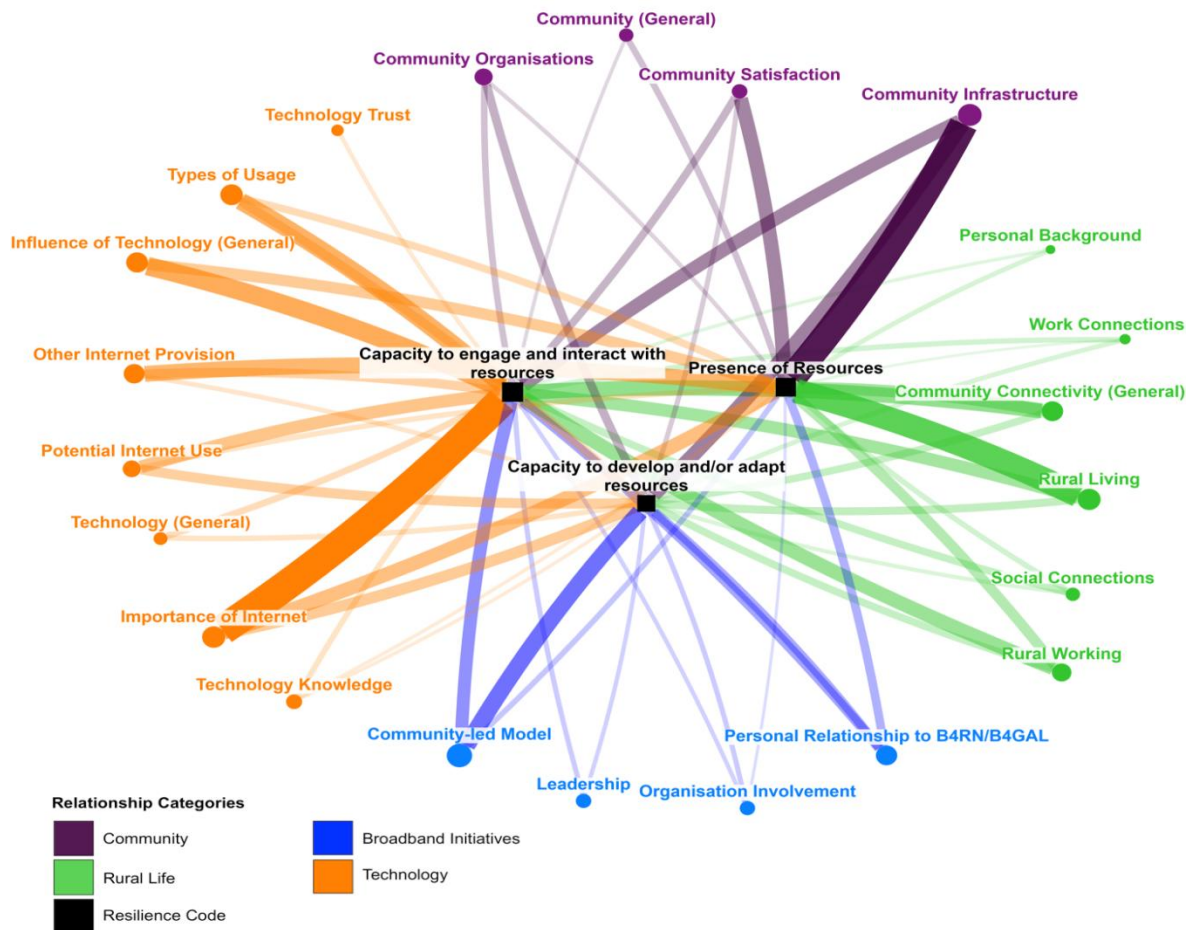


Figure 5 - 3 Dimension 1: Resources

Figure Note: Each vertex depicted with a black square is representative of a 'resilience' node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an 'open' node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the 'relationship value', or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between resources as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to resources and community-led broadband processes.

Resources are critical for rural resilience (Magis, 2010; Sherrieb *et al.*, 2010; Skerratt, 2013). The presence of resources, the capacity to develop or adapt resources and the capacity to engage with resources, considering individual and community scales, were examined. This considers elements of adaptability which remain central to the resilience concept (e.g. Norris *et al.*, 2008). Throughout the pre-connectivity interviews, resources were reflected upon as the broadband technology itself, as well as other social, environmental, and economic resources found within and external to the individual or community. These resources, or capitals, were

referred to by Wilson (2012a, 2012b) as playing a role in developing resilience. As established in Chapter Two, resilience cannot be considered without looking at the multi-scalar relationships, the institutional relationships that influence communities, so resources are thought of in both the local and extra-local sense (Sonn and Fisher, 1998).

The presence of resources as a code was strongly linked with current community infrastructure, and interviewees reflected positively on existing natural resources such as protected natural areas, walking paths and historic buildings that contribute to a sense of place and community satisfaction. In particular, interviewees appreciated the framework of protected areas, as it created an environment that would always be accessible for outdoor pursuits. These represent particularly physical resources. In contrast, interviewees also discussed a perceived lack of community resources such as degraded infrastructure (including but not limited to telecommunications), lack of access to natural resources due to landowner barriers in both England and Scotland, and a lack of economic stability and alternative business opportunities due to current stagnant economic activity in the area, incorporating both the physical and social structures that influence resilience (Brown and Kulig, 1996). This also applies to individual resources, whereby the lowered economic activity or access to a customer base is also influential to individual businesses. Finally, the presence of resources, both active and dormant, was closely linked with living in a rural areas, demonstrating that in some cases resources were either present or in a deficit due to the very nature of the rural situation.

The creation of superfast community broadband was perceived to be the creation of a new resource in itself, something that must be considered when examining the effect the superfast Internet has on resilience. As it is a community-led resource, it has increased people's pride and enthusiasm for their local village or town, a process contributing to resilience through community building (Graugaard, 2012). This was in contrast to perceptions of higher scale, government-enabled development, which was considered to lack equity for people in rural regions: i.e. the hardest to reach would always be left out, decreasing resilience as mentioned by Adger (2000). This has an influence upon the community as a whole, being perceptibly equal, and also on the individual's that otherwise would not have superfast broadband available to them.

The capacity to develop and adapt resources was linked almost equally to multiple facets of superfast broadband. This is relatively unsurprising given that the literature identifies

broadband connectivity as a method of developing resources, both individual and community. In relation to economic resources, an individual's ability to diversify and adapt business structures was understood to be possible through superfast broadband, and thus increase their networks and resilience. On a social level, knowledge acquisition and skill sharing was heightened through broadband. It appears that the community-led broadband movement is linked more strongly with the capacity to develop, as the development of a community-led model is in essence an adaptation and furthering of current telecommunications infrastructure and community organisations, contributing to overall resilience (Skerratt, 2013). The community-led broadband model was also seen as a method for gaining and furthering skills (i.e. learning the intricacies of fibre optic technology as a community). The linkages with the influence of technology and the importance of the Internet should also be understood in the context of types of usage; the services that are accessed can encourage various resource development processes, both individual and community-based as detailed above, contributing to resilience through resource diversity and participation (Sherrieb *et al.*, 2010).

The capacity to engage and interact with resources was heavily linked with aspects of technology. Engagement with new or existing economic and social networks was heightened when broadband connectivity was present, though these network engagements tended to be external to the local area and often related to the individual interviewee. This reflects the engagement discussed by Davidson (2010) and the importance of participation discussed by Sherrieb *et al.* (2010), and Pfefferbaum *et al.* (2005) at this individual scale. The importance of the Internet and the capacity to engage was the strongest relationship found in the pre-connectivity data. This highlights that interaction and engagement in the social realm (at the levels of individuals and local communities) and in areas of economic activity could be increasingly reliant on technological tools. This is striking in that it affirms that the Internet, and in this case the switch to superfast Internet which sat at the core of these interviews, has a strong link to individuals' capacity to engage, which could lead to a renegotiation of village living in relation to the community scale, and by inference generate resilience in times of change.

Links also exist between the capacity to engage and the community-led model for superfast broadband infrastructure. In many cases, the community-led approach was seen to proliferate community-wide engagement including but not limited to broadband provision (i.e. once volunteers were involved in broadband provision, other opportunities arose). Digital champions, or leaders within the broadband roll out, are part of this, and act as a critical

component to the lifecycle of community broadband initiatives. Their skill sets and enthusiasm for the projects have encouraged participation and engagement, which in turn has assisted in creating new social networks and local linkages. Leaders lending their individual resources to the project can increase the skills of others in the community through the desire to ‘cascade’ down knowledge of how to fund, build and run a broadband network, enhancing the overall individuals’ and related community’s resilience. The relevant role of leaders in resilience enhancement is discussed by Roberts and Townsend (2015). They identified the relevance of “community leaders who are able to identify funding source, mobilise and network (for) the community” (p. 5) for the development of rural community adaptive capacity.

Throughout these discussions it was apparent that the easier it is for key individuals to access, engage and develop resources within the community (such as volunteer time and skill set), and engage interviewees, the more likely the community-led broadband project is to gain momentum. This perpetuates the idea that, without added support from extra-local resources such as technical expertise being brought in, such activities will be confined to communities that have had past success with community-run schemes, and that have a large, diverse resource pool (i.e. already exhibit resilience traits), thus excluding other regions from realising the same success. This illustrates a concern discussed in theoretical terms by Walsh-Dilley *et al.* (2013). She argued that local capacity is ‘privileged’ above all else in resilience thinking and this lays all responsibility on local people. I argue that this doctoral research draws our attention to the ways in which local adaptive capacities are constrained by a variety of power dynamics, structures and organisations. This highlights the advantage of identifying and utilising both extra-local and local resources to fully realise resilience dimensions. Engagement must be multi-scale to fully enhance community resilience, incorporating individual with varied skill sets, as well as small social networks, and other community-groups, and if possible, regional entities.

5.4.2 Agency and resilience

Analysis of the pre-connectivity interview transcripts now turns to consider the dimension of agency which was considered in the context of the following questions:

- Is there a strong presence of connected and proactive individuals (digital champions) and groups within the community?
- In what ways do community broadband processes enable (or hinder) proactive capacity building from individuals?

- In what ways are individual users 'empowered' (or disempowered) through community broadband?
- In what ways does the community access and develop networks? Are there any participation networks in place?
- In what ways do community broadband processes enable community-level capacity building?
- In what ways do community broadband processes facilitate imagining, and strategising actions for individuals and the community?
- In what ways does the use of community broadband enable individuals and communities to plan for future change?
- In what ways do community broadband processes increase (or decrease) flexibility of resources for individuals and the community?

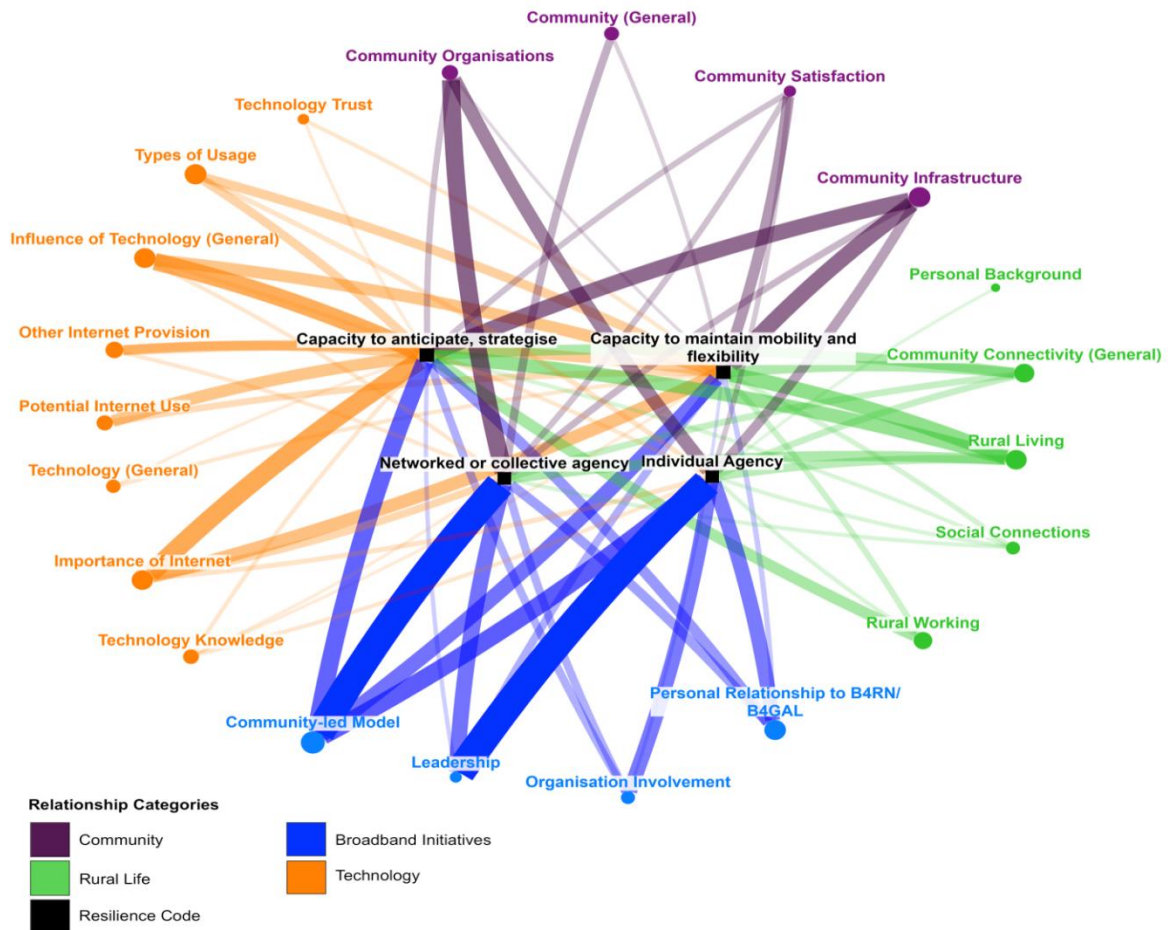


Figure 5 - 4 Dimension 2: Human agency

Figure Note: Each vertex depicted with a black square is representative of a 'resilience' node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an 'open' node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the 'relationship value', or the

number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between agency as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to human agency and community-led broadband processes.

Human agency is situated at the core of this resilience framework (e.g. Davidson, 2010; Magis, 2010; Scott, 2013; Skerratt, 2013), and empowered individuals and leaders were seen to heavily influence the resilience of the community. I now present reflections on an analysis of the presence of individual agency, networked or collective agency, the capacity to anticipate and strategise, and the capacity to maintain mobility and flexibility (particularly in times of change).

In terms of individual agency, individual communities within each case study area appeared to benefit strongly from connected and pro-active individuals, leaders or digital champions. These individuals were integral to the broadband roll out and contributed to the creation of networked organisations within the community. Networked agency, critical to resilience and discussed by Norris *et al.* (2008), was strongly linked to the community-led model, and it was felt that by following this grassroots approach, more individuals and groups took part in decision-making, and knowledge and skills were shared collectively, contributing to a community-scale resilience. However, there was a concern that the community groups and individuals participating and contributing to this networked agency were not wholly inclusive, and represented the 'usual suspects'. It would remain that some individuals would be left out of the process, ultimately detracting from individual level resilience.

The capacity to anticipate and act strategically was linked more strongly to the importance of the Internet and the influence of technology. Primarily this reflected the thinking that instantaneous access to knowledge and information allows individuals to quickly generate flexible and imaginative strategies for future, particularly economic, growth contributing to their individual wellbeing and emphasising that local and global interactions (through online means) can contribute to social resilience (e.g. Keck and Sakdapolrak, 2013). On the periphery of this debate is the idea that superfast broadband as a resource would allow individuals to move to and work in the case study areas, ensuring a changed, lively community atmosphere. The community's demographic profile could become more diverse, possibly enhancing diversity in economic and social sectors, which in turn would enhance the flexibility of the community as a whole, increasing community resilience.

The capacity to maintain mobility and dynamism within community structures was not closely linked with technology, although it certainly played a role in rural life. There was some recognition that an individual's ability to maintain flexibility during times of change was linked to the influence of technology, but it simply did not directly relate to a community-level action. The presence of superfast broadband was also primarily understood to 'empower' users in an individualised manner, which was a contributor to being able to maintain flexible economic and social structures during times of change.

Through the process of leading and participating in the community superfast broadband projects, interviewees in both B4RN and B4GAL reported that they felt more comfortable exercising their individual agency. There was a clear ability by strong leaders to strategise and anticipate and cope with future change. Leaders' past involvement in community activities provided them with wide social networks through which to invite and encourage participation, which Keck and Sakdapolrak (2013) term the ability for social actors to craft institutions and foster individual welfare. However, this can entrench a cycle of 'usual suspects' and divisions within the wider region. Both case study areas experienced problems with the 'usual suspects', with B4RN experiencing it through individuals with community organisation experience, and B4GAL with individuals who had past experience with broadband technology. These groupings potentially 'disempowered' users from participating and the perceived lack of readily available information continued to reinforce this issue, thereby diminishing potential for individual resilience.

5.4.3 Equity and resilience

The next dimension to be discussed is that of equity. Again, it was considered in relation to the central question developed in 4.6.1:

- In what ways do community broadband processes enable equal involvement of vision setting or encourage equal access for individuals and the community?

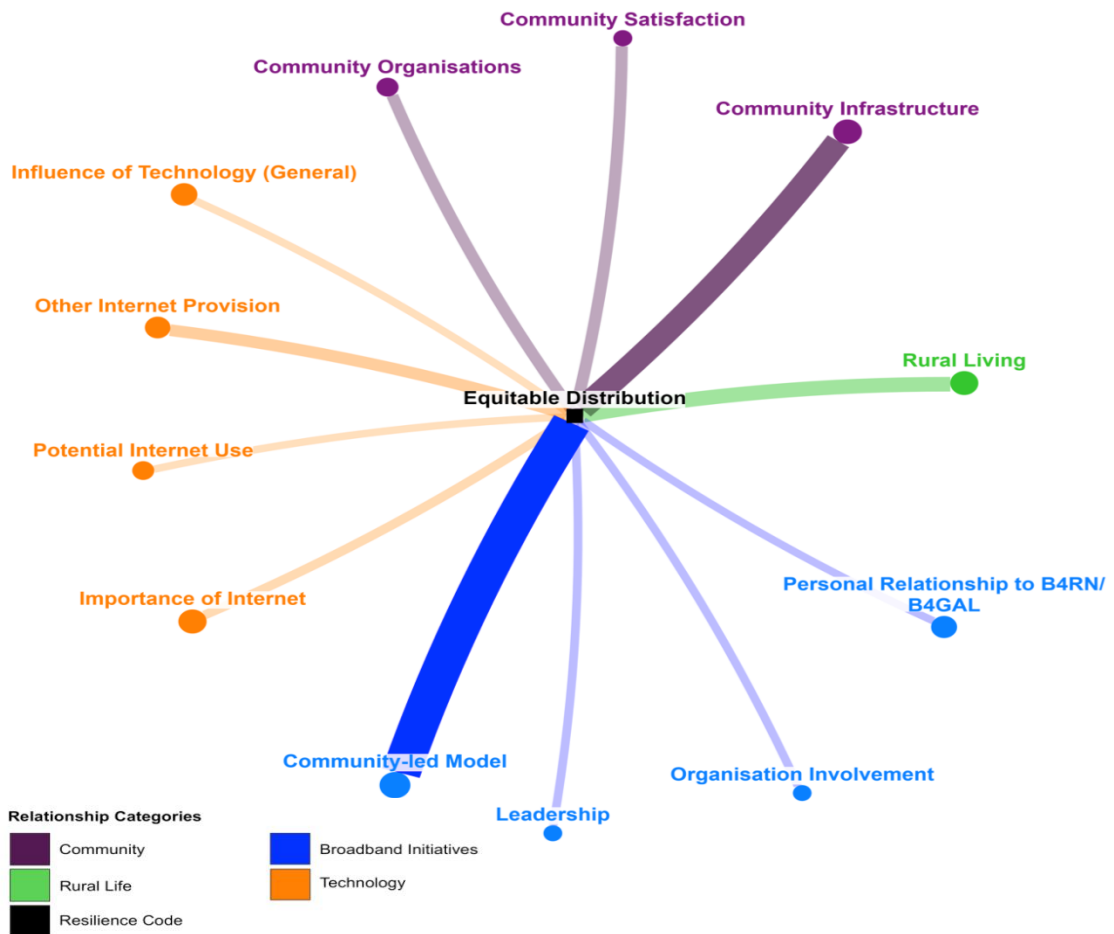


Figure 5 - 5 Dimension 3: Equity

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertices is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between equity as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to equity and community-led broadband processes.

Resilience is often discussed in terms of the equitable distribution of assets (e.g. Sherrieb *et al.* 2010). With increased community fairness comes a well-represented response in times of change. Conversely, inequality diminishes resilience (Walsh-Dilley *et al.* 2013). In the pre-connectivity phase of this research there was a minimal link between encouraging equity and superfast technology use. Yet it was strongly linked to the community-led installation method, demonstrating that the creation of a non-profit model for technology installation is thought to

best serve an equal access aim. Different levels of responsibility for the broadband project were discussed across the interviews, with several findings relevant to the enablement of equality across the communities. There were several facets of ‘equality’ that are explored here. Firstly, there is equality of access: the development of superfast broadband will be affordable (as both B4RN and B4GAL are non-profit-making entities and seeking to provide services at as low a cost as possible). This in turn was seen as an enabler of economic equality by potentially providing new employment opportunities for community members, affecting individual resilience and increasing our understanding of a social justice approach to resilience (Walsh-Dilley *et al.*, 2013). This also contributed to social spheres, with the community-led model including individuals who, due to their geographical location, could not engage with commercial broadband installation, potentially leading to an increased sense of community and community resilience. Community-led broadband has enabled a stronger consideration for equality across digital access, and the development of ‘responsibilities’ in community members who had perceived power and therefore felt an obligation to participate, enables those who cannot participate to still benefit from the digital outcome.

The community-led model also was set up to offer training, or to provide free connections to those in need in order to maximise take up of the new digital opportunities. For example, B4RN was setting up a charitable arm ‘*Friends for B4RN*’, and B4GAL was going to be setting up requirements for all contracts to fulfill community aims (i.e. hire local workers and apprentices). It was also seen as generating equality between rural communities in general and other parts of the country where broadband connectivity was better such as large urban centres – an ‘evening the playing field’ for economic and social opportunity.

Finally, B4GAL was in the unique position of being set within Scotland’s largest on-shore wind farm, the Clyde Valley Wind Farm. Their intent to apply for access to its community benefit fund for part funding of the community broadband scheme was discussed as the best method to gain some benefit from the fact that it is within their region, and too many people, a blight on the landscape. This would equal out its impact and provide some compensation to the community as a whole, reflective of what Norris *et al.* (2008), terms reducing their risk equity. This demonstrated the desire to harness existing community infrastructure to contribute to the equal access aim and potentially contribute to community resilience.

5.4.4 Sense of place and resilience

The final dimension to be considered and discussed is that of sense of place, related to the central question developed in Section 4.6.1:

- In what ways do community broadband processes strengthen (or weaken) local identity (both individually and communally)?

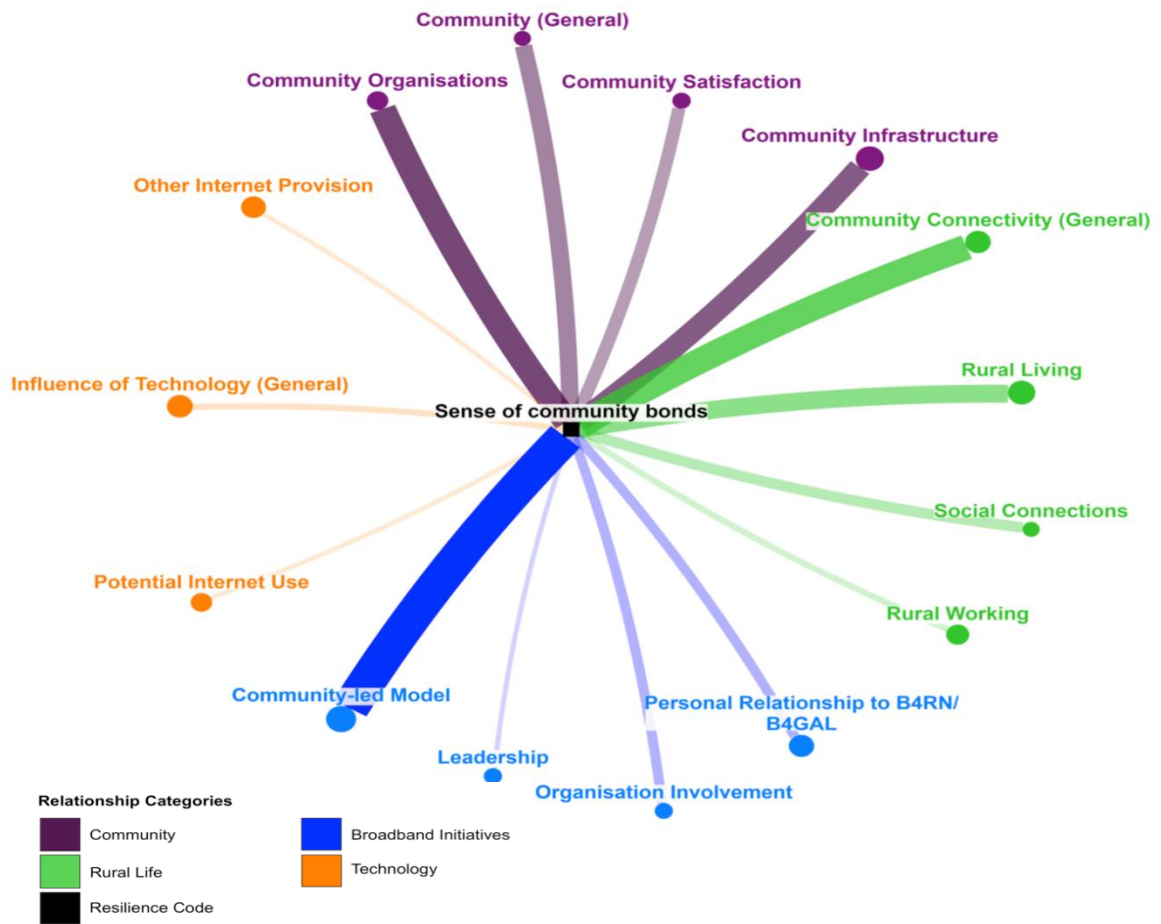


Figure 5 - 6 Dimension 4: Sense of place

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertices is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between sense of place as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to the sense of place and community-led broadband processes.

In resilience literature, community memory and community cohesion are seen to increase resilience in times of change (McManus *et al.*, 2012; Wilson, 2013). Unsurprisingly perhaps, this code overlapped most with the community-led model, indicating multiple facets to the resilience narrative. Firstly, the level of involvement with the community-led model is linked

to a current and previous sense of community and sense of place, perhaps reflecting what Wilson (2013) terms the accumulated wisdom, knowledge, skills and experiences within the community. Secondly, there is the potential for the inclusion of a community-led technological infrastructure to alter that sense of community, perhaps beyond the village borders to where it is currently generally limited, identifying the importance of place in resilience, but also the potential for that understanding of place to alter over time (Lyon, 2014). Thirdly, throughout the infrastructure roll out process, there was a need to identify and seek out skill sets, harness those (often in a voluntary capacity) and pursue funding. In this case, the presence of the entities of the initiatives B4RN and B4GAL enabled a connection within the community, one that had not existed previously. It was through these processes that some interviewees gained, and proliferated, a new community network. Their understanding of place and community was enhanced through their participation in the digital agenda, and they were able to imagine and develop future community development, increasing their individual resilience (as they now had new resource networks), but also the overall community resilience (as they now interacted with these networks, contributing to overall agency and resources). Despite this link with the broadband roll out methods and community belonging, in closer reading of the coded extracts it was clear that the actual use of superfast in the home or business was not inclined to influence that sense of community, and that remained in the realm of individual resilience.

As established in the theoretical development of resilience, it is non-neutral, and can be political (e.g. Cote and Nightingale, 2012). This became apparent when engaging with the concept of community memory and sense of belonging. Community-led broadband initiatives have generally aided in the proliferation of existing community belongingness, and also provide opportunities for new involvement, similar to McManus *et al.*'s (2012) finding that the sense of community belonging was linked to the ability for a community to transform. The community-led broadband initiatives have developed new understandings of spatial communities, developing regional, broadband network-based communities. Conversely, this understanding and development were not always evident, and some villages struggled to encourage involvement in the digital project despite having a sense of community in other areas of life.

5.5 Conclusion

This chapter has examined the relationship between those who live in rural areas and superfast Internet, and has sought to determine how community-led superfast broadband is perceived within rural communities and whether it plays a role in enhancing rural individual and

community resilience. By analysing the pre-connectivity interview data from both case study communities it examines the implications of a community-led approach followed by the expectations from superfast technology use. It then presents the coding relationships between the grounded codes and the deductive resilience codes to indicate potential relationships to both individual and community resilience. Ultimately, the findings paint a complex, and at times contradictory, picture of the influence of superfast installation and services for the rural user.

Digital champions, or leaders within the broadband movement, present one critical component to the momentum behind a community-led broadband initiative development and adoption. They are succeeding in getting a message of digital inclusion into communities, but are potentially contributing to a problematic dimension of individual social exclusion through entrenching existing, potentially unequal, community social dynamics, which ultimately would detract from individuals' capacity to engage in community agenda-setting, thus diminishing resilience. The processes of developing community-led broadband are rooted in a bottom-up approach, one where residents can take control of their infrastructure development and adapt their current telecommunications resources. In practice, this discourse has the potential to further exclude rural communities from digital roll out as the assumption of 'rural self-sufficiency' is perpetuated. The dialogue surrounding community-led broadband as antagonistic to globalised telecommunications companies further perpetuates this challenge by diminishing opportunity for extra-local linkages with the telecommunications industry which potentially has the ability to weaken resilience. Current community-led initiatives wherein high resource levels and varied skill sets exist (i.e. already have resilience traits) will gain momentum more quickly than others, demonstrating that community broadband initiatives is perhaps another example of uneven development, and these aspects of exclusion can serve to further degrade the capacity to adapt resources across rural communities.

Community-led broadband has further strengthened concepts of local identity, and also developed new spatial understandings of community identity, which can enhance a sense of community and shared culture. This sense of 'community', be it at different scales, can contribute to resilience of both individual and community through social memory building and the development of equitable interests. The outcome of locally run services increases personal and collective capacities of communities and demonstrates and increases the ability to be proactive and 'proud' of their locale.

The interest in superfast broadband is dependent on both personal perspectives and knowledge of Internet-enabled services, their culture of use, but also the implications it may have for personal wellbeing and empowerment, contributing to individual resilience, and potentially ‘scaling up’ to community resilience. The concept of ‘rurality’ has a contradictory relationship with Internet technology and service provision, whereby services are often expected to be lacking, and it is a ‘trade-off’ to live rurally, and conversely technology is a required element for modern society and rural areas should not be left out. There is scope for reflecting on superfast broadband in relation to community enhancement through renegotiating patterns of living and working, possibly supporting the development of new resources and capacities such as economic opportunities, and ultimately enhancing resilience within those communities. Chapter Six will now detail Phase II of the study, the ‘post’ connectivity analysis and discussion to reflect further on these themes of community-led broadband and social resilience.

6 COMMUNITY-LED SUPERFAST BROADBAND: A COMPARATIVE ANALYSIS OF INDIVIDUAL AND COMMUNITY IMPLICATIONS

6.1 Introduction

Chapter Five outlined processes of community-led broadband development and the perceptions of future superfast broadband use held by participants in both case studies, representing the Phase I pre-installation findings. This chapter sets out the Phase II post-installation findings, identifying social resilience implications with respect to the installation and actual use of community-led superfast broadband services. Between Phase I and Phase II data collection the B4RN case study was successful in installing their superfast broadband network. However, the B4GAL case study was unable to overcome a multitude of challenges and remains, to date, in the planning stage for a superfast broadband network. As of spring 2015, B4GAL has successfully gained approval from the Scottish Government to build a broadband network within a smaller area than their original intended plan but installation had not yet begun. B4GAL's comparative lack of progress has changed the parameters of this doctoral study because a direct comparison of pre- and post-installation was not possible in B4GAL. However, this research is able to present impacts from the community-led broadband process across B4RN and B4GAL, with B4RN achieving their intended network and rolling out superfast to interviewees, and B4RN continuing to work towards building a community-led superfast network. The analysis presented here interrogates the challenges faced in both B4RN and B4GAL to examine how and why those differences exist, analysing any (a)symmetry in order to develop indicators to provide improved direction to the community-led broadband process in relation to social resilience.

The first half of this chapter discusses B4RN, focusing on the implications of the community-led process (Section 6.2.1), and detailing the impacts of superfast broadband access for those interviewees that had connections established between Phase I and Phase II data collection (Section 6.2.2). It concludes by analysing the implications for individual and community resilience, using the social resilience analytical method developed in Chapter Four and used in Chapter Five (Section 6.2.3). The second half of the chapter focuses on B4GAL, evaluating the challenges it has faced as an initiative (Section 6.3.1), the continued future role it hopes to play in superfast broadband provision (Section 6.3.2), and finally analyses the implications of the community-led broadband process for individual and community resilience (Section 6.3.3). The findings from these two case studies present a complex picture interwoven with local and extra-local relationships, highlighting the increasing need for an integrated approach for

broadband development - from national broadband policy to the local community level - to both enhance superfast broadband provision and social resilience.

6.2 Broadband for the Rural North post-installation findings

Following Phase I data collection in summer 2012, the findings of which are discussed in Chapter Five, the B4RN initiative connected its first homes to their fibre-to-the-home (FTTH) network in November 2012. Since then, installation has progressed steadily, with occasional slow periods due to lack of funding and bad weather. At the commencement of Phase II data collection in July 2014, the B4RN initiative had connected approximately 550 premises³¹. Phase II interviews took place between July and October 2014³², during which 16 of the Phase I 25 interviewees participated (2 governance, 12 'user' individuals, and 2 non-adopters of the B4RN service). Of the 12 'user' interviewees, five remained unconnected but were registered to be connected in the near future. A table outlining interviewees and the associated interview and connection times can be found in Appendix IX. The discussions to follow reflect all 16 interviews. Throughout this section, vignettes of contemporary Internet cultures, derived from the five types presented by Dutton *et al.* (2013) and first discussed in Section 5.2.3 are interspersed to tell a story about the progression from limited Internet access to a 1 Gbit/s service in relation to that culture³³. These vignettes inform the discussion of the findings and serve to illustrate the influence of superfast broadband installation and use in rural areas of the UK.

6.2.1 Evaluating the influence of the B4RN community-led process

The first research question of this doctoral project seeks to understand whether the *process* of community-led broadband installation plays a role in social resilience. This section will further our understanding of this issue by outlining the community-led installation process for B4RN. The various multi-scalar relationships the B4RN initiative has within and outside of its physical community (Section 6.2.1.1, 6.2.1.2. and 6.2.1.3) are identified and the implications of B4RN as a volunteer process (Section 6.2.1.4) are then discussed.

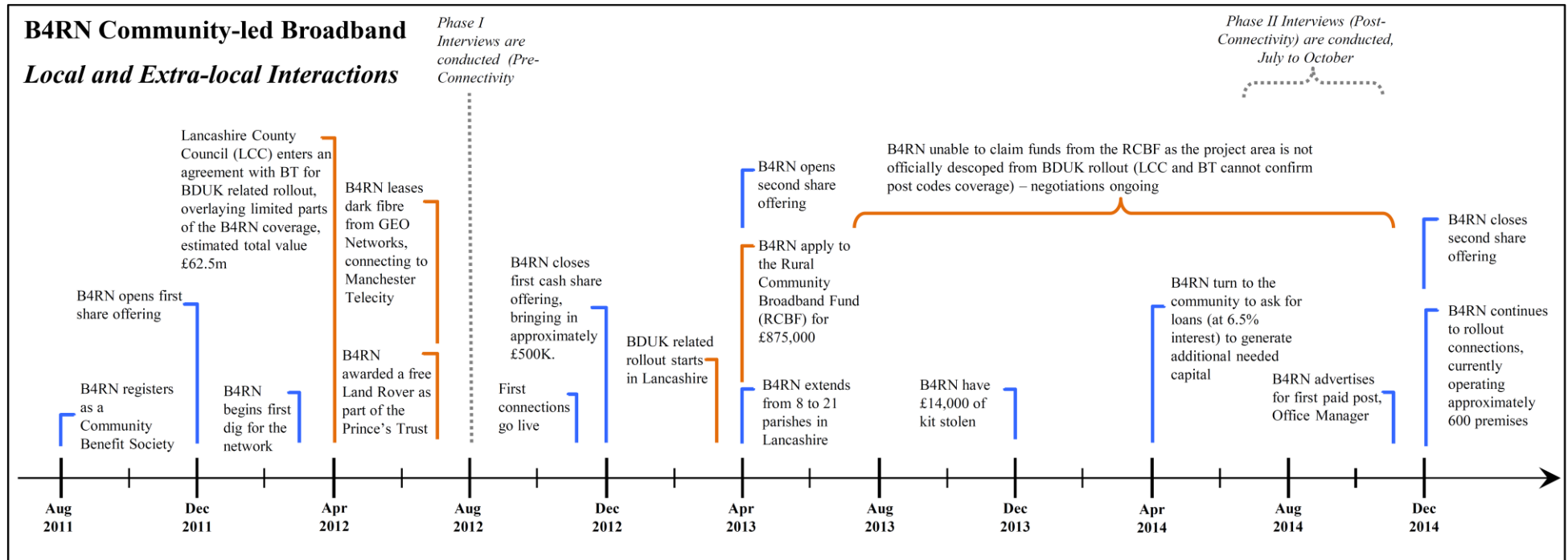
³¹ This figure changed daily as connections were completed, meaning that an exact number is not possible for the three months over which interviews took place.

³² The time frame for Phase II data collection was not set. The span of four months with the B4RN case study allowed for as high as possible retention rate of Phase I interviewees and was extended based on interviewee response and availability.

³³ The five 'types' are e-mersives, techno-pragmatists, cyber-savvy, cyber moderates and adigitals. These vignettes are made up of a mixture of results from individuals that were associated with the 'culture' being discussed. The use of more than one individual in a vignette seeks to ensure anonymity of these 'cultures' due to the small, illustrative sample.

6.2.1.1 The presence of multi-scalar relationships in B4RN

B4RN, as a community broadband network provider, interacts with its place-based community, external communities of interest, industry, and local, regional and national government, all of which has had a profound influence on technology adoption and the influence B4RN has on their community's social resilience. Theoretically, a community's internal and external relationships (including with local, regional and national government) are contextualised as highly relevant to the creation and enhancement of social resilience (Keck and Sakpoldrak, 2013). It is therefore taken that positive relationships with internal and external individuals, groups, or other parties, may enhance social resilience. In B4RN, there were clear internal and external relationships at many levels. These varied multi-scalar interactions between B4RN and other parties are represented in Figure 6 - 1.



Legend

- Local Relationships
- Extra-Local Relationships
- Researcher Involvement

Figure 6 - 1 B4RN community-led broadband local and extra-local interactions

The intersecting, multi-scalar relationships are highly influential to the social resilience of individuals and the community within B4RN. The following two sections will address the relationships that B4RN has at the national level (6.2.1.2) and the local level (6.2.1.3)

6.2.1.2 B4RN's national level relationships

Firstly, the antagonistic dialogue between B4RN and the telecommunications industry, a finding from Phase I, continued and was discussed in Phase II interviews. The national telecommunications industry is placed as separate to B4RN's operation, diminishing potential partnerships or knowledge exchange. One interviewee described the relationship as:

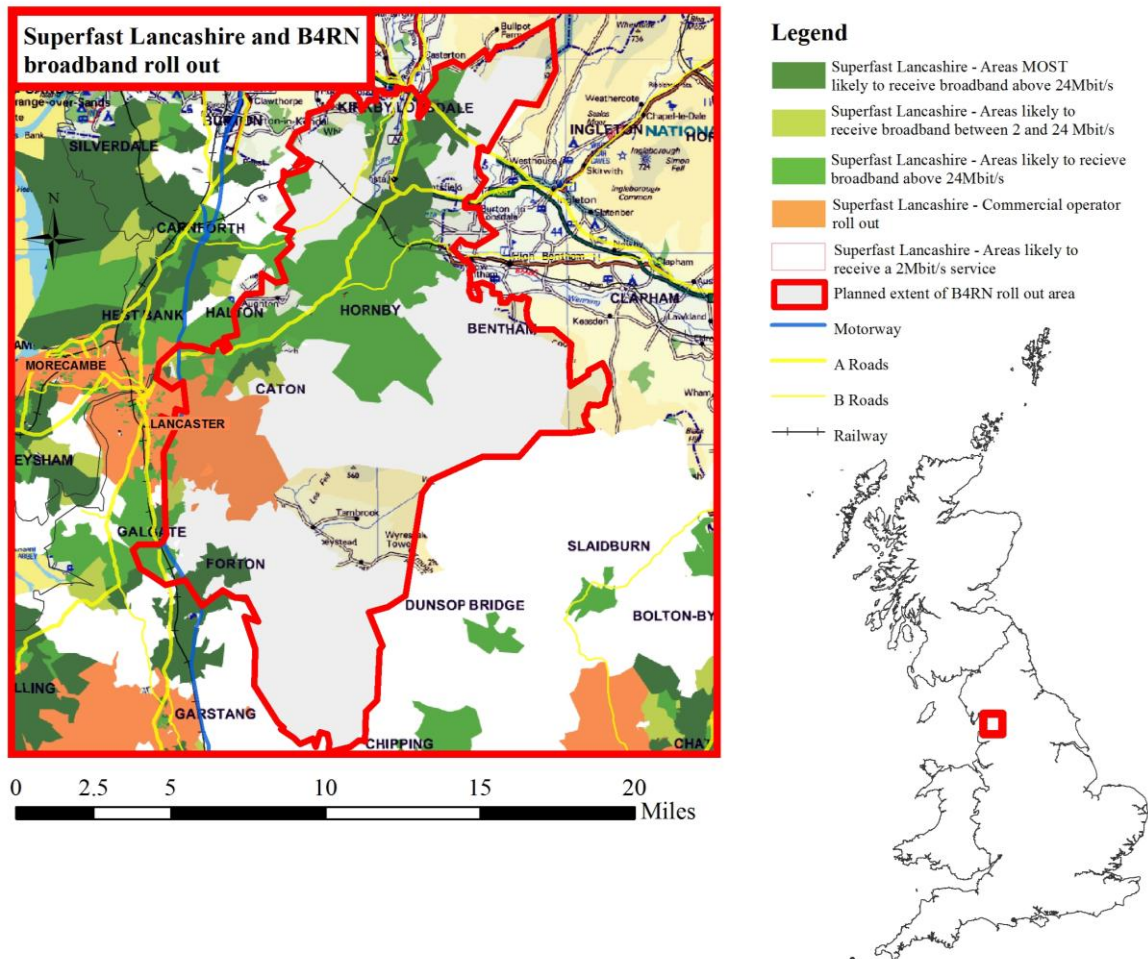
"It's a bit like David and Goliath really" (B4RN 20)

Secondly, it is relevant to consider the relationships between B4RN and both regional and national government. This was evident primarily through B4RN's initial work attempting to partner with Lancashire County Council, and their later application to the Rural Community Broadband Fund, (RCBF), a programme run alongside the (national) Broadband Delivery UK (BDUK) programme overseen by the Westminster Department of Culture, Media and Sport (DCMS) (Jackson, 2014). The RCBF, described in Chapter Three, is a funding mechanism for rural communities to support their local superfast broadband infrastructure projects.

The community-led broadband process, like social resilience theory itself, has been identified by others and in this research as inherently political (seen in Section 5.2.4). This is particularly evident through the interaction between B4RN and national government via the RCBF. The guidelines of BDUK and RCBF do not allow for initiatives that will overlap each other to be funded, i.e. if BDUK subsidised superfast broadband roll out is already approved for an area, no part of that area may receive RCBF funds. This appears logical, yet there is little expectation on the part of the local residents that BDUK subsidised roll out will reach all premises within the approved area. Small initiatives like B4RN are not able to accurately determine actual BDUK coverage because BDUK programme areas are defined at postcode sector level and that information is deemed to be commercially sensitive. Community organisations such as B4RN cannot access BDUK money if they cannot prove that their coverage does not overlap. Due to the structure of BDUK and the commercial sensitivity allocated to that coverage information, this exact proof is almost impossible to obtain. B4RN has struggled to receive enough grant money to progress with roll out, as receiving external funds had always been built into their business plan and being unable to explicitly prove other broadband coverage has stalled those plans. To demonstrate this overlap, Map 6 - 1 depicts the BDUK supported roll out, implemented by BT, in relation to the B4RN community-

funded superfast broadband roll out as initially planned (Forde, 2013). This demonstrates the areas of B4RN (primarily those along main roadways and classed as more ‘accessible’ rural spaces) which are simultaneously receiving publicly subsidised BT superfast broadband roll out.

Map 6 - 1 Location of BDUK superfast broadband roll out compared to B4RN community-led roll out



Source: Base map with BDUK related roll out data by Superfast Lancashire (2014), addition of B4RN information provided by Forde (2013) and illustrated here by Author. Areas of exposed basemap indicate no data provided by Superfast Lancashire (2014).

As a whole, this process demonstrates a lack of integrated approaches with respect to rural policy interventions and BDUK roll out. The formal structure of BDUK inhibited B4RN (and B4GAL as will be discussed in Section 6.3.1) from engaging with the RCBF. This bred resentment: as an initiative they had been encouraged to apply to RCBF by external individuals because of their values and suitability for the scheme.

“We were running very very low on income and we were supposed to get funding from BDUK, which we were pushed into getting funding, they said you must apply you are a perfect candidate for funding, you must apply, so we did” (B4RN 20).

Despite this apparent interest by external parties in B4RN, the existing agreement between BT and Lancashire County Council for BDUK subsidised roll out was a barrier and B4RN have been unable to access grant funding without confirmation that the existing project will not be providing coverage to those areas. B4RN, in effect, was not ‘descope’, or excluded, from the County level plans, and there has been no confirmation about postcode level coverage from industry. This aspect of the regulatory process, raised initially in Section 3.4.3, has become a key critique of the BDUK programme.

“Eventually BDUK said, yes you can have the funding, you can have, I think it was over £1m from RCBF funding, but we have to agree with Lancashire County Council to descope your postcodes, because if they are not descope you can’t have your funding. And that battle has raged for 18 months” (B4RN 20).

The B4RN initiative therefore remains in ‘limbo’ with respect to funds from national government, a frustrating state that they do not believe will ever abate in a timely fashion to be useful.

“We can’t afford two of everything. When you want the fusion splicer it is at the other end of the network...we are desperately short of kit but we can manage and get by, but how much easier it would be if we had got that funding, and how much better and quicker...we would have done this network – it would be all finished by now!” (B4RN 20).

Less formal engagement with other parties, including charities and some actors in the telecommunications industry also has taken place, including support from technical firms in return for publicity and small-scale grants or in-kind donations. This included, for example, the exclusive use of a Land Rover from the Prince’s Trust for their project, and some initial monies for promotion from the Forest of Bowland AONB. However, these remain small contributions that are not specifically targeted to the physical development of the B4RN broadband network.

While B4RN continues to install their service, BDUK subsidised roll out is also being installed across some parts of the B4RN coverage area, leading to overlapping superfast networks. Increased integration between such commercial and non-profit organisations could have altered the broadband opportunities for those living and working in the B4RN area. However, currently a perceived negative relationship between B4RN and government bodies limits the resilience of the community initiative. The lack of positive experiences for B4RN with central and local government has served to undermine resilience being developed by creating insular patterns of resilience, with B4RN neither connecting nor interacting in a beneficial manner

with 'higher' scales, but remaining 'local' to respond to 'local' issues. The interaction between B4RN and the superfast broadband policy rhetoric of BDUK has increased the perception of isolation and, while B4RN is 'doing it for themselves', positive national level external partnerships could have been a useful addition to their process. These frustrations must also be considered in the wider context of national governments encouraging communities to 'do it for themselves' across a wide range of rural policies. Shucksmith and Talbot (2015) highlight the presence of this localism ideology for the policy and practice of rural development, emphasising, for example, supranational policies including OECD's 'New Rural Paradigm' and the EU's community-led local development (CLLD) initiative. In the UK, under the Localism Act 2011, many powers were transferred to local or more regional levels, influencing how services and information was relayed to rural communities. However, despite the rhetoric, in the case of digital policy and community broadband the presence of regulatory and institutional barriers at the national level frustrates local communities, detracting from their ability to 'do it for themselves', even if they have the motivation to work collectively. As stated by Shucksmith and Talbot (2015) "...even fully resourced localism is not sufficient to address all rural problems in the UK: some can only be addressed by larger-scale structural adjustments at national or supranational scales" (p. 255). These tensions, exemplified in B4RN between local and extra-local involvement in broadband development, continue to perpetuate the 'us versus them' antagonistic dialogue first presented in the pre-installation phase of the research.

In terms of practical solutions to the B4RN-central government funding impasse, there were several key findings with respect to potential future interactions between general community-led broadband and national or regional government that emerged from Phase II interviews. It was discussed that government in general could act as a network node to enable collaboration and knowledge sharing between community groups (this was also highlighted in B4GAL, as will be discussed further in Section 6.3.1). This could perhaps be developed at the national level and administered regionally, similar to the current BDUK structure, but integrating community alternatives within the main framework of broadband installation. Secondly, government could create a physical bank of specialised tools for lease at affordable rates for community broadband network building. Other public bodies run such 'banks' for research purposes (i.e. Natural Environment Research Council), and therefore there is not only precedent, but also procedures that could be emulated. Finally, central and local government could enable easier mechanisms for volunteer initiatives to interact with formal issues such as permits or road crossing applications, which are often difficult to navigate without the correct

experience and knowledge. This could again be addressed by national level policy, but administered at the devolved nation level to address differences in legal procedures.

6.2.1.3 B4RN's local level relationships

While these local-national interactions have generally faltered in the case of B4RN, settlement to settlement interaction within the B4RN area has developed and increased as the installation process has played out. At the local level, there were interactions between B4RN as an initiative and local village or settlement area individuals, styled as 'digital champions'. These local residents promoted and encouraged the B4RN broadband network installation directly to their neighbours throughout the B4RN project development and installation process. More generally, the share-funding process employed by B4RN to raise funds involved many local individuals investing because they wished to receive the broadband service, as well as extra-local individuals investing because they were interested in supporting B4RN in principle. This process engendered feelings of 'belonging' as individuals became part of the community level initiative through buying shares.

Following the adverse interaction with RCBF funding, and the uncertainty that was bred through those national level negotiations, the B4RN initiative again turned to the local community. This time they sought specific loan funding to aid with the project, beyond the 'share' mechanism, and determined that if they could secure loans from local residents, they could continue the project without RCBF or bank funding. This emphasises again the presence of 'good citizen' communities accessing endogenous resources within B4RN (Woods *et al.* 2007).

"We said, well we got £300,000 from the shareholders to launch the company, the charity bank wants 6.5% interest off of us for a loan, why don't we ask our people if they will loan us the money at 6.5% instead? So we did, and they lent it to us. And they lent it to us in either £1,000 or £3,000 or £5,000 or £10,000 chunks, and they all get 6.5% interest. So that got us through the sticky bit" (B4RN 20).

This process of funding via community members highlights an interesting response from that community: when higher scale interaction proved ineffective for the B4RN project, the initiative was able to make up such shortfall from within the local community. This reflects what Beer (2014) calls the 'unseen power of leaders and communities', which can contribute to their future even when their formal powers are limited. However, such action was contingent on practical measures including community members having access to funds, and being willing to invest in the B4RN organisation, measures that may not be so readily available in other rural regions.

Local interaction was also evident through the physical broadband network building. B4RN pursued a roll out method where each village or settlement is responsible for getting the B4RN service connected from the core route (the core route being put in by the B4RN volunteer team) to that locality. Therefore, within the local settlements, individuals must work together to effectively install the service to the homes and businesses.

“Now the B4RN theory is that we bring the ducting to the garden effectively to the house, and then the household is responsible for bringing it into the house to where the router is going to go” (B4RN 12).

This has increased the interconnectedness amongst the residents of each settlement, and created a strong level of understanding about their lives and business requirements.

“It’s all about collaboration...I talk about fitting in with people’s holidays – you have to fit in their work commitments as well. Some people are just not around during the day, so we talk to them, make arrangements and go around one evening. Again the volunteers are quite happy to do that, as long as it is mutually beneficial. And provided we get plied with tea! We did have one lady who said I know you weren’t planning on doing mine tonight, but if I bribe you with tea and flapjacks will you do it tonight? It worked!” (B4RN 12).

This physical roll out process also has led to inter-village or settlement communication; as the core route is laid out, villagers begin to discuss how to connect to it, and communicate with other already connected settlements to learn methods of best practice.

“We are obviously passing on what we found...” (B4RN 10).

However, it also meant that each village or settlement has taken on the responsibilities differently and in an *ad hoc* fashion.

“I mean we have obviously learned a lot, I mean I think that parishes joining more recently are better briefed and understand what is involved” (B4RN 15).

Newer settlements seeking to join the B4RN network have more knowledge to exploit, which changes the dynamic of rolling out the services in those areas. According to media reports in May 2015, B4RN has been able to extend its planned coverage (originally depicted in Map 4 – 1) to include parts of North Yorkshire and South Cumbria, demonstrating both the relevance of community engagement in determining whether superfast broadband installation will occur in that community, and the flexible nature of the B4RN roll out method (Jackson, 2015). This malleability and mobility of the installation methods has hindered some individuals’ interest in adopting the service, which aligns with similar findings from Phase I.

“It’s why you can’t roll out, which is really my fundamental...I like to see continuing structures and hierarchy, all very boring stuff...It is a volunteer thing, if you get the right chemistry and the right enthused people then it will happen, if not, it won’t” (B4RN 3).

These various types of local community relationships present within the B4RN initiative, with volunteers, residents, broadband users, and, of course, individuals providing funds are a backbone to the B4RN project and help overcome any shortfalls created due to the poor relations with national government and industry. These local interactions have also generated a very fluid and dynamic building and installation process, a process that is different for each village or settlement within B4RN, introducing a level of complexity that would be difficult to replicate for other rural areas.

Another type of interaction experienced within the B4RN initiative, although not depicted on the multi-scalar relationship map in Figure 6 - 1, was the creation of a community-led broadband initiatives network. This is a node of informal discussions and physical visits between interested individuals and other community-led broadband groups with B4RN to learn and discuss opportunities for community-led broadband in the UK.

“It’s certainly a lesson to others already, we are running show tell days, and they are extremely popular...we had some friends from Wales at the last one who came because they are trying to set up their own, not to join to B4RN but to learn from its experience, and that’s happening all over!” (B4RN 24).

This is evident in B4GAL as well, discussed in detail in Section 6.3.1.3, and demonstrates that community groups engaging at this community broadband organisational level can benefit from increased morale and enthusiasm, and occasionally skill development and enhancement.

6.2.1.4 B4RN as a volunteer initiative

The importance of volunteerism in community organisations such as B4RN was first introduced in Chapter Five. With long-term volunteerism in the B4RN area based on traditional cultural identities, place and place identity continue to be relevant throughout the installation process, as does the difficulties for volunteer retention due to episodic engagement (Rochester, 2006). Throughout the broadband installation process, there continued to be impacts for B4RN as a community-based *volunteer* initiative. Firstly, the community-led process continued to develop new social relationships within villages and settlements of B4RN, a potential outcome that was initially presented in more theoretical terms in Section 5.2.2. Secondly, the large retired (but active) population present in B4RN, a feature not present in every rural locality, played a significant role in the development and installation of broadband due to a large proportion of the local people having the time to be long-term volunteers. Thirdly, the fluidity and malleability of the installation process often meant that resident’s interest in the broadband product increased after something had been achieved. Fourthly, this

malleability and reliance on key individuals continued to hinder participation because there were no obvious points of contact for interested individuals. Finally, due to the concept that each village, or cluster of homes, is responsible for physically connecting to the core route to obtain B4RN services, the installation environment was marked by competing village-level interests because all the settlements had differing strategies and volunteer bases to engage with the process. This physical roll out method also neglected to properly account for isolated dwellings, which had to engage with the B4RN team and any neighbouring villages independently.

Implications for the B4RN community-led process generating new social relationships are considered first. Volunteers speak to each other, to their neighbours, and to other members of their specific community as they install the physical network, leading to increased knowledge and interest in each other's daily activities.

"I think it's a fantastic exercise in and around it's been an opportunity for people from different villages to get together, putting together a business model, that originally was quite complicated, but it's been very well managed" (B4RN 6).

"They all end up talking to the neighbours and then they talked to another group further down the street, and it ends up literally everybody in the village ends up talking to everybody else" (B4RN 20).

The relevance of specific, long-term, volunteers at the settlement level was also highlighted, focussing on retired individuals and the self-employed.

E-mersive – the local digital champion

Stanley, a semi-retired resident of one of the villages, has been involved in B4RN since its inception and is widely considered a driving force behind the movement where he lives. When we first met in 2012, he was very keen to promote the importance of superfast broadband for individuals and communities.

His time in 2014 is still spent fully on the B4RN project primarily working to build the physical core network. This has even been to the detriment of his connectivity:

"Oh it's great, but I haven't the time to use it! So, yeah we've nearly 500 customers on now, and the [phone rings] phone's never stopped"

When he thinks about B4RN, he believes it has changed primarily the concept of 'community':

"It's certainly altered it from my perspective, how the community connects with each other. It has had a, as far as I can see, a profound effect on the community"

Although Stanley continues to contribute his time to the project, he is concerned over how much management the project needs from volunteers like him:

"I can see there are one or two main people that are taking the burden, and running themselves ragged. No one is complaining! But I do feel that is a potential problem"

It was inferred that those types of individuals, either retired or self-employed, could renegotiate their time relatively quickly leading to successful installation and connection with the B4RN core route. The presence of these types of volunteers contributed heavily to the success of the volunteer based method for B4RN.

“We are really lucky. We’ve got within this village, a group of volunteers who are newly retired, or semi-retired, reasonably fit – for their age – and therefore able to be available during the week. That is a fantastic advantage; a lot of other groups don’t have that. They then struggle because of people’s limited availabilities. And that has been a fantastic advantage; we hadn’t realised how important that was going to be” (B4RN 12).

While this was a beneficial trait to have within a settlement, it certainly was not the only consideration when reflecting on the volunteer methods overall. Interviewees also reflected that the emergent difficulties for their volunteer base was mismatched skill sets (technical, motivating persons and so on), and consequently trying to get the correct combination of such skills within each settlement to ensure successful installation strategies.

“It’s difficult. We’re all volunteers, we go when we can; getting the right number of people at the right time has always been a challenge...” (B4RN 1)

The presence of certain types of individuals, from retired to technically skilled, can differ across the B4RN region, so while this volunteer process is currently working as the B4RN roll out continues, it is not simply a case of replicating exactly the same methods to successfully install a broadband network in every B4RN community. Methods used by one settlement in B4RN may not be suitable in another village: local considerations must be acknowledged and accommodated. This has emphasised the role of ‘local champions’, introduced above, to identify and select appropriate processes for their individual locality.

“But these other communities aren’t as lucky. So they have to then go away and think about how we have done it and how they could do it differently in the same way that we have to do each village differently. Every village we have done is different from the last one, and that’s why we have these local champions” (B4RN 20).

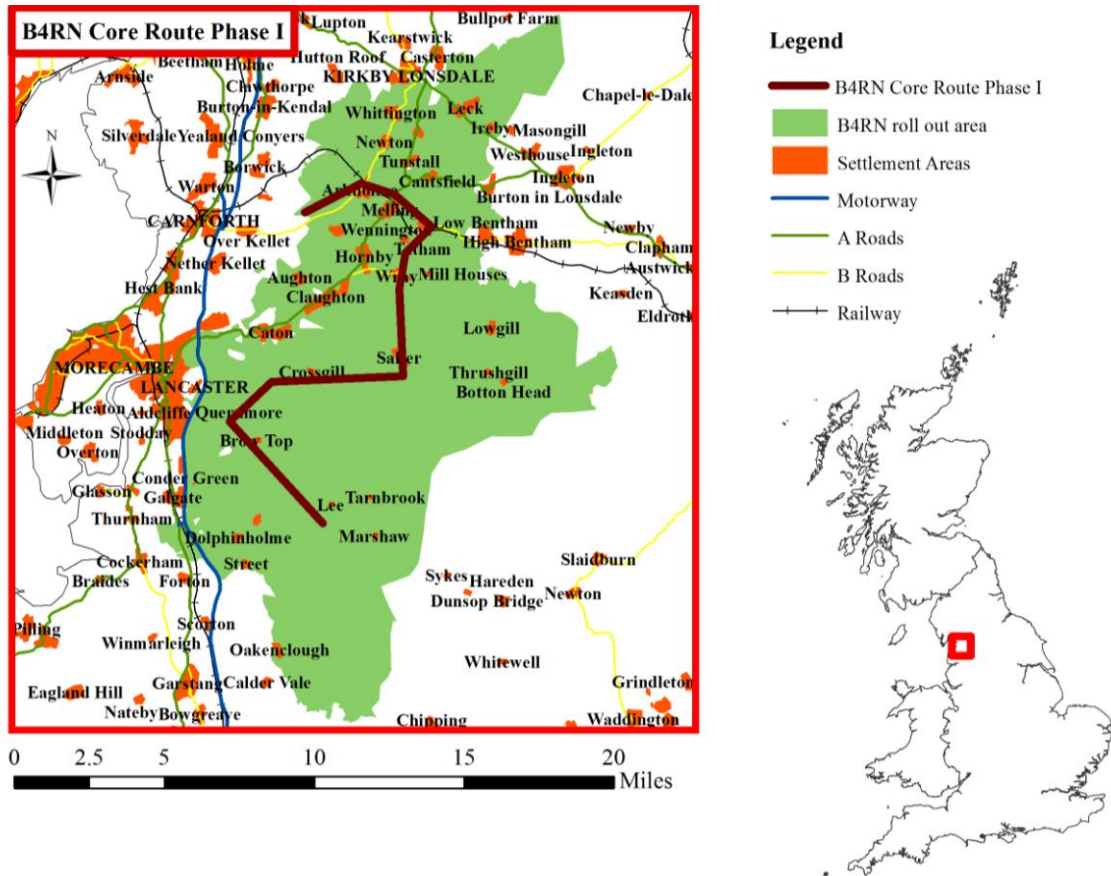
Each settlement’s local champion is intended to understand and plan how best to install the B4RN services within that specific area, or village. This again creates the need for motivated individuals who have time to commit to the project to volunteer.

“Thanks to particular people, individuals who have really borne the brunt of the work!” (B4RN 3).

The speed at which villages and settlements within B4RN were connected to the superfast network was also reliant on the involvement of local volunteers, rather than being based on an overall B4RN project plan. The B4RN method of installation, described in Section 6.2.1.3,

meant that each village or settlement was responsible for its own connection to the B4RN core route. The initial core route, developed for Phase I of broadband installation, is represented in Map 6 – 2.

Map 6 - 2 B4RN core route for phase I superfast broadband roll out at March 2012



Source: Core route provided by B4RN (2012), other B4RN coverage information provided by Forde (2013) and mapped by Author.

This responsibility essentially created an ‘if you build it, we will come’ mentality, where it was up to individual residents to push for digging, and connection to the core route. If there was no money or funds to do so, it would then be up to that village or settlement to raise funds if they wished, representing a separate fundraising activity from the main B4RN fundraising efforts.

“We said [to the local village], well you don’t have to wait for it to get to you! You are at the other end of the network. All you have to do is dig 3.5 kilometres...and you can be online...and they said, well we haven’t got any diggers, we are just villagers, and we said, well hire some diggers...and they said well we already bought shares, and we said, well you can wait for somebody else to dig it then! But if you want it, you’ve got to do something about it...If you all want it, you have to dig it” (B4RN 20).

The process of additional self-funding in each settlement was ambitious but proved fruitful as B4RN have been able to roll out broadband connections as they received funds to the various settlements, and continuously re-evaluate their financial situation.

“The people that are pushing hardest, um, are getting things done and therefore getting the service more easily! That’s the way life works, isn’t it?” (B4RN 7).

This method of installation and the ability for the B4RN team to change priorities based on volunteer involvement also led to changing or competing connection opportunities between villages within the B4RN region, as some settlements pushed more than others.

“I mean, [local village] was never in Phase 1 of the project, it was always in Phase 2, but [local leader] got it moved up! He got it moved up as part of the first phase, and he was outstanding, the village would not have had it without [local leader]. It might’ve in the future, but it wouldn’t have it now...” (B4RN 3).

Community-led broadband, as pursued by B4RN, is then exceedingly complex due to the reliance upon voluntary activity which results in timelines which are very fluid for the project. However, once momentum for the project was achieved, for example when the first connections were made, or individual community members saw people digging, interest in the potential network picked up, for both volunteerism and customer subscription.

“I think I’ve been pleasantly surprised, I’m not shocked or amazed, but pleasantly surprised that the interest levels have crept up so quickly from other areas, and I mean, that simply reflects the obvious perceptions of what a fantastic quality scheme it is...” (B4RN 7).

“It’s growing; I mean it’s truly amazing what we have achieved considering there is only a relatively small group of core workers. Some of the villages, they have been fantastic, turning out, and helping digging...” (B4RN 15).

This continued reliance on key individuals, such as time-rich volunteers or local champions, was in Phase II interviews highlighted as a significant concern for non-adopters of the B4RN technology, as was discussed at the theoretical level in Section 5.2.1. Although one non-adopter interviewee did participate in B4RN by volunteering to dig trenches for a few days in his village (again emphasising the importance of ‘place’ in volunteering (Rochester, 2006)), his confidence in the B4RN broadband product was not strong enough for him to adopt the superfast technology. Simply put, he did not think it would ‘last’ or, at least, considered B4RN broadband too risky to adopt.

“I still think it is too dependent on a small number of people, I don’t see the structure there to keep it going in 20 years, I might be totally wrong...” (B4RN 3).

The level of ‘riskiness’, of going completely with a volunteer-run community-led entity with no formal structure for the future of the business, was simply too overpowering to consider adoption in his case.

Cyber-moderate - the non-adopter

Sam lives in the B4RN region, and although he was intrigued by the B4RN offering, he had opted in 2012 to retain his original broadband service provided by a national operator. His online retail business required reliability, and the uncertainty over the future of B4RN, including its operational procedures and future planning, led him to not adopt in 2012. When we spoke again in 2014, his views were much the same.

“We have an Internet business for heaven’s sake! You know it is partly because we are totally dependent on the Internet that we didn’t want to sort of risk going away from a reliable source and go with something unproven”.

These concerns remained present in 2014, although he did participate at the local level.

“I mean, I went out and helped with the trench digging and such, but we decided not to make a connection to our house”

Adigital – the non-adopter

Nancy has similarly strong, if not stronger feelings towards B4RN, and lives in an isolated property, at a distance from the nearest settlement. She has never wanted to adopt B4RN, although has been approached about it multiple times over the years. In 2014, her opinions retained their earlier concern over the running of B4RN as a business entity.

“It’s unprofessional. I think the whole thing is being driven along by sort of a few people, all very laudable and all that, but it’s very fragmented, you know there is no cohesion about it, there’s nobody running the project. You know everybody might be doing a little bit here and there, but there is nobody actually in charge! So consequently, because I have this experience, the whole thing leaves me cold”

Both Nancy and Sam did not wish to adopt the B4RN service primarily due to the lack of future information, a strategic plan to address what happens when the high levels of volunteerism fade, or leaders move on, or away from the project. Despite this lack of interest, they both use broadband for personal and business activities, and in fact it was the need for certainty in connection that was a factor for Sam to stay with his current provider. Nancy felt that her broadband use would not increase nor change in a manner that would require such a fast connection, and therefore was not convinced about the B4RN project.

Given the fluidity of B4RN installation processes, communication about the project from the core team to its constituent villages and volunteer leaders proved problematic for B4RN. This contributed to uncertainty for those individuals interesting in adopting the service.

“In terms of customers, you know when we go into a new area, there is a lot of confusion I suppose really...there is a sporadic flow of information that we manage to get out there. The main excitement has always been to build the network” (B4RN 18).

Volunteer time itself was limited. In an initiative fully reliant on volunteers, their time needed to be dedicated to the development of the physical network, or indeed, raising more funds for the physical network.

“I think the one area, and it is not a criticism, it is just an observation, is that communication hasn’t been great. That said, this isn’t a big commercial organisation with hundreds of people and a PR office, but getting information about where the dig’s got to, which route it is going on, timing for individual parts of the project has been like extracting blood from a stone” (B4RN 8).

The voluntary nature of the B4RN initiative has continued to influence social dynamics and settlement-level relationships throughout the installation process. The community-led volunteer-based process continued to encourage new social relationships, due to increased settlement level and regional interaction. Firstly, individuals were meeting like-minded individuals with an interest in pursuing the community-led network, as well as having increased opportunity to meet other residents as they installed or promoted the network. Secondly, the demographic profile of the region and its settlement structure, significantly the large proportion of both retired and self-employed individuals, played a significant role in installation in relation to facilitating increased volunteer time. Thirdly, the fluidity of the installation process, which had initially hindered some interest in the project due to uncertainty over the actual superfast broadband services being provided, often meant that interest increased once the first connections in a locality were established. This demonstrated an increasing momentum as time passed. Fourthly, the reliance on key individuals and leaders in the communities and the B4RN team continued to hinder subscription to the service. Fifthly, due to the concept that each settlement is responsible for connecting to the core route to obtain B4RN services, the installation environment was marked by competing village or settlement-level interests as each area had differing strategies and resources to engage with the process. Finally, the reliance on volunteers with limited time and specific skills meant that communication from the core team to individual leaders and local interviewees was fragmented and of poor quality, leading to uncertainty and confusion over installation timelines for future subscribers and village volunteers.

6.2.2 Evaluating the influence of superfast broadband access for B4RN adopters

The second research question of this doctoral project queries whether *access* to superfast broadband influences the social and economic interactions of rural dwellers and their respective communities. This section will endeavor to respond to this question. Section 6.2.2.1 will outline the impacts of broadband described as relatively individual, or centred on a family unit and Section 6.2.2.2 will outline community-scale impacts of broadband, attempting to draw out the relationship between the use of superfast broadband by individuals and its link to their respective communities. The use of vignettes in both sections again serves to further illustrate the shift in broadband accessibility for rural dwellers, from relatively slow or non-existent broadband access, to superfast broadband access via B4RN.

6.2.2.1 *The influence of superfast broadband access on individuals*

The influence of superfast broadband upon individuals is a subject of recent policy and academic interest, particularly due to the purported benefits reported, for example, in policy initiatives such as *Britain's Superfast Future*, discussed in Chapter Three. However, few studies have been able to reflect in a qualitative manner on the societal and economic impacts of superfast broadband access. Interviewees connected to the B4RN service highlighted multiple impacts of their new broadband access. This research thus serves as an exploratory study of the influence of superfast broadband services at the household or individual level. Several findings presented in the above sections are clearly linked to the increased speed and capacity of their connection. The B4RN superfast broadband connection has facilitated what is termed 'next generation usage', which emphasises Internet use from multiple devices and locations (Dutton and Blank, 2011). Firstly, individuals and family units reported being able to take advantage of multiple access points in the home, creating an environment where multiple people can work online simultaneously; an advantageous tool for a family or larger household. Secondly, most interviewees reported that they were online more, but over shorter periods of time, indicating an increase in efficiency. Many interviewees felt their technology-life balance was better weighted as they could now do what they wanted to do online quickly and reliably.

“And I just think that all the things that we thought were going to happen are happening, and we will carry on with that really – in an accelerated fashion” (B4RN 7)

Techno-pragmatist - the technologist homemaker

Michaela has an at home business focussing on technology support and IT services. In 2012, she really struggled to retain business and respond to clients in a timely fashion which detracted from her potential as a homemaker. In 2014, after a year of connection, she feels the B4RN project has improved her economic stability, and contributed to the community where she lives. Economically, her productivity is no longer hindered by the Internet connection.

“We found that particularly good for uploading and potentially downloading files, and um I use video a lot and do a lot of video work, and so uploading video has just become a totally different world”

At the community level, she believed it had a wonderful effect on social cohesion.

“It's the best thing that has ever happened in this area really. I mean not just in terms of the actual connection speed and the quality of the service, but just in terms of social cohesion and stuff”

Thirdly, external social or economic connections supported via their superfast broadband were emphasised. This confirms the finding from Section 5.3.2 that broadband is a useful tool as a connector between communities, rather than within them. This is primarily due to the increased reliability of both streaming video and VoIP services, such as SKYPE, to communicate with friends or family who do not live locally. Similar findings were also reported in a study in Cornwall, where home users of the Superfast Cornwall service

emphasised the benefits of whole families being online at the same time, improved homework balance, and the benefit of being able to connect to the outside world (Superfast Cornwall, 2013).

The introduction of superfast broadband specifically through a community-led process with B4RN has also had a significant impact on individuals by increasing their digital literacy. Digital literacy in this case can be understood as the interest and knowledge in multiple aspects of digital technologies and/or devices. Examples of how B4RN has increased the interest in and knowledge of digital technologies in general are now presented. Interviewees in the B4RN region have experienced a surge in knowledge concerning telecommunications networks due to the locally based installation methods for service deployment. The methods of building a fibre network in such an open and accessible way meant that interviewees could engage with all levels of the process, volunteering themselves, or speaking with volunteers to learn about the network. This was particularly noticeable in invested volunteers who gained knowledge and expertise in network building.

On an individual level, interviewees reported an increased interest and knowledge in *how* they accessed the superfast broadband. Realising what the speed of a 1 Gbit/s connection could do necessitated education about the influence of personal hardware on broadband capabilities (i.e. using an older computer will not necessarily allow for the highest possible speeds to be reached).

“These things will come slowly, we only really will know over the next five years how big of a change [B4RN broadband] has made, and what new technologies we are starting to use because of it” (B4RN 18).

Interviewees spoke about increased interest in broadband-enabled devices. Due to the open and accessible method of B4RN installation, individuals experienced a heightened awareness about points of access, and the potential for other devices, beyond standard computers, to access broadband-enabled services. Such devices included smart TVs and other entertainment units. It is worth noting here that any such interest in alternative devices is also reliant on household disposable income, a feature of device adoption emphasised by Ofcom (2014e).

“I have just invested in anticipation, I bought a new telly! Yeah, we have video capability and so on, yes I will invest a little more because there are other devices around the house that don’t usually work to the same extent, but once the bandwidth is available, no reason why we wouldn’t want to take advantage of it!” (B4RN 7).

Techno-pragmatist to Cyber-savvy - the retiree

Sally lives in the B4RN region, and often made use of the wireless service implemented by Lancaster University. *“I was with the university’s free one [wireless mesh] before for their research, it wasn’t that reliable in the end”* Although retired, Sally uses the Internet for many things including travel bookings and researching to find information about her many hobbies.

In 2014, Sally had been connected to superfast broadband for about 6 months. Her usage increased; she was using multiple devices to access broadband-enabled services, and had made purchases such as a Smart TV to watch on-demand video services, enabling her to access broadband –enabled services in a more flexible manner for personal enjoyment.

“Now I can use iPlayer on the television, I used to go upstairs, to catch up on the odd thing, and I mean I would but it was impossible most of the time, but I choose to do it through the television now”.

She continues to research her hobbies and book travel, but has since found that her time is more efficiently spent: *“I’m using it more, but not spending so much time on it because it is fast and reliable. I can do things quicker now than I could do before”.*

“Most days, yes it is for me, and I think it has kept my brain very active having to learn how to use a computer, and I’m more connected with it”

These individual impacts make her feel extreme pride in her community and its ability to create such a service.

“Just amazing seeing people out digging and laying, and now with getting the cable across my drive, and I was there when they blew the fibre through, which I just found so exciting, very childish really! So you can hear it coming through, this tiny cable that was going to provide all this wonderful stuff!”

In particular, this knowledge of new devices and potential uses for broadband in the home expressed by interviewees that had adopted the B4RN superfast broadband proliferated because the B4RN project and its broadband service was the ‘talk of the village’.

Interviewees noted that broadband had become a key discussion for many social groupings, both existing groups, and newly created social networks formed around the B4RN project itself. These discussions increased knowledge exchange about digital technologies in general as friends and neighbours helped get individuals connected in a much more participative manner than a traditional telecommunications installation would have done.

Techno-pragmatist - the farmer

Michael is a third generation farmer in the B4RN region. Prior to Superfast deployment he was consistently frustrated by the need to use the Internet for aspects of his business, such as milk reporting.

“Milk recording...every month they do the recording and they have to send us the results by, well we still get it on floppy disk because we can’t access the online service proper” (B4RN 14).

The consistent need to conform to government agriculture regulation and processes, that they could neither easily respond to nor access, limited their desire to use the Internet in general.

In 2014, Michael had had access to the B4RN superfast broadband network for over a year. He had experienced a complete shift in how he views guidance from DEFRA and other farming requirements.

“DEFRA has been insisting that they have to be done online, and there are groups and there are MPs that are in Yorkshire and East Anglia in particular who are trying to persuade DEFRA that there are areas where farmers just can’t do it, and to put alternative provision in ...we are alright, we can do all of ours online now without a second thought”

The B4RN superfast service had also changed how Michael managed daily practices, allowing those working on the farm to maintain greater mobility:

“The business use, I mean it is so much easier! We used to sit for hours and spend the whole evening sometimes trying to do a couple of banking transactions, and uh, its now, just when you want it you can just do it in a flash”

As a farming unit, they are also exploring new technologies made possible by B4RN.

“We are setting up cameras... so that [farm workers] can connect in and check on the cows that are calving, in the buildings up here”

6.2.2.2 The influence of superfast broadband access on community

The influence of the B4RN superfast broadband for communities was considered in the interviews, reflecting primarily on the impact in the interviewee’s village or settlement. Most interviewees reported that, within their local community connections, broadband had little influence. However, email as a method of simple communications had increased.

“Not within the community, I don’t think that’s made a difference, perhaps we use email more than we did” (B4RN 14).

Interviewees also reflected on the creation of superfast ‘nodes’ in their village for broadband access. In some villages, the local population had come together to install a B4RN superfast connection into a local institution, such as a village hall, school, or church, providing a (often free) superfast connection to anyone using that space.



Photo 6 - 1 Local hall in the B4RN region advertising superfast broadband access via the B4RN service

Source: Author

Many knock-on effects of providing such a service for the community included better use or increased rental of local spaces and increased opportunity for local hall based events. In the case of one settlement, the post office had closed, and postal services were temporarily available in the village hall. The use of the B4RN broadband by this post office made it easier for them to continue to operate in such temporary conditions.

“...The temporary post office that we have that is in the village hall is taking advantage of the free B4RN connection, they are very happy about that...” (B4RN 6).

In addition to use from external groups, local B4RN-connected spaces could be used for the live online streaming of local events, such as church services or other community based events. This service could potentially provide video and audio of any such events for community members unable to attend or who are housebound. Although this service had yet to be trialled, it demonstrates the new community-level opportunities interviewees were keen to pursue through their B4RN superfast broadband service.

“I think in the long-term, we’ve been piloting streaming local cricket matches, and local events, and one of the churches is connected up and they are streaming some of the church services...” (B4RN 24).

Additional impacts for the community from superfast broadband use identified by interviewees included the potential for superfast broadband access to lead to a renegotiation of living and working in rural areas. This is similar to findings from Phase I (see Section 5.3.1.2), where there was a strongly held belief expressed by interviewees surrounding the

potential of broadband accessibility to contribute to changing patterns of living and working in rural communities due to the relatively limitless broadband services.

“I can see more...businesses moving out of the city and into the rural locations now that the surrounding villages have got high speed broadband and can access business. So there will be a growth of that, which will to some extent revitalise the countryside I think” (B4RN 1).

Nevertheless, this remains a theoretical finding, and the span of a few years between Phase I and Phase II data collection is not enough to find evidence of actual structural change at that level.

Much of the discussion around community benefit, or settlement scale benefits, from the B4RN broadband service was rooted in the B4RN processes of installing superfast broadband through the participatory, community-led framework, rather than from the technology use itself.

“I really don’t know much about the community side of it to be honest, from what we do know they are all saying basically the same, it’s fast!” (B4RN 11).

Therefore, throughout the interviews, the impact upon communities of superfast broadband use was conflated with the installation process, demonstrating that the community benefit from the community-led process of installing broadband, and the actual use of such broadband remained, at least in the perspective of the interviewees, intrinsically linked. The community was considered by interviewees to benefit from the superfast broadband access because of the B4RN participatory process (discussed in Section 6.2.1.2), highlighting the creation of new social networks and relationships, which in turn enhance a sense of ‘belonging’ and community cohesion.

“...it has brought a lot of different people in the village together as a project, never mind how we are doing it, but the very fact that we are doing it has brought people together which is good” (B4RN 12).

It is possible that installation led from an alternative method, i.e. commercially-led installation, would not provide similar community impacts. While this doctoral study has contributed to our understanding of community impacts from a community-led broadband installation process, other modes of installation could be explored in future studies to determine if the community-scale impacts are enhanced similarly, or in a different manner altogether.

6.2.3 Implications for individual and community resilience for B4RN

Previous sections in this chapter about the B4RN initiative have sought to outline the individual and community impacts of superfast broadband, from the installation process to its

use. It has begun to describe the influence broadband is having on the B4RN area, through both the text and vignettes, and this discussion will now be expanded to explicitly outline the relationship B4RN superfast broadband has with individual and community resilience³⁴. Facilitating this analysis is the resilience approach developed in Chapter Four, and used in Chapter Five to explore Phase I pre-installation findings. Here the same analytical approach has been employed to visualise the relationships between Phase II findings and resilience. This section will outline the dimensions of resilience, focussing on resources (6.2.3.1), agency (6.2.3.2), equity (6.2.3.3), and sense of place (6.2.3.4), evident in the Phase II B4RN research.

6.2.3.1 B4RN: resources and resilience

In the first area of discussion, querying resources and resilience, several themes and relationships are of note for B4RN, as illustrated in Figure 6 – 2. In the examination of resources, I broadly reflected on the central questions developed in Section 4.6.1. I focussed primarily on the ‘use’ of community-led broadband but also reflected on the processes of installation, as it became clear that these processes of community-led broadband continued to influence individuals and the wider community in B4RN. These central questions are:

- In what ways do community broadband processes increase (or decrease) resources (including societal and economic interactions) for individuals and the community?
- In what ways does the use of community broadband as a resource itself increase (or decrease) availability of other resources for individuals and the community?
- In what ways do community broadband processes aid individuals and the community in developing current or new resources?
- In what ways does the use of community broadband influence adaptation of resources (both individually and communally)?
- In what ways do community broadband processes increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?
- In what ways does the use of community broadband increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?

³⁴ As opposed to Figures 5 - 3, 5 - 4, 5 - 5, and 5 - 6, each resilience network map for Phase II was completed for the specific case study due to the divergent path each community organisation has taken, as outlined in Section 6.1.

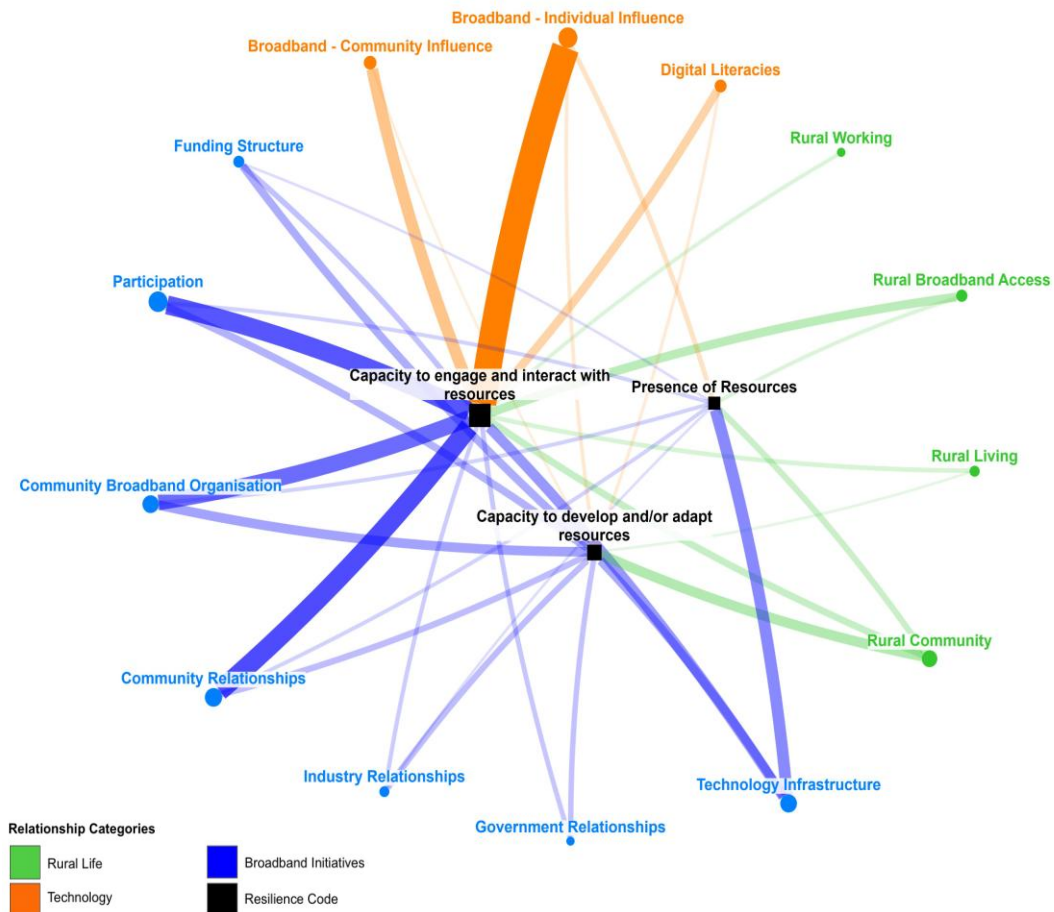


Figure 6 - 2 B4RN Dimension 1: Resources

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between resources as an element of becoming more resilient and community-led broadband processes and technology use.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to resources and community-led broadband processes and technology use.

The presence of resources was discussed by interviewees primarily when reflecting on the built broadband infrastructure, highlighting the inclusion of the B4RN superfast network as a resource itself, or an addition to community assets (Magis, 2010). It is important to highlight three points from this. Firstly, the reliability and availability of superfast broadband itself has enhanced individuals’ capacity to engage with broadband-enabled services and applications, demonstrating the strong relationship depicted with the individual influence of broadband. Secondly, its reliability has enhanced individual agency and feelings of personal empowerment

and engagement with wider society, underscoring the links demonstrated with participation and community relationships. The importance of human agency in resilience (e.g. Davidson, 2010; Magis, 2010), highlighted throughout this thesis, is exemplified here in relation to the increasing ability of individuals to harness their own agency when using superfast broadband.

*“Now we are not limited, as far as I know or want to know, because we’ve got [B4RN broadband]”
(B4RN 10).*

This feature of agency is particularly relevant as settlements have lost or are lacking public spaces or services, including shops or pubs, which limits the built capital within the region and subsequently resilience (Wilson, 2012a). Superfast broadband access ameliorates this lack of capital. Thirdly, individuals are not changing their online personal uses currently. However, the 1 Gbit/s B4RN service is changing how people consider the ‘Internet’ in terms of digital literacies. Therefore, in terms of resilience, the presence of B4RN superfast broadband as a resource itself, embodying qualities such as resource robustness through reliability (Brown and Kulig, 1996), is crucial to perceived individual empowerment and agency. However, significantly, altered broadband use patterns are not evident.

More practically, considering online use and activities via the B4RN network, the capacity to engage and develop Internet-enabled resources was highly linked to individuals. This was due, in part, to concepts of multiple access points for households, the opportunity to have multiple devices online and, related to the community influence, the potential to expand alternative working arrangements for rural dwellers. This potential for resource diversity and increased participation of online resources (Sherrieb *et al.*, 2010), has a significant influence on individual resilience, which potentially may ‘scale-up’ to community level (Berkes and Ross, 2013). Conversely, the presence of B4RN as an organisational or institutional resource (Sherrieb *et al.*, 2010), with its entrenched social dynamics, has continued to limit interaction from individuals who did not believe they were wanted or would be able to contribute to the debate (the non-adopters), thus reducing their individual resilience.

6.2.3.2 B4RN: agency and resilience

Moving towards the discussion of agency in B4RN, multiple relationships emerged, depicted in Figure 6 - 3. Agency was similarly considered in the context of the following central questions:

- Is there a strong presence of connected and proactive individuals (digital champions) and groups within the community?

- In what ways do community broadband processes enable (or hinder) proactive capacity building from individuals?
- In what ways are individual users 'empowered' (or disempowered) through community broadband?
- In what ways does the community access and develop networks? Are there any participation networks in place?
- In what ways do community broadband processes enable community-level capacity building?
- In what ways do community broadband processes facilitate imagining, and strategising actions for individuals and the community?
- In what ways does the use of community broadband enable individuals and communities to plan for future change?
- In what ways do community broadband processes increase (or decrease) flexibility of resources for individuals and the community?

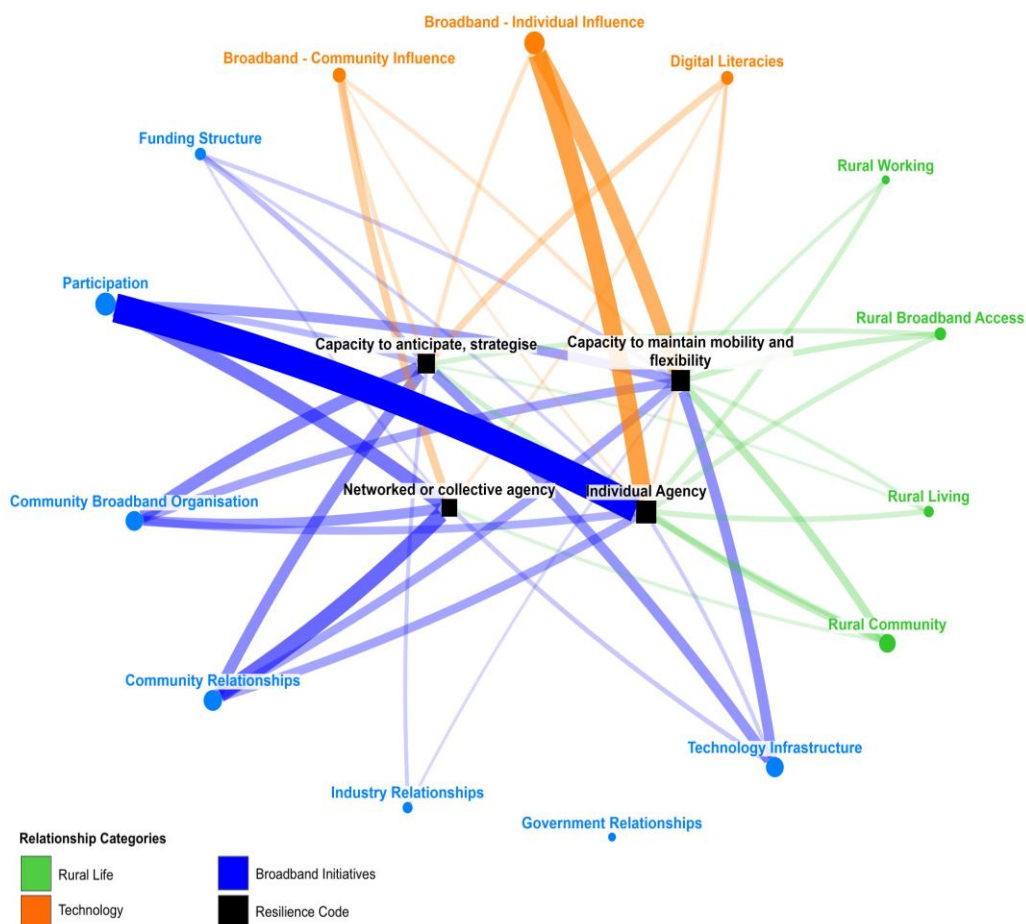


Figure 6 - 3 B4RN Dimension 2: Human agency

Figure Note: Each vertex depicted with a black square is representative of a 'resilience' node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an 'open' node (on the outside of the image) based on grounded coding. The size of these vertexes is

reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the 'relationship value', or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between agency as an element of becoming more resilient and community-led broadband processes and technology use.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to agency and community-led broadband processes and technology use.

There is a strong presence of connected and proactive individuals in the B4RN community as a whole, contributing to resilience (Skerratt, 2014). These individuals often operate at the village or settlement level, thus the local level of agency can vary across the B4RN region, and scale retains importance. Participative capacity can be uneven across the region due to factors such as mobility, education, social networks and so on (Lorenz, 2010). The proactive individuals within B4RN typically had time and financial security (for those providing funds) to take part in the scheme, again highlighting the potential power dimensions that dictate participation (Lorenz, 2010). Multiple interests continued to influence agency and participation in the B4RN initiative, including an interest in the technology, creating a name for the region within the wider technology industry, and also a desire to improve the community itself by having 'world-class' services. This was identified in Phase I of the research and continued to be strongly felt in the intervening years, demonstrated by the strong network links depicted between individual agency and participation. Those that have not had time or inclination to participate did not see any resilience enhancement from this B4RN participatory building process. The practice of involving every village and settlement and making them responsible for connecting to the core route of the broadband network has also enabled proactive capacity building from individuals. However, it has also laid all responsibility for action on local people (Walsh-Dilley *et al.*, 2013), which does not allow resilience to be influenced by both local and global interactions (Keck and Sankdapolrak, 2013).

Similar to the discussion about increased resource diversity, individual users of the B4RN broadband are empowered through the ability to access reliable, superfast broadband that contributes to their potential wider social and economic interaction. This is illustrated in the link between individual agency and the individual influence of broadband. Godschalk (2003) emphasises the importance of informal and formal human associations, which are increased through broadband use at the individual level. Superfast broadband access is contributing to these individual feelings of empowerment through increasing social network access as well.

“I think it may allow people to use Skype more for families away...” (B4RN 1).

While the use of broadband-enabled services creates further avenues for formal and informal human associations, at the networked or collective level the empowerment stemmed from the on the ground participative building processes, rather than use of broadband. This is similar to the findings from Phase I.

“I think our intra-village communication systems are still at their infancy” (B4RN 12).

Pre-existing community participation networks found throughout the B4RN region were the starting points for individuals’ interaction. However, new actors and collaborators emerged due to an interest in the technology. In particular there was a strong engagement by B4RN with other community-led broadband initiatives as installation progressed and various types of assistance were needed. This is indicative of increasing networked adaptive capacities (Norris *et al.*, 2008) as well as collective helping and the presence of pro-social aims and actions, all of which contribute to community resilience (Butler *et al.*, 2007).

The capacity to anticipate and strategise as individuals within B4RN was linked to digital literacy. Individuals were more strongly able to discuss and understand the potential implications of digital services in the future, which affected their decision-making processes for future economic and social arrangements. It was also linked to the introduction of B4RN as a successful community-led project. This has enabled individuals, particularly those already participating in some capacity with B4RN, to consider future community change that they could instigate. The success of B4RN in the face of numerous government and regulatory challenges and funding complications has increased their motivation to create more community services at the local level. Again, this development of participative capacity has the potential to reflect power dynamics, which could negatively exclude individuals and decrease resilience (Lorenz, 2010). Interestingly, the lack of government interaction with B4RN is noted here as it has not had any influence on human agency across the B4RN region.

6.2.3.3 B4RN: equity and resilience

The discussion will now focus on equity, which was considered in B4RN in the context of the following central question:

- In what ways do community broadband processes enable equal involvement of vision setting or encourage equal access for individuals and the community?

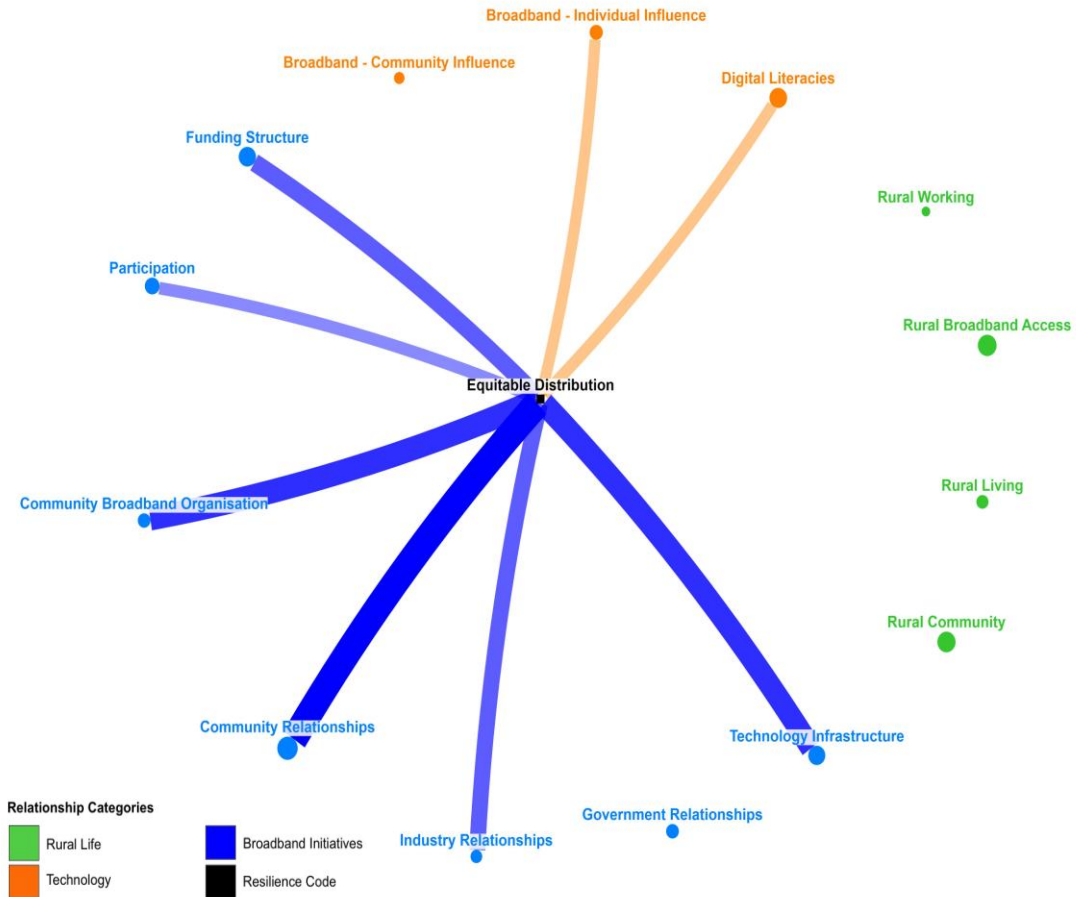


Figure 6 - 4 B4RN Dimension 3: Equity

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between equity as an element of becoming more resilient and community-led broadband processes and technology use.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to equity and community-led broadband processes and technology use.

Equity was primarily discussed by interviewees in relation to the B4RN model of superfast broadband installation and its overall ethos, that of providing ‘for the community by the community’ services, representing an equitable community asset (Adger, 2000). The model of each village or settlement being ‘responsible’ for helping to dig or to connect to the core network was critical, and was underscored by an understanding that it was up to the community to contribute in all stages of installation (funding, digging and so on), essentially

attempting to not privilege one settlement over another. Equity was also strongly understood in B4RN in terms of community relationships for two reasons. Firstly, many local anchor institutions, such as village halls and churches were to have free connections, enhancing the whole local community and representing, again, resource equity (e.g. Sherrieb *et al.*, 2010).

“...we allow people from the village to access it through the village hall. So we have it open effectively. So we already have a few organisations that use the village hall, actually using [B4RN broadband]”
(B4RN 12).

Secondly, volunteers have been able to engage with other individuals’ patterns of living, (for example providing digging assistance to those that perhaps cannot dig due to age or physical condition), and consider others working hours, enabling the provision of support (Pfefferbaum *et al.*, 2005). This has increased appreciation for others’ lives and livelihoods, creating new social values within the community (Masten, 2001).

6.3.2.4 B4RN: sense of place and resilience

Finally, the dimension of place is relevant for resilience. Sense of place was considered in B4RN relative to the following central questions:

- In what ways do community broadband processes strengthen (or weaken) local identity (both individually and communally)?
- In what ways does the use of community broadband increase (or decrease) feelings of connectedness within the community for individuals?

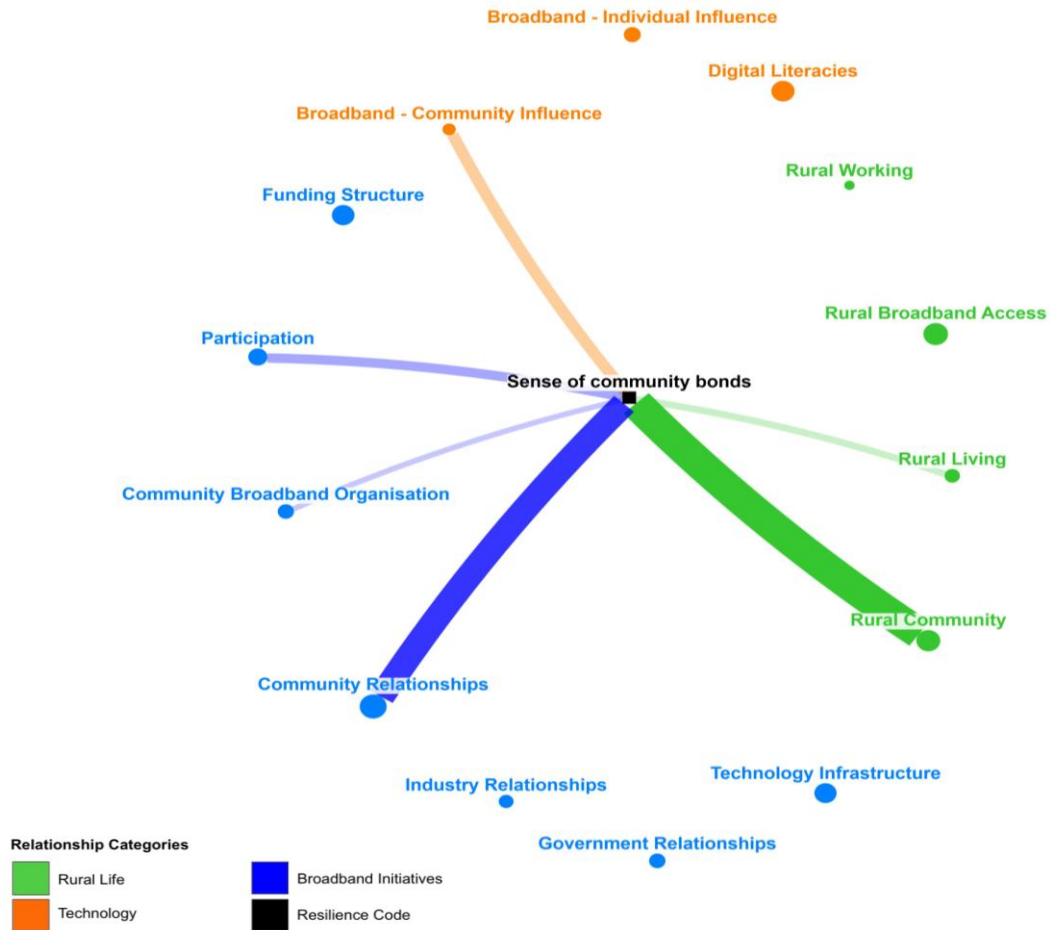


Figure 6 - 5 B4RN Dimension 4: Sense of place

Figure Note: Each vertex depicted with a black square is representative of a 'resilience' node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an 'open' node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the 'relationship value', or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between sense of place as an element of becoming more resilient and community-led broadband processes and technology use.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to the sense of place and community-led broadband processes and technology use.

Community broadband processes, primarily the B4RN installation methods that are reliant on each settlement's interaction, both strengthened and, in some cases, weakened local identity, depicted through the strong links with community relationships and rural community life. It is apparent that the installation methods employed by B4RN have contributed significantly to local identity, much of which has been alluded to above, with participation often encouraged due to shared values (Pfefferbaum *et al.*, 2005), and a sense of community belonging (McManus *et al.*, 2012). Volunteers have aided in the creation of new social groupings and

increased interaction between neighbours due to the need to coordinate digging and connecting of each individual property/premises. I argue that this has increased community cohesion and therefore resilience (Graugaard, 2012). While this was understood to have potential in Phase I of the research, it has been confirmed in this post-installation phase.

“It’s created a lot of new groupings that didn’t exist before, or people who had met each other in the past when their kids were at school, but hadn’t really seen each other since. And it has worked out very well” (B4RN 12).

It also remains true that any sense of pre-existing community bonds within the settlements in the B4RN region has played a role in encouraging volunteerism in the B4RN installation process and has continued to enhance resilience (e.g. Sherrieb *et al.*, 2010). It also remains apparent that those that have not utilised the B4RN service are excluded from this extended engagement with the community, and in some cases were alienated because they would not take part. This has weakened their wellbeing and sense of community belonging and diminished their resilience (Graugaard, 2012; McManus *et al.*, 2012).

The presence of the B4RN network and its use contributes highly to a sense of community, mostly due to the pride it has instilled by being a completely community created initiative, enhancing what Kimhi and Shamai (2004) call the community history and culture. The actual day-to-day use of the superfast broadband has had limited impact on community resilience, although its use has not necessarily decreased any feelings of community connectedness or enhanced sense of place.

6.2.4 Summary

The B4RN case study has reflected on the complex influence of superfast broadband accessibility for individuals and communities. As a process, the B4RN initiative’s unproductive interactions with national and county level government has limited resilience enhancement of the region. B4RN has experienced some positive external interaction with other charitable bodies, in the form of in kind donations or time. Yet these remain small contributions. As highlighted by Keck and Sakdapolrak (2013), while ‘local’ is crucial to understanding resilience of a community, social resilience is also a product of both local and extra-local interactions, and therefore the lack of positive interaction at this extra-local scale diminishes overall resilience in the B4RN region. Local-level interaction has continued to increase in B4RN in the years between Phase I and Phase II data collection and, within the settlements, individuals have worked together effectively to install the service to homes and businesses. Therefore, when B4RN’s interaction with extra-local sources, such as government, proved ineffective for

the project, the initiative was able to make up such shortfall from within the local-scale interaction. This was contingent on the presence of practical features including community members having access to funds, and being willing to invest in the B4RN initiative, which could easily have not been available. This reflects the power dimensions of participative capacity identified by Lorenz (2010). These interactions have served to increase the pro-active nature of settlements within B4RN, increasing individual and village or settlement-level resilience. B4RN has relied almost entirely on volunteers (their energy, practical and professional skills) to write plans, fundraise, and physically build the fibre network (digging, laying duct, and splicing and blowing fibre). It cannot be assumed that the capacity to undertake such complex, wide-ranging and time-consuming activities is available in every rural community. The geographical location of B4RN in relation to a source of backhaul (the connection from the local sub-network (community) to the Internet core network) in Manchester has enabled direct access to content providers keeping overall service cost low. Backhaul is identified by Buneman and Hughes (2013) as the critical constraint to the success of a community network. The location and access of backhaul afforded to B4RN is a relatively unique situation, unlikely to be replicated in other rural areas where there is a community-led broadband group.

The B4RN community-led volunteer-based process continued to develop new social relationships, but its success was found to be contingent on demographic features, such as an active retired population, which enhances the resilience of those individuals, but does not always alter the resilience for those that do not engage so heavily. The fluidity of the B4RN installation process due to its reliance upon voluntary labour often meant interest for the broadband product increased after something had been achieved, ‘proof’ of ability to deliver such a product essentially being demonstrated. This malleability and reliance on key individuals continued to hinder adoption, and potential B4RN users were often left with little information or regular communication from the B4RN team, detracting from their individual resource diversity, agency and ability to engage with external networks or indeed broadband-enabled services (Sherrieb *et al.*, 2010). Finally, due to the concept that each settlement area (village or otherwise) is responsible for meeting the core route to obtain B4RN services, the installation environment was marked by competing village or settlement-level interests as each had differing structures, strategies and volunteer bases to engage with the process.

In terms of the influence of the use of B4RN superfast broadband, interviewees reported being able to take advantage of multiple access points in the home, be online more frequently,

but over smaller periods of time, indicating an increase in efficiency and individual agency with respect to online services. Most reported that within community social connections little had changed. However, email as a method of simple communications within the communities had increased. Primarily, the (often free) superfast broadband servicing of local institutions, including schools and parishes, provides a local-level benefit, something that could contribute more heavily to community-level resilience in the future due to equitable access to superfast broadband (Adger, 2000). Interviewees using the B4RN service had noted increased external social or economic connections. This solidifies the view that broadband is a useful tool as a connector between communities, rather than within them and demonstrates increased resilience through promulgating formal and informal human associations via digital means (Godschalk, 2003). Most interestingly, the introduction of superfast broadband through the B4RN participatory approach has increased digital literacies, which are interest and knowledge in multiple aspects of digital technologies and devices, increasing individual flexibility and mobility, dynamic processes that critically enhance individual resilience (Norris *et al.*, 2008).

6.3 Broadband for Glencaple and Lowther Phase II findings

In the B4GAL case study, several challenges arose for the initiative following the pre-installation phase, which led to a restructuring of their project. Rather than focus on FTTH services, which, although considered to be the best ‘future-proof’ option, were still expensive and likely to take a lengthy amount of time to install, the group decided that the more pressing matter was simply creating adequate universal broadband access for their area. With that renewed ethos in mind, they restructured, and as of spring 2015 are now planning to build a fixed wireless system, with backhaul access from either Glasgow or Edinburgh.

“We went through and considered that wireless technology has come along leaps and bounds since when we first started looking at it, so that makes it a lot better, we couldn’t do all of the area, but we could...get something going” (B4GAL 3).

A business plan was completed in January 2015 to reflect this alternative. Given the challenges faced, there was a lack of interest from Phase I interviewees to participate in Phase II, data collection which took place between September and December 2014. This section can only reflect on data collected from 4 interviewees (11 had participated in B4GAL Phase I). However, of those, 3 were directly involved in the progress of the B4GAL initiative and this enabled a small but detailed study of the challenges facing community-led broadband in this case. The remaining B4GAL Phase II interviewee was a user with past organisation involvement.

In order to best illustrate the challenges that B4GAL faced, the rationale for their decision to opt for an alternative development model, and to identify future plans for broadband installation, this section will now outline three areas of interest: 1) the challenges of community-led broadband for B4GAL, including the challenge of policy partnerships and funding access (Section 6.3.1); 2) the future role B4GAL hope to play in broadband installation (Section 6.3.2); and 3) the resultant influence on social resilience, identifying where and how resilience was diminished, enhanced, or altered in any way, and what aspects of resilience were in play throughout the broadband development process (Section 6.3.3).

6.3.1 Challenges of community-led broadband for B4GAL

Modelled on the ideals of B4RN, the intention of B4GAL was to roll out FTTH superfast broadband connections to their region in South Lanarkshire and north-eastern Dumfries and Galloway. However, as of June 2015, they have been unsuccessful in achieving those aims. The Phase II follow-up interview-based research has established that there have been multiple challenges that have not yet been overcome to adequately develop a community-led broadband network. These include a lack of appropriate governmental involvement, an existing regulatory framework for telecommunications that was not conducive to small, community-led processes, a lack of timely technical expertise and a lack of trust in dialogue between levels of governance. A positive aspect, although not one that has enabled B4GAL to overcome these challenges, is active networking amongst different community-led broadband initiatives, also explored below. While the volunteerism and passion within the B4GAL group is strong, and is working to overcome these challenges, as of spring 2015 the initiative has had to re-evaluate the technological offering, acknowledging the expense of fibre cabling (costing approximately £3.5 million), and the difficulties of appropriately reaching all households in a timely manner.

6.3.1.1 Political processes and the challenge of multi-scalar interaction

Phase II B4GAL interviewees reflected continuously on the role of government and public intervention for rural areas in the telecommunications sector. This inevitably highlighted the current programme of intervention being pursued at the national level, BDUK, outlined in brief in Section 3.4.3, and discussed in the context of B4RN in Section 6.2.1. The critiques of BDUK outlined in Chapter Three highlight the complexity of the bidding process, and the inevitable consequence of one sole bidder being eligible for all contracts, British Telecom (BT). It became clear through this doctoral research that the BDUK procurement and roll out process had an extremely negative effect on local community-led broadband processes. This was exceedingly difficult to comprehend for the local organisers of B4GAL because

community-led broadband was originally set out within the BDUK framework to *complement* the primary roll out, and community organisations were thought to be supported at the regional and national government level. However, in practice, the lack of comprehensive or integrated approach from government bodies continued to frustrate and stall B4GAL as an initiative.

“So the whole joined up process from government down, and they did the thinking, and it got lost in implementation” (B4GAL 9).

In order to best understand the multi-scalar relationships between B4GAL and governmental bodies in particular, Figure 6 - 6 sets out a timeline of network relationships, between ‘local’ and government (‘extra-local’) actors throughout the lifetime of the B4GAL project.

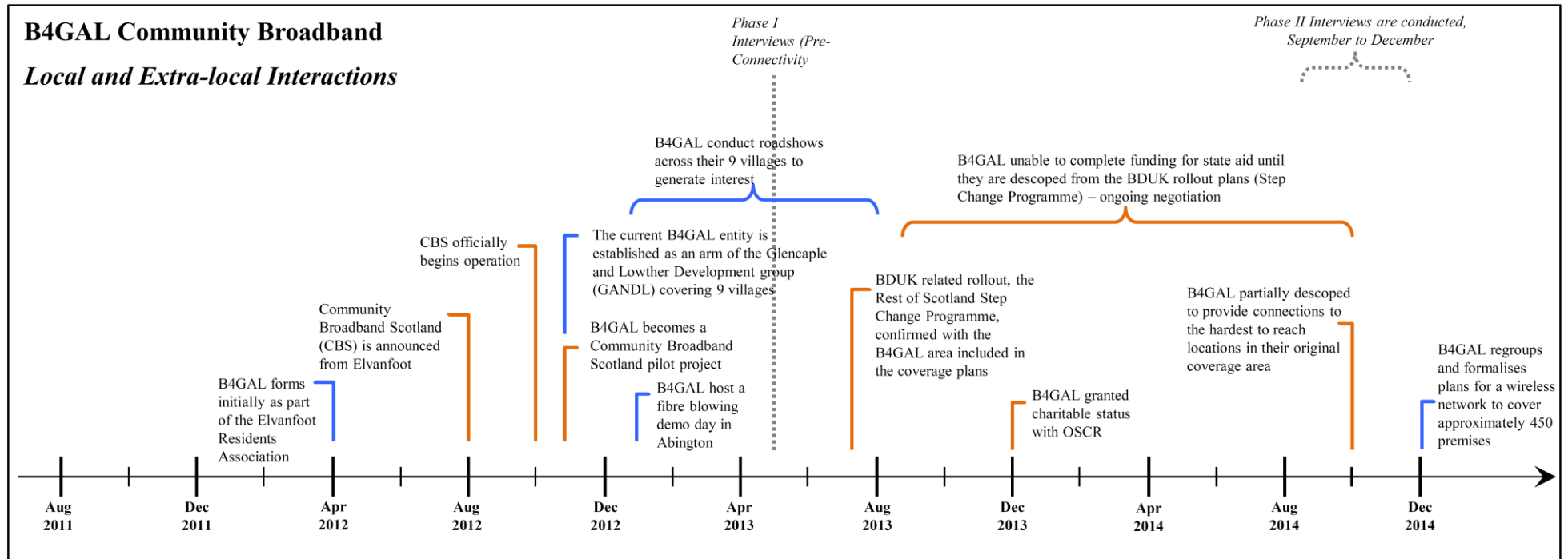


Figure 6 - 6 B4GAL community-led broadband local and extra-local interactions

B4GAL as a project was founded in 2012, and was officially made a Community Broadband Scotland (CBS) pilot project in November of that year. CBS was set up as an organisation to encourage community activism in broadband, and to supplement the main BDUK roll out, discussed in Section 3.4.3.2. The unveiling of CBS took place in Elvanfoot in August 2012, where B4GAL is ‘headquartered’, and therefore there was a strong level of confidence expressed in Phase I interviews that, as an initiative, they would be supported and encouraged at Scottish Government level.

“I just feel really let down, I really do. And I think considering the government chose Elvanfoot as a pilot scheme you know for community broadband...it is a disgrace...they should be pushing for us to have this, and be proud, ‘look the people have achieved this through our help’. And it’s awful. It’s like it’s a battle...” (B4GAL 10).

As an initiative, B4GAL is meant to compliment the main BDUK roll out in Scotland, known as the Step Change programme, which is separated geographically into two areas, the Highlands and Islands and the Rest of Scotland, in which B4GAL is located (Scottish Government, 2014). Yet, in practice they were considered an ‘aspirational’ project by the Step Change programme during procurement consultation³⁵, despite their involvement with CBS (which predated any consultation held for the Step Change programme). Therefore the area under which they had hoped to roll out their community broadband was included in the scope for the Rest of Scotland procurement package. This meant that the B4GAL initiative would not be able to receive any additional public funds to contribute to their project without proving unequivocally that the BDUK roll out would not reach their area.

“They frankly have caused us more trouble than they’ve given us help...the ideas from the Scottish Government are laudable, but as often happens, once it gets to the civil servants, it falls apart” (B4GAL 9)

This led to a frustrating period of time for B4GAL, as they could not proceed due to funding restrictions, a similar predicament to that which B4RN found itself in. No one area may benefit from two public funding interventions, so if the Rest of Scotland programme included the B4GAL area, B4GAL could not build any network using public funding from CBS. Following a lengthy period of negotiation between B4GAL, CBS, the Scottish Government and BT (as the winners of the Rest of Scotland contract), it was confirmed that part of the

³⁵ As established in Chapters Three, CBS has six pilot projects, 3 of which were located in the Rest of Scotland procurement area for the Step Change Programme. All three submitted information about their projects to the consultation, and they were all deemed ‘aspirational’ and therefore their regions were included in the main procurement, meaning that they would be unable to gain public funds to pursue their networks without additional confirmation that principle BDUK roll out would not reach them (Scottish Government, 2013).

area would likely not benefit from the main Step Change programme, and therefore B4GAL could be allowed to build in those areas.

“It’s the fringes basically, BT has claimed the bulk of the denser villages, but have agreed that we can take on the more remote areas. That basically reduces the number of premises of the project from about 900 to about 450 or 500” (B4GAL 11).

The national framework for telecommunications provision through the Step Change programme has meant that B4GAL has had to continuously negotiate for a place in that provision. BT has essentially taken the ‘easy’ to connect, leaving the B4GAL community project to deal with the ‘hard-to-reach’, a seemingly inequitable division of resource development.

Community-led broadband, like many other types of community organisation, appears to be a relatively organic process. All of the B4GAL Phase II interviewees reflected on the learning curve, the things they would have done differently, but understood that they would not have succeeded without those experiences. In effect, this organic process struggles to fit alongside the higher scale public intervention for broadband because it is fluid, not so decisive, or deadline oriented, and the volunteer base means that there can be difficulty in responding adequately, using appropriate terminology in requests for information from higher scale bodies, such as governmental departments.

“It’s been very frustrating, there have been times when we have had board meetings, and we have thought, that’s it, it’s finished, we can’t do anything more...but we’ve come out of that, and we’re still at it...but there is light now at the end of the tunnel” (B4GAL 9)

This lack of progress due to the negotiation period also confused interaction between B4GAL and their local community. The community, and their internal relationships, sit central within B4GALs ethos, and therefore in examining the scalar relationships, local ones are critical.

“...people are asking for this, people are asking for that, let’s see if we can provide. And because we are a community group, we are very community driven, so what people want, we will try to give to them” (B4GAL 9).

B4GAL had conducted road shows throughout late 2012 and into 2013 to engage the community and promote their potential community-led superfast broadband network. However, due to the need to negotiate at length with Scottish Government and their partners due to the Step Change programme, they could not engage with the community to the same extent as time went on. This limited the information being circulated and detracted from additional community involvement.

“...before anyone can do anything, networks and infrastructure, BT have to give consent...so we’ve been fighting political battles for the whole year and half...they have to give an official statement of impact on what would happen if B4GAL went ahead with the network, building in areas we’ve already agreed BT aren’t going into...so it’s taken months and months to get BT to confirm which areas they’re going into, and which they aren’t...so that’s fundamentally taken all that length of time” (B4GAL 9)

Following these interactions at the Scottish Government level, B4GAL have been partially ‘descoped’ from the Rest of Scotland Step Change programme, and are now considering a fixed wireless network with radio, or microwave backhaul to provide for the hard to reach households that will not be covered in the BT delivered, BDUK funded superfast broadband roll out.

“We have had a change in philosophy, in as much as when we spoke before we were going to fibre every home, we were going FTTH. Well, we have thought about that, and I think that was going to cost us something like £3.5million, which is an awful lot of money and infrastructure, and it will take a long time! But there is an imperative here to get broadband...so we are going for radio backhaul, microwave backhaul, and a completely wireless, fixed wireless network” (B4GAL 9).

With respect to funding arrangements, B4GAL have been working to obtain large grants to enable their broadband development. However the inability as of yet to put out a complete business plan (due to uncertainty over technology, cost and so on) has limited the ability to apply for such grants. B4GAL still aims to work with CBS, and will also target local funding alternatives including the Clyde Valley Wind Farm, as discussed in Section 5.2.4.

“It’s frustration at the minute, of trying to get money. We know how we want B4GAL to operate, we wrote the operations, we have been making progress for sure” (B4GAL 9).

It was hoped that B4GAL’s regulatory challenges would be alleviated by working and negotiating within their government CBS partnerships. However, in practice, it only served to slow progress and increasingly created challenges for the community initiative.

“They have been incredibly disappointing to be honest. We had seen the government as a vehicle for bringing together communities and sharing knowledge and experiences, and there has been none of that...” (B4GAL 11).

Beyond these issues of competing BDUK plans and the ongoing challenge of negotiating for a space within those plans, B4GAL had hoped that CBS could also be a resource for skills and information that would aid them as volunteers attempting to roll out broadband. However, it became apparent to interviewees that the skills they and similar groups really needed was technical expertise, and this was not being offered or supported by CBS, leaving B4GAL isolated. Wallace *et al.* (2015) identified this as ‘technological capital’, a component which contributes to the potential success of a community broadband organisation.

“You know, CBS could have been an aggregator. It could have actually brought all those communities together and offered them the kinds of benefits of scale for the cost of backhaul and other things that would have been really useful, but they’ve missed out that opportunity and become a business advice service. Which isn’t really that useful to communities” (B4GAL 11).

The relationship that B4GAL, and indeed B4RN as well, have with both central government pushing for community-led interventions to encourage broadband development, and the telecommunications industry in general, is exceedingly complex, and there are negative tensions driving interactions between these groups.

“I’m disgusted really. I’m disgusted with the government and [telecommunications industry]; you know the government have really let us down. I mean the people that are involved with B4GAL now, have put in so much effort and so much time to try to get this off the ground, we have had surveys and it is a waste of money...because then we have had it pulled from under our feet...” (B4GAL 10).

B4GAL is still working to achieve their initial aims as a ‘by the community, for the community’ broadband initiative, and hopes to be installing a wireless solution in the near future. The challenges faced are sourced outside the B4GAL community, rooted in policy decisions and regulatory frameworks developed at the national level, which in reality have diminished the opportunity for local approaches to broadband installation. This runs counter to other policy that supports localism and endogenous efforts, especially in rural areas.

“It’s taken us about a year to get the project removed from BT’s contract with Scottish Government. And so we’ve finally been told within the last month that we have been given clearance to go ahead with at least half the project” (B4GAL 11).

The potential role for government, for a group like CBS or another incarnation of policy-level guidance on community broadband, was still thought by those interviewed in B4GAL to be useful, but it would be more effective if it integrated both alternative and mainstream approaches to rural broadband development.

“...we really felt that is what CBS should have done: identified the backhaul, or established the backhaul network, because with the money that has been spent by CBS, they could have just put their own fibre in, and then you know just allowed communities to come and access it” (B4GAL 11).

B4GAL has faced many challenges that have hindered their ability to roll out their superfast broadband plans. Reflecting on the complex nature of multi-scalar interaction, B4GAL faced several political challenges, including a lack of appropriate, or integrated, governmental involvement, including working with CBS, but being in constant tension with other governmental departments about the Rest of Scotland procurement. The existing regulatory framework for telecommunications and BDUK roll out was not conducive to interaction

between the state and small, community-led initiatives, and a lack of timely technical expertise, a skill that had to be bought in, detracted from B4GAL's ability to adequately plan for coverage. All of these multi-scalar features contributed to the stagnation of the B4GAL project.

6.3.1.2 Trust and mistrust in community-led broadband

Alongside these pragmatic political concerns relating to government involvement in community-led broadband, B4GAL exhibited underlying issues of trust. A lack of joined-up dialogue between central government, the telecommunications industry, and community-led broadband initiatives has contributed to a loss of trust between community organisations and government, or extra local, statutory organisations.

Within the dialogue of community-led broadband, the community initiatives are situated as being distinct from industry or publicly-subsidised roll out. B4GAL, and B4RN as reflected in Section 6.2.1, have been situated as counterweights to the telecommunications industry, or responding 'in spite' of it. This point was expressed in Phase I, and has continued to proliferate in the intervening period before Phase I and Phase II data collection. B4GAL, as a community-led initiative, is interested in matters beyond simply cost or profits, focussing on the community benefits that universal broadband access should bring. Therefore they do not trust national operators to consider the potential of such benefits when determining the roll out coverage.

"And that is all [the telecommunications industry] question, is it cost effective? Whereas we are interested in the benefits [of superfast broadband]. And that is the difference" (B4GAL 9).

This dialogue of trust and lost trust between B4GAL and industry-led broadband installation serves to further diminish the potential for additional or productive interaction between the local and extra-local parties.

"It's really been horrible. I actually think that probably had we realised what it was going to be like; I actually think we wouldn't have done it. And in a way that we didn't realise how hard it was going to be because you know at least we are doing it" (B4GAL 11).

"We couldn't possibly run with BT because they wouldn't quote us! BT's official response to us asking was, because we did go through due process, we said, 'well, could we get backhaul from BT?' They simply said, 'Oh it's too expensive' and that was the extent of their consideration!" (B4GAL 9).

B4GAL has also had to consider the trust developed or lost within their community. They were once hosting regular road shows and promoting their ability to deliver broadband. However, the stagnation of the project, in part due to the need to negotiate with the

government, has diminished any trust that the community may have held for the project. The more time that passes, the less credibility B4GAL is seen to have, particularly if any evidence of alternative installation by national operators is present.

“I know people, I have heard people saying ‘what is happening with the broadband’ because you know you think when we were doing the survey we were putting it out then, and within the year, and people don’t know what’s going on!” (B4GAL 10).



Photo 6 - 2 Original promotional material used by B4GAL during events such as roadshows in 2013

Source: Author

This factor of lost trust within B4GAL’s region was exacerbated through the lengthy negotiation period between B4GAL and the Scottish Government to determine their status. During that time B4GAL could not be as transparent with the community as it desired due to a lack of trust in the industry partners, which contributed to uncertainty for potential consumers of their broadband product.

“We’ve actually not done as much information dissemination as I would like, but with good reason! What we found was that everything we said in the community was then feeding back to [the telecommunications industry] and being used against us in negotiations...” (B4GAL 11).

The interviewees also noted a significant lack of perceived confidence in the B4GAL initiative by the government. For example, when a submission was made to the Rest of Scotland procurement package about their broadband project, it was responded to as an “aspirational project, no speeds confirmed” (see Rest of Scotland Procurement notes). In effect this signaled a perceived lack of trust by the national government in B4GALs ability to deliver. The tasks set by CBS as part of B4GAL’s ‘pilot project’ status were often accompanied by

little completion guidance, and continued dissatisfaction by CBS in the work provided by B4GAL, such as business plan preparation, required the plans to be completed multiple times by the B4GAL team. This again increased an element of perceived mistrust in the community initiative by their government partners.

“...we had a fibre map of the area, you know an actual map, done very early on...we now have two, because we were told to employ another consultant to check that...and our business plan constantly doesn't meet their requirements, but they won't tell us what those requirements are!” (B4GAL 11).

These conflicting feelings of trust and mistrust between the B4GAL community-led initiative and the higher level bodies, such as government and the telecommunications industry, have created a fractious process. Broadband installation requires multi-scalar interaction for resources, funding and a multitude of other factors, all of which have their own practical challenges, and the undercurrent of lack of confidence or trust in both directions continues to limit opportunities for effective partnerships between alternative and mainstream approaches to broadband delivery.

“We are in the ‘too-hard’ box, my friend used to say, ‘oh that is too hard, we will put it in that tray and leave it’. And it's wrong” (B4GAL 10).

A lack of perceived trust within and between the many levels of governance, underscoring practical political challenges, has significantly detracted from B4GAL's ability to proceed. The process of negotiation has left the initiative's members with negative impressions of such multi-scalar interaction. The dialogue of community broadband continues to situate B4GAL 'against' other large scale roll out strategies, which has led to a loss of trust in other regimes and alternatives for roll out. Within the local community itself, B4GAL has had to fight for credibility as time passes, and has felt they have been unable to share more information lest it be used 'against' them by the telecommunications sector, another example of lack or loss of trust. Finally, requirements of B4GAL from governmental partners has engendered loss of trust, as the community-led broadband initiatives have completed tasks multiple times, or receive little to no feedback on what to do next. A perceived loss or indeed complete lack of trust between all these parties is further entrenching the dialogue of community-led broadband initiatives being situated 'against' other types of roll out, and continues to underscore practical multi-scalar challenges, isolating both community-led broadband initiatives and the national level telecommunications sector (and associated governmental departments) from integrated policy and broadband development.

6.3.1.3 Active networking between community-led broadband initiatives

B4GAL team members have continued to network between themselves on the local scale and with other community-led broadband initiatives, emphasising relationship building and knowledge exchange between community-led broadband projects. This type of activity was also noted by B4RN interviewees (discussed in Section 6.2.1.1), and the importance of these interactions must be discussed. Importantly, active networking with other community broadband projects could be considered a positive aspect to the B4GAL initiative, contributing to knowledge exchange and skill building, although it has not yet been significant enough to overcome the other challenges to building their network discussed above.

“I have had long talks with a lot of other projects, you know [local leader] up in the Highlands...we talk quite often...” (B4GAL 11).

Firstly, there was a high level of dialogue amongst the community-led broadband groups, through personal conversations as well as through social media, which created a new node of social networking.

“Seriously, talk to other community groups. There should be some sort of register, and I think CBS should be coordinating that...” (B4GAL 9).

Secondly, community-led broadband initiatives also offered physical assistance to their counterparts across the UK, teaching groups technical skills and encouraging site visits, which can enhance the morale of the visiting group and also increase skill sets, creating a network of resources for all community broadband groups.

“We spent quite a lot of time with [community-led broadband organisation]...learning how to splice fibre, learning how their model works for them...” (B4GAL 11).

“...we can share knowledge, like have you done a business plan, we can look over it, give advice, put you in touch with people, make introductions, linking you in to the backhaul providers...” (B4GAL 11).

This level of nested interaction within the sphere of community-led broadband initiatives is something that has not yet been formalised into any significant access point or directive, but it appears to have proliferated through like-minded dialogue and a willingness to share and access information in an informal manner. It has been successful in both B4GAL and B4RN as a way to learn technical skills, and share and occasionally ‘borrow’ knowledge.

6.3.2 Future role of B4GAL in superfast broadband accessibility

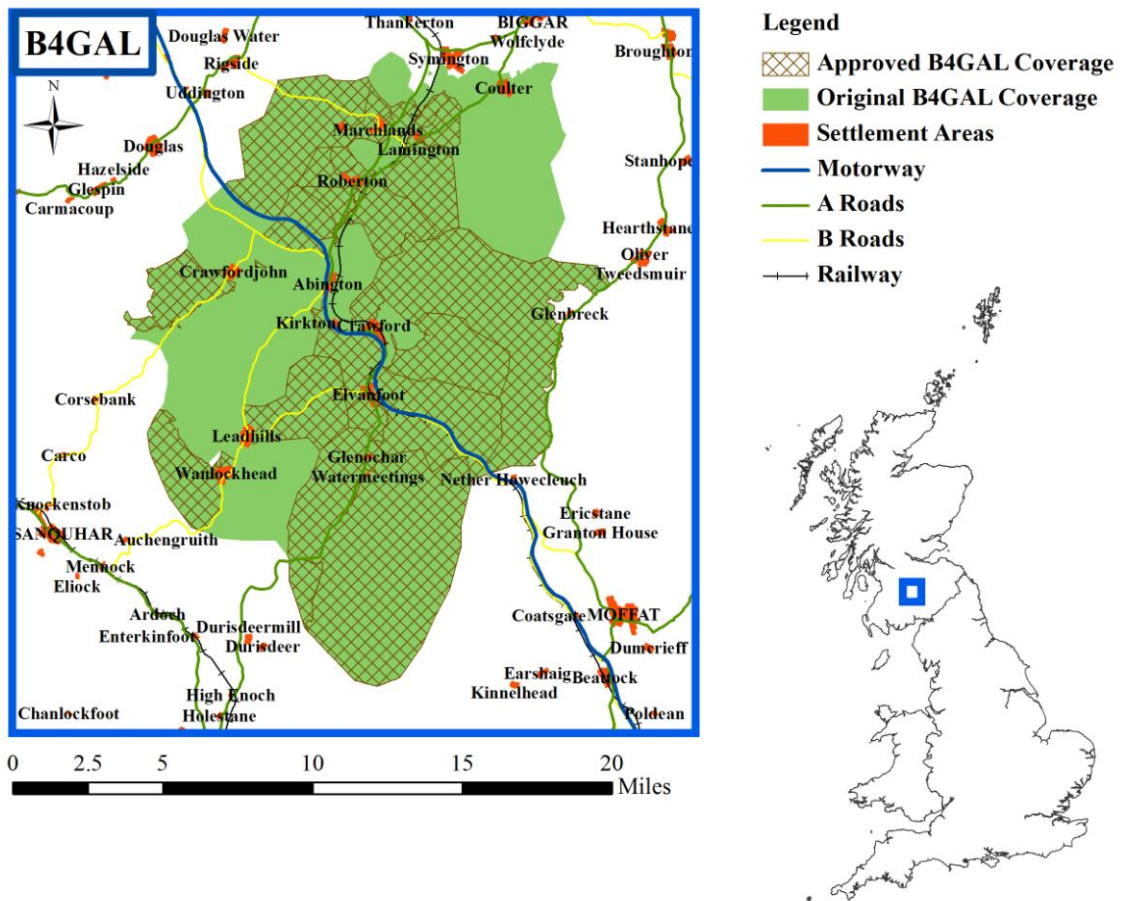
B4GAL is continuing to strive to roll out community-led broadband access to its remote and hard to reach regions through a wireless system, as discussed in Section 6.3.1.

“There is this feeling of ‘ob my god’ but we have put so much energy in it so far that we have to keep going. But there...what’s the success in this situation? I feel like I have been banging my head against a brick wall for the last two years!” (B4GAL 11).

“The wireless will do 30Mbit/s minimum” (B4GAL 11).

They intend to roll out a phased implementation, focussing on a wireless solution to the ‘white spaces’ or spaces that will not be covered under any other provision currently planned, and thus have been partially ‘descoped’ from the Rest of Scotland programme. This coverage was confirmed in April 2015, and is illustrated in Map 6 - 3. It is also hoped by interviewees that additional postcodes could be added to the coverage following this initial allocation, increasing their reach within the region.

Map 6 - 3 Confirmed coverage by B4GAL at April 2015



Source: Confirmed postcode coverage provided by B4gal Community Broadband Ltd (9 April 2015), map created by Author.

The areas that have been retained by BT for BDUK subsidised roll out are most commonly the ‘accessible rural’: alongside roadways and within village settlements, which continues to disadvantage remote rural dwellers from accessing the benefits of superfast broadband. This also serves to further disadvantage community-led broadband initiatives, which are now left

with only the harder to reach locations for broadband development, a more technically challenging and costly endeavour for a volunteer organisation. This is similar to the BDUK related roll out in Lancashire, presented in Map 6 – 1, which illustrated the BDUK roll out occurring in more accessible locations. As of December 2014, the B4GAL team estimated that a wireless broadband project will cost a total of £1.5 million. Grant funding, estimated to contribute a potential total of £350,000, would be sought from the Clyde Wind Farm Fund to begin the project. The Clyde Wind Farm Fund, operated by SSE Renewables through their Clyde Valley wind farm, provides funding to community and business development projects within the Clyde wind farm area, located in South Lanarkshire up to around 15km from Abington. SSE estimates they will invest approximately £17.5 million over the life of the fund. The B4GAL broadband project is located within the stated area of the wind farm fund, and the B4GAL team hopes to access this funding to contribute to their community broadband development. The B4GAL team is planning for financing to be in place by summer 2015, following which contractors can be hired to build the network over the summer of 2015. However, confirmation of any new developments for the B4GAL initiative in terms of coverage, funding, or building of a broadband network has not been made available as of July 2015.

While the B4GAL initiative had experienced setbacks and delays due to the largely external challenges, as outlined in Section 6.3.1, there remains a committed core volunteer group, albeit smaller than initially. The current volunteer Board remains focussed on achieving improved broadband accessibility in their region.

“Now it’s pretty intense, but there has definitely been a change! And there is no social aspect at all to the board meetings anymore. They are very very business-like; we all take our duties as Directors very seriously. And we all know each other very well now” (B4GAL 9).

As a volunteer run initiative, B4GAL is still contending with issues considered in Phase I, namely those of maintaining motivation and enthusiasm in the community, and being able to have the time from its volunteers to adequately work together and make progress.

“We have all taken time off work, and other schedules and we have been working through the business plan...” (B4GAL 9).

The interviewees emphasised that individuals working for B4GAL have had to take time off work, using up holiday time in pursuit of digital connectivity. As B4RN has been primarily reliant on those with free time (the newly retired, or the self-employed who can allocate time in a more flexible manner), there was little discussion of this aspect of volunteering within

B4RN. In comparison, allocation of time to the B4GAL project will continue to remain an issue as it continues to progress with its wireless solution. B4GAL is also continuously committing to its ‘by the community, for the community’ ethos, and intends to pursue multiple delivery options to support that objective and ensure they create universal access. This will also place time demands on volunteers.

“It is very much about the community. There is seldom a board meeting where we don’t remind ourselves of that” (B4GAL 9).

Similar to B4RN, B4GAL intend to pursue free superfast broadband access for public/focal point premises in their area, such as village halls, which may also ensure that any individual or family experiencing financial hardship within their area can still gain superfast access.

“We don’t want to create a situation where people can’t afford our services. Especially these days where people are on benefits and need to use the Internet to be able to sign on and things like this, we decided that we will actually have a free service to the village halls...” (B4GAL 9).

The B4GAL objective of developing adequate free universal access to those suffering financial hardship reflects wider debates held across policy about digital inclusion. Economics is thought to influence Internet use, with income-deprived areas having a higher proportion of slow (less than 2Mbit/s) broadband connections, and disposable income acting as a contributing factor in any new take up of communications and media devices (Ofcom, 2014e). This underpins the impetus for B4GAL’s free access points. While economic stability can influence the ability of a household to afford a certain level of broadband connection, it has been acknowledged that many factors influence digital divides, and income is not necessarily the sole reason for limited access to technology (see also Townsend *et al.*, 2013). Anderson and Whalley (2015), for example, identify areas in inner-city Glasgow that are described as ‘impoverished’, which can be linked, in part, to low adoption of fixed line broadband. However, they identify other factors as well, such as alternative mobile phone use, or public library provision that may influence the need for household broadband adoption. This underscores the myriad of features that can lead to ‘digital divides’, first presented in Section 3.3.2.

The change in technology offering from B4GAL, from FTTH to wireless, has also meant that their initial community benefits plan, including the potential to employ local residents, has had to change. However, B4GAL are still keen to have at least some apprenticeships for community residents.

“The wireless does restrict us somewhat in terms of the knock on community benefits, we were very keen to offer apprenticeships and courses in splicing fibre and so on, but there is always a next phase...” (B4GAL 9).

In terms of the physical building of the network, B4GAL has been open to alternatives for wireless accessibility, including part building the network themselves or outsourcing completely. It is this flexibility that provides B4GAL with an advantage when determining final costs and timelines. Through this determination by the B4GAL volunteer board to remain a part of the broadband debate, they are committed to generating coverage for, at minimum, the hard to reach locations within its area.

“We are negotiating at the moment. The other thing that we have done is we are looking at what are the options if we decide to outsource the entire project” (B4GAL 11).

Reflecting on the construction process, a practical challenge that B4GAL has faced and that will continue to play a role in any future broadband installation is that of backhaul. A critical component for community broadband groups across the country has been the access to affordable backhaul. Backhaul, the connection from the local sub-network (community) to the Internet core network, is required to have a connection to the Internet. Backhaul accessibility remains problematic for rural areas because backhaul access points are located generally close to urban centres (Ofcom, 2013b). Buneman and Hughes (2013) identified the importance of backhaul for community broadband networks, emphasising that when necessary backhaul is not available, or is too expensive, the community is limited in their ability to build a local distribution network.

“Backhaul has been one of the biggest problems throughout the whole thing, the cost of lighting dark fibre...is very difficult in terms of financial sustainability...we have since looked at two alternatives...a wireless relay link from Edinburgh...” (B4GAL 11)

Due to the nature of backhaul being held by companies at strategic points in the country, community-led broadband initiatives need to network with higher levels of the telecommunications industry and government in order to gain access to backhaul. As discussed in Section 6.3.1, these interactions have been fractious, and therefore dialogue surrounding backhaul opportunities for community-led initiatives is contradictory and limited.

“You know, we are in touch with other community groups who have the exact same problems with backhaul. Everybody has a problem with backhaul” (B4GAL 9).

“It is getting backhaul that is the problem” (B4GAL 10).

This again highlights the potential for government partners to assist community-led broadband initiatives with the technical aspects of broadband. However, this has not been the case in practice.

“...overall the level of knowledge within CBS is not very helpful in that they have hired for community engagement skills and management skills, but nobody employed by CBS has any real knowledge of networks” (B4GAL 11).

Affordable backhaul has been relatively difficult to secure for B4GAL due to the small number of premises typically being included in a community-led broadband initiative. Backhaul access can be costly and operates in relation to economies of scale, so small initiatives initially providing for a few hundred homes would struggle to make enough in subscription charges to cover backhaul costs. The distant nature of backhaul points for rural areas further complicates this and increases potential costs, a feature that B4GAL has suffered from.

“It would be nice to have more practical hands on help!” (B4GAL 9).

As no technology has yet been installed, it was not possible to analyse the influence of the adoption of superfast broadband across the B4GAL area. However, sentiments expressed in Phase I of the research, including a desire to take part in the wider digital society, were echoed in conversations with interviewees in Phase II, highlighting potential benefits of broadband access for the B4GAL area remain high on the agenda.

B4GAL aims to provide a terrestrial wireless system, with speeds of at least 30mbit/s to the agreed upon hard-to-reach locations by the autumn of 2015. They hope to harness funding from CBS and the Clyde Valley Wind Farm in order to complete this aim. Additionally, in order to provide for those who perhaps cannot afford their services, they hope to provide a free service to users via local centres, such as village halls. Backhaul access continues to remain problematic, although potential radio links to services from Edinburgh are now seen as being the most economical option. Although B4GAL has put aside any plans for FTTH at the moment, there is still the hope that, eventually, the larger settlements in the area could achieve FTTH to ‘future-proof’ their connections. While many challenges have been due to their interaction with governmental organisations, B4GAL intend to continue to work within the auspices of the policy and telecommunications sector to negotiate for and ensure future development of equitable broadband access for their region.

6.3.3 Implications for individual and community resilience for B4GAL

Despite a lack of superfast broadband access for the B4GAL case study during Phase II data collection, it is still relevant to consider the potential implications for individual and community resilience that superfast broadband would bring, particularly in the face of the challenges the B4GAL initiative has so far been unable to overcome. B4GAL provides a unique perspective on community-led broadband initiatives, and, as a case study, is able to illustrate the place and importance of multi-scalar interaction and the nuanced importance of skills and literacies in the community. Following the same analytical approach adopted for exploration of data collected in the B4RN region, this section will outline the four dimensions of resilience in relation to B4GAL, examining resources (6.3.3.1), agency (6.3.3.2), equity (6.3.3.3), and sense of place (6.3.3.4).

6.3.3.1 B4GAL: resources and resilience

This section will reflect on the relationship between individual and community resources, or capitals, and their influence social resilience in B4GAL. Figure 6 - 7 depicts these relationships. In the examination of resources, I broadly reflected on the central questions developed in Section 4.6.1, focussing primarily on the processes of community-led broadband as B4GAL continued to work towards achieving traction as a project. These are:

- In what ways do community broadband processes increase (or decrease) resources (including societal and economic interactions) for individuals and the community?
- In what ways do community broadband processes aid individuals and the community in developing current or new resources?
- In what ways do community broadband processes increase (or decrease) the ability to engage with internal and external resources (both individually and communally)?

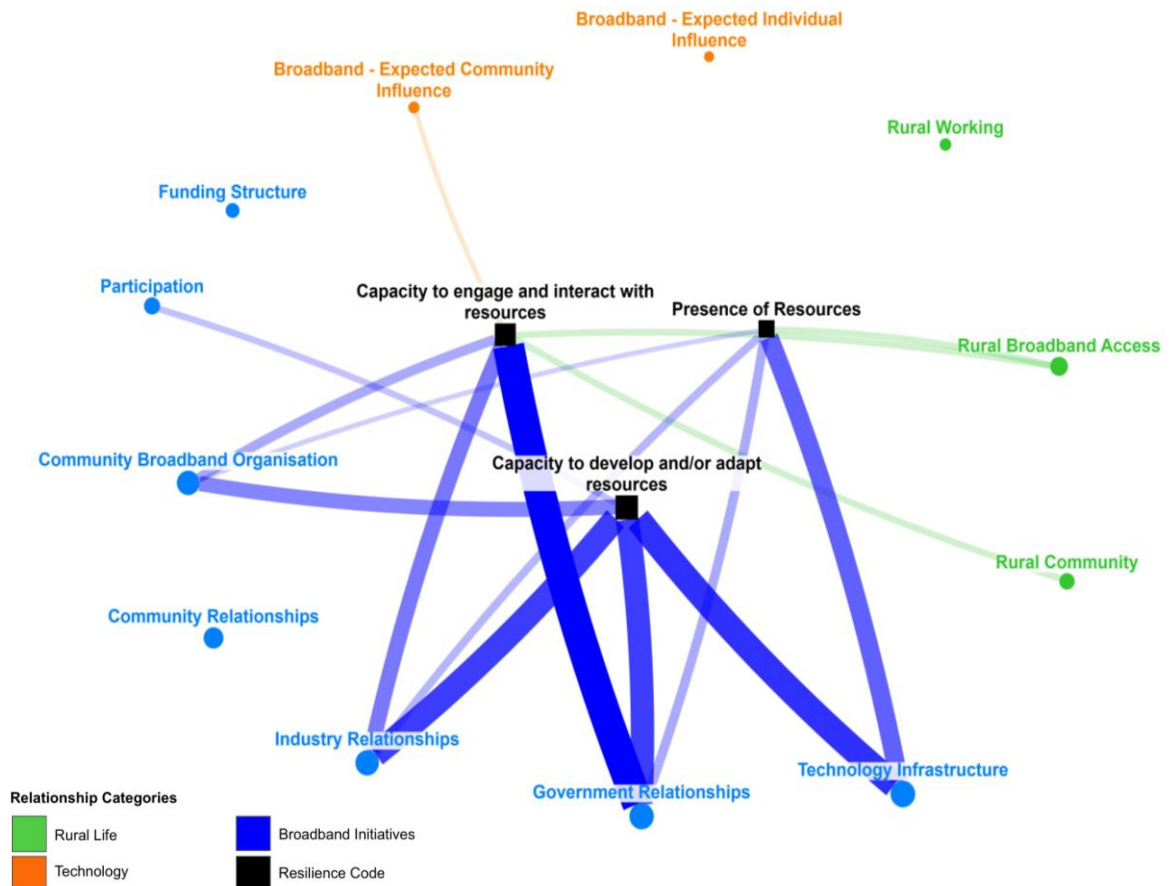


Figure 6 - 7 B4GAL Dimension 1: Resources

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between resources as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to resources and community-led broadband processes.

In B4GAL, the first aspect with respect to resources was the distinct lack of supporting backhaul access to enable the community-led broadband initiative to connect to the Internet. This specific issue, reminiscent of what Davidson (2010) terms structural variables, diminishes the resilience of the B4GAL initiative.

“Obviously the big problem for any community group is the backhaul” (B4GAL 9).

The availability, or lack thereof, of backhaul represents a strong finding in relation to resources for community-led broadband initiatives in general as well. Backhaul is a critical resource for an ISP, for, without backhaul, there would be no connection to the Internet. However, it was specifically the presence of available, affordable backhaul for a small project that is relatively distant from any backhaul access points that proved challenging to B4GAL. The B4GAL project is, in a Scottish context, not that remote from larger population centres. Therefore backhaul difficulties can only be assumed to be magnified in more remote communities as well. Lack of backhaul access for the B4GAL project demonstrates that the lack of resource robustness and diversity continues to influence the resilience of B4GAL (Brown and Kulig, 1996; Sherrieb *et al.*, 2010). Coupled with little technical assistance from their government partners and the lack of information for B4GAL to continue, including misinformation about cost of backhaul, B4GAL has continuously struggled to engage and develop their telecommunications infrastructure.

“...Maybe the only way is to either have private shares or to get private funding, like a big loan but who can take the risk in that! And the interest rate. You wouldn’t get communities agreeing to that. And then it wouldn’t be community broadband...” (B4GAL 10).

The capacity to develop resources, identified by Magis (2010) as key to resilience enhancement, was considered to be heavily limited for B4GAL by the current BDUK roll out process. B4GAL found it difficult to engage with the current telecommunications roll out, due to the peculiarities of not being ‘descoped’ from the regional level plans.

“That certainly created a year of having to negotiate that we shouldn’t have had to need to...” (B4GAL 11).

The need to engage with industry has introduced B4GAL to the commercial realities of telecommunications, and has meant they cannot share as much information with their local community as they would like. Overall, policy bureaucracy inhibits project change and development. This lack of adequate local and extra-local resources, identified by Scott (2013) and Keck and Sakdapolrak (2013) as part of social resilience, was magnified by the need for multiple methods of communication, to communicate with the community, with policy, and with the telecommunications industry, a challenge that required additional skill sets in the B4GAL initiative and ultimately resulted in stagnating resource development and loss of resilience enhancement.

The acknowledgement of wireless as an alternative shows, on a basic level, that wireless broadband as a resource itself had improved to make it a viable option for superfast

installation. The willingness of B4GAL to engage with resource alternatives allowed it to be identified. This demonstrates internal resilience with respect to their capacity to develop resource alternatives for broadband access.

6.3.3.2 B4GAL: agency and resilience

The relevance of agency, individual and collective, in relation to resilience in the B4GAL areas is illustrated in this section. Figure 6 – 8 depicts the multiple emergent relationships. Agency was similarly considered in the pre-installation phase, leaving aside questions concerned with superfast use for B4GAL. The relevant central questions are:

- Is there a strong presence of connected and proactive individuals (digital champions) and groups within the community?
- In what ways do community broadband processes enable (or hinder) proactive capacity building from individuals?
- In what ways are individual users 'empowered' (or disempowered) through community broadband?
- In what ways does the community access and develop networks? Are there any participation networks in place?
- In what ways do community broadband processes enable community-level capacity building?
- In what ways do community broadband processes facilitate imagining, and strategising actions for individuals and the community?
- In what ways do community broadband processes increase (or decrease) flexibility of resources for individuals and the community?

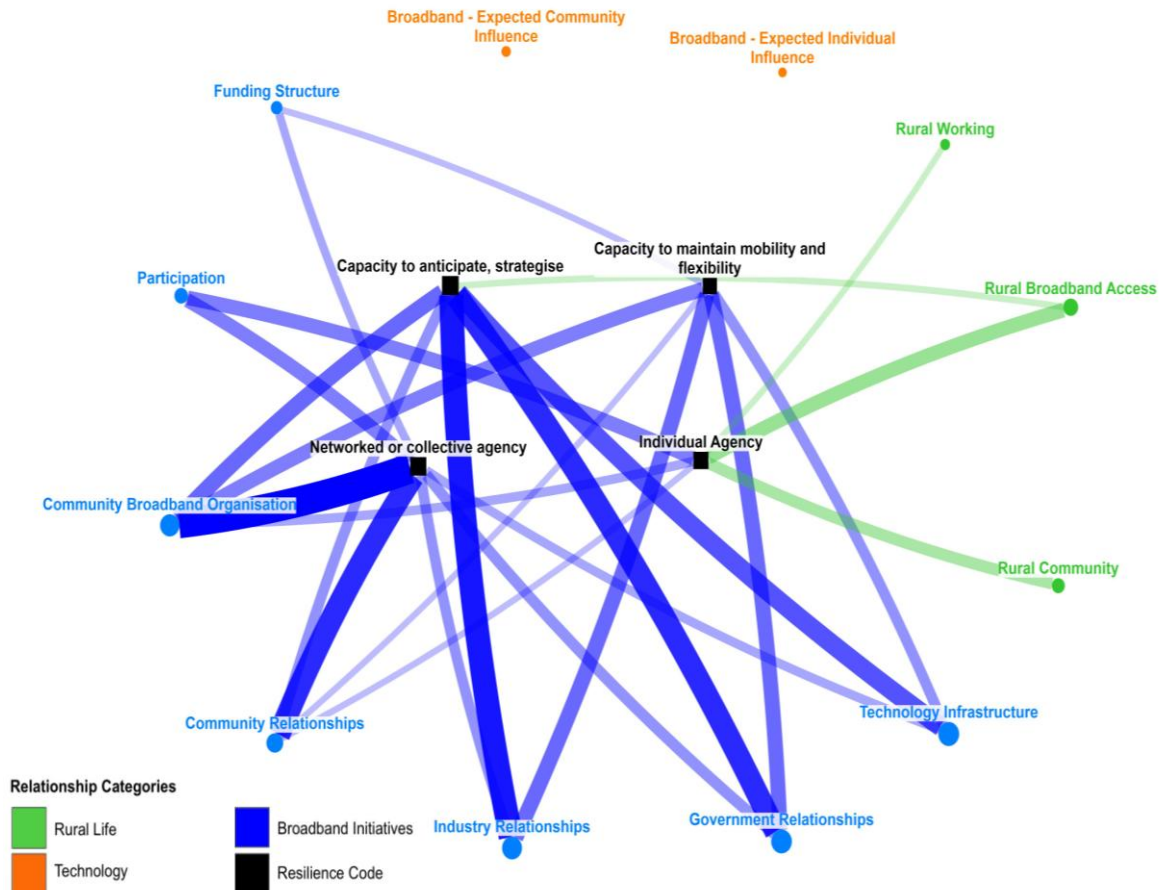


Figure 6 - 8 B4GAL Dimension 2: Agency

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between agency as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to agency and community-led broadband processes.

Agency and the B4GAL community-led broadband process depict some of the most complex interactions and implications for resilience. Individually, it remains difficult for the rural broadband user to engage with aspects of modern society due to a lack of reliable Internet connections and many resources being located solely online, detracting from their empowerment and individual resilience. A lack of connectivity has the potential to create

relative individual isolation. This was represented through the links between individual agency and participation, or inability to participate, and current rural broadband access.

“I don’t feel isolated living here...I feel isolated by the fact that I can’t do things to make life easier with regards to being online” (B4GAL 10).

The B4GAL initiative relies on individuals with time and energy to spend on the project, indicating the need for some level of pre-existing individual agency within its members, and potentially relying on existing capacity or creating uneven power dynamics (Lorenz, 2010). One interviewee noted that, with respect to funding arrangement for community-led broadband projects, wealthy communities could be more successful, emphasising the potential unevenness with respect to agency across rural areas when comparing or attempting to replicate community broadband projects.

“So again, struggling with funding, and the ones that we are seeing being successful, like [other community-led broadband project]. That is basically someone that has said sod this, I am going to fund it and I will make a loss, which I will make back over time. So basically it is someone putting their own money there. And unless you have someone really wealthy willing to bankroll it, you are a bit stuffed!” (B4GAL 3).

Collectively, agency was illustrated to be linked to community broadband initiative and community relationships, demonstrating that while resilience is strong within those internal B4GAL connections, it has not yet been linked to broadband opportunities due to the stagnation of the installation process.

The capacity for B4GAL to maintain momentum collectively as a broadband initiative is hampered by external relationships, including funding barriers through the BDUK roll out stipulations. This is represented here by the strong links with government relationships and industry relationships. The role of CBS has created a unique situation whereby B4GAL has been unable to exercise their networked agency, which is present, and is limited in their ability to develop the potential community-led broadband as a resource itself. The need to maintain momentum and be proactive in B4GAL in terms of reframing plans, technology alternatives and reacting to the government and industry involvement has been acknowledged by B4GAL. Yet, it has not always been possible for B4GAL to take action due to the need for external involvement (again, emphasising the fact that social resilience must incorporate local and extra-local interaction (Scott, 2013)). This puts B4GAL in a compromising situation, highlighting that their internal agency and resilience has not been able to overcome the need for multi-scalar interaction.

The capacity to anticipate and interact with B4GAL on the part of the general rural user is hampered through lack of information and clarity about the project and timelines. Consequently, there is the concern from B4GAL that individuals will go elsewhere for broadband access, further undermining the customer base of a community-led option. It remains difficult for B4GAL to anticipate and engage with the local community, traits highlighted by Davidson (2010) as relevant for resilience, when nothing is happening, or when aspects of the project are commercially sensitive, leading to a potential loss of credibility on the part of the community broadband project.

6.3.3.3 B4GAL: equity and resilience

The dimension of equity in B4GAL is considered now in the context of the following central question:

- In what ways do community broadband processes enable equal involvement of vision setting or encourage equal access for individuals and the community?

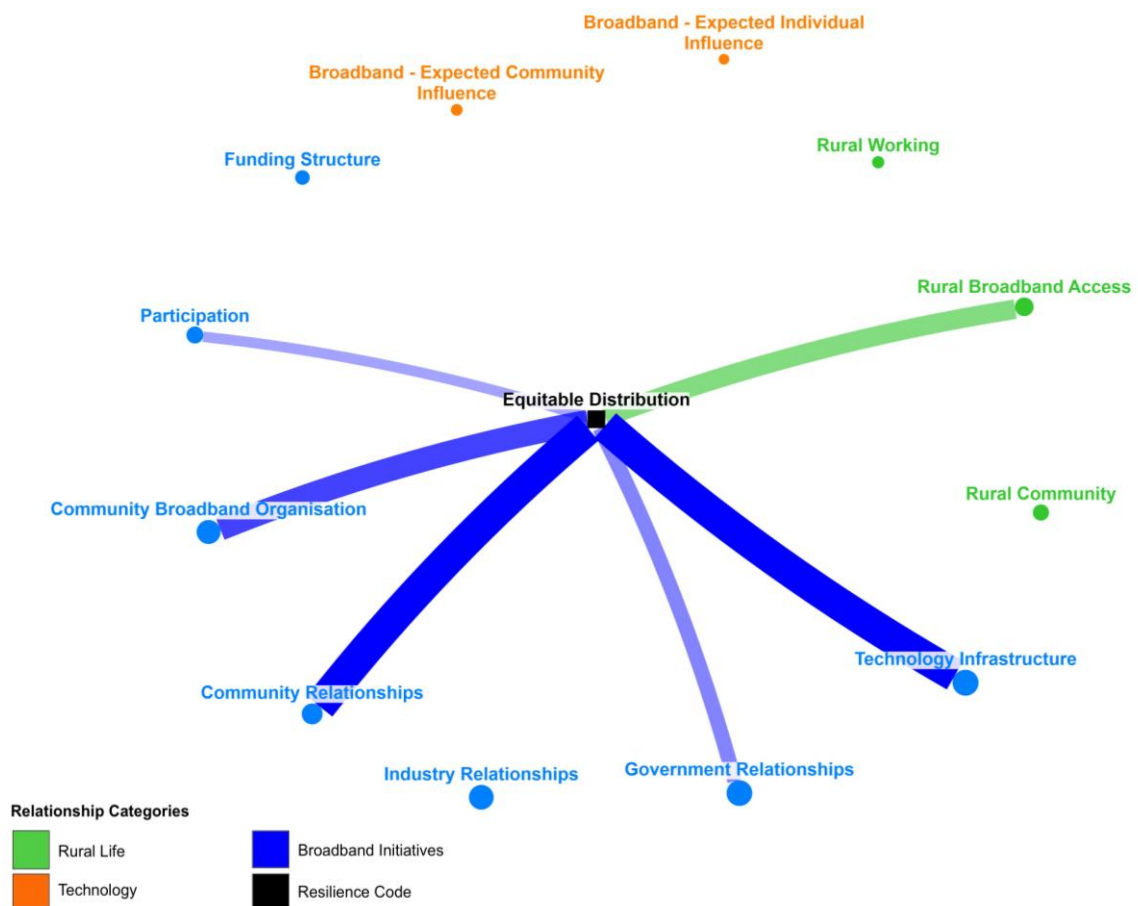


Figure 6 - 9 B4GAL Dimension 3: Equity

Figure Note: Each vertex depicted with a black square is representative of a 'resilience' node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an 'open' node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the 'relationship value', or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present

a relationship). This figure demonstrates relationships between equity as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to equity and community-led broadband processes.

Equity was discussed in very strong terms by B4GAL Phase II interviewees. Firstly, it was thought to be the central ethos of their broadband development plans, represented by the link to community broadband initiative, highlighting that everyone would get the same level of broadband access. This included individuals with physical limitations to connectivity, such as remoteness and distance from exchanges or cabinets, to ensure individual resilience in B4GAL. This is an example of the desire to create resource equity, or an equitable distribution of community assets (Adger, 2000).

“We believe everybody should be online, which is fantastic from the community side...” (B4GAL 3).

This thinking of resource equity is represented in the link to technological infrastructure. Alternative roll out options supported by national schemes are known to cover approximately 95% of premises, and therefore were not seen as equitable or as an adequate universal service in comparison to B4GAL. This was considered to limit individual and community resilience. B4GAL viewed broadband as an essential service that must be distributed equitably.

“So really we think, why did we even bother with CBS, why didn't they just pay BT, and say it has to be everywhere” (B4GAL 3).

This linked their concerns about equitable broadband access to government interaction, as they fought to have a place in provision to ensure equitable coverage for their rural area.

6.3.3.4 B4GAL: sense of place and resilience

Finally, the dimension of ‘place’ was considered in B4GAL in relation to the central question:

- In what ways do community broadband processes strengthen (or weaken) local identity (both individually and communally)?

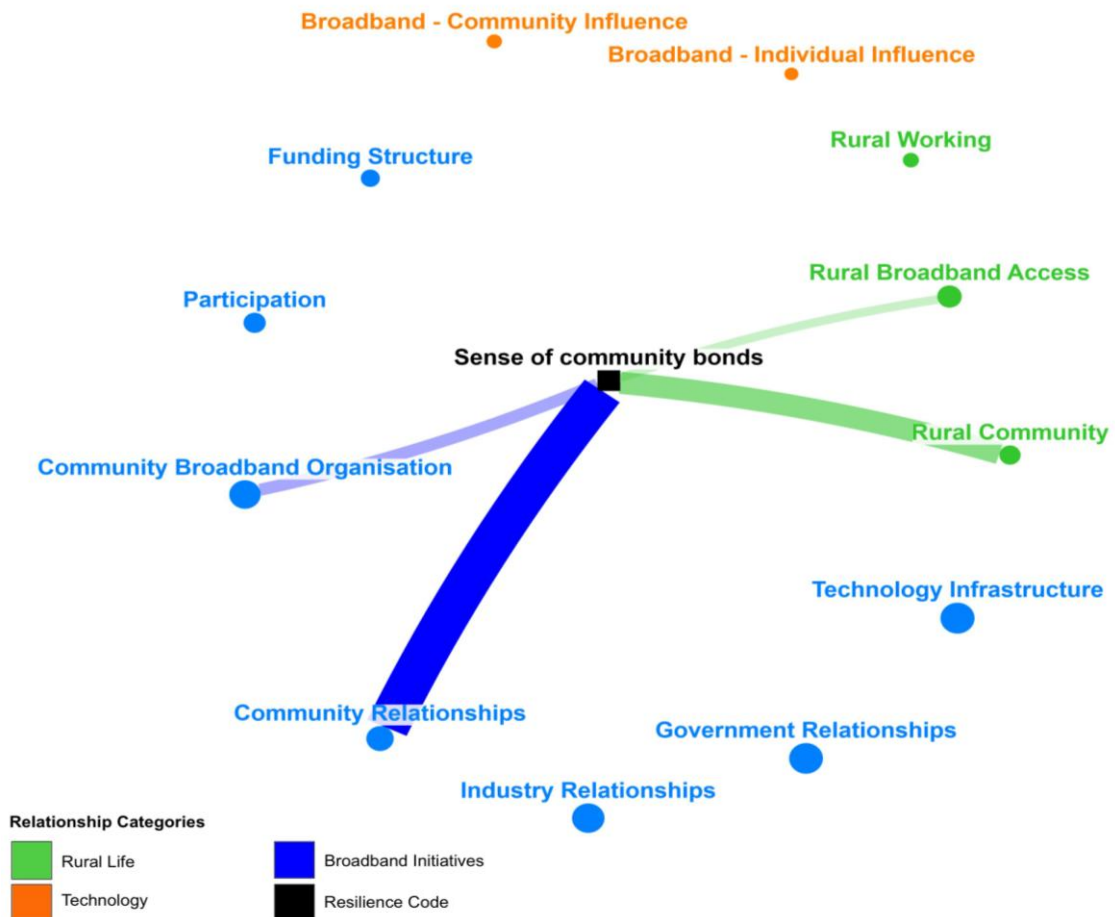


Figure 6 - 10 B4GAL Dimension 4: Sense of place

Figure Note: Each vertex depicted with a black square is representative of a ‘resilience’ node (located in the centre of the image) based on the dimensions outlined in Chapter Two. Each vertex depicted by a coloured sphere is an ‘open’ node (on the outside of the image) based on grounded coding. The size of these vertexes is reflective of the number of references in the interviews (i.e. the larger the vertex, the more frequently it was discussed). The width and opacity of the lines between each node is reflective of the ‘relationship value’, or the number of times the nodes overlapped within coding (i.e. the wider and more opaque, the more strongly present a relationship). This figure demonstrates relationships between sense of place as an element of becoming more resilient and community-led broadband processes.

This visualisation depicts the networks between resilience codes and open codes within the analysis. This allows the researcher to perceive the dominant areas for resilience development in relation to the sense of place and community-led broadband processes.

Community-led broadband processes in B4GAL appear to have strengthened the local identity of those involved in the initiative itself (depicted by the link with community relationships and broadband initiative). However, due to a lack of superfast broadband installation, any further understanding of this is limited.

“We, you know, we have been in muddy fields, and have started getting dirty and talking to landowners and estate managers, and it’s beginning to feel quite real” (B4GAL 9).

Throughout the progression of B4GAL, it has become clear that they have helped to create a ‘community’ of ‘community-led broadband initiatives’. Creating an informal network of information sharing and knowledge exchange (represented in the strong link to community relationships) exemplifies what Godschalk (2003) terms informal human associations for increased resilience. Despite this existing informally, B4GAL desires something more formal, and cited the government level as the level at which that could be established.

“Talk to other community groups. Seriously. There should be some sort of register, and I think CBS should be coordinating that...” (B4GAL 9).

Community broadband processes were also linked to the nature of ‘rural community’, the idyllic representation of rural with equitable and accessible services and an involved close-knit community dynamic, similarly identified as a contributor to community resilience by Schouten *et al.* (2012).

6.3.4 Summary

B4GAL has faced many challenges that have hindered the ability to roll out their community superfast broadband plans. The complex nature of B4GAL’s relationship with government and industry has created several pragmatic political challenges, including a lack of comprehensive government involvement. This created tensions between B4GAL, CBS and the Rest of Scotland procurement and detracted from B4GAL’s resilience due to the fractured nature of local and extra-local interaction. This process highlights that despite internal empowerment and resilience within the B4GAL region, the need for external links remained paramount (Scott, 2013). A lack of timely technical expertise for B4GAL detracted from their ability to adequately plan for coverage. A lack of perceived trust within and between the many levels of governance, underscoring the practical political challenges, significantly detracted from B4GAL’s ability to proceed, and has left volunteers of the initiative with negative impressions of such multi-scalar interaction. The dialogue of community broadband in B4GAL continues to situate them ‘against’ other large scale roll out strategies, and within the community itself, B4GAL has had to fight for credibility, another example of lack or loss of trust, limiting potential mobility (Hudson, 2010), and cooperation (Steiner and Atterton, 2014). This detracts from the ability of B4GAL to maintain flexibility and engage with community members, detracting from community scale resilience. Finally, requirements from higher scale bodies such as CBS have provoked mistrust, as the B4GAL community-led broadband initiative has completed tasks multiple times, decreasing any feelings of empowerment with the community-led broadband initiative. These perceived losses in trust in

both directions between B4GAL and the government continue to underscore practical multi-scalar challenges, isolating both community-led broadband initiatives and the national level telecommunications sector (and associated governmental departments) from integration. All of these multi-scalar features have contributed to the stagnation of the B4GAL project and detracted from the potential community-scale resilience generated through broadband access. Despite these scalar challenges, there has been a level of nested interaction within community-led broadband initiatives and B4GAL, projected through like-minded dialogue and a willingness to share and access information in an informal manner, an aspect of resilience thinking (Godschalk, 2003). It has been successful in both B4GAL and B4RN (see Section 6.2.1.1 and 6.3.1.3) as a way to network, learn technical skills, and share and occasionally 'borrow' knowledge and skills as required from other community-led broadband initiatives. This enhances individual resilience in the region.

B4GAL aims to provide a superfast terrestrial wireless system to the agreed upon hard to reach locations by the autumn of 2015. They hope to obtain funding from, amongst others, CBS and the Clyde Valley Wind Farm in order to complete this aim. Backhaul access continues to remain problematic for B4GAL, representing how the lack of resources can increase a community's vulnerability (Skerratt, 2013), and backhaul remains a point where government interaction could be beneficial for community groups. Although B4GAL has put aside any plans for FTTH at the moment, there is still the hope that eventually the denser settlements within their region could achieve FTTH to 'future-proof' their broadband connections. This illustrates the desire to generate more than simple broadband access (although that is the short term goal), but to generate sustainable access and increase equitable broadband coverage in the B4GAL region, enhancing individual resilience and representing the shift from coping (short-term adaptive response), to pro-active agency (Lorenz, 2010; Skerratt, 2013). B4GAL intend to continue to work within the auspices of the policy and telecommunications sector to negotiate for and ensure future development of equitable broadband access for their region.

6.4 Conclusion

This chapter has set out results from Phase II, or the 'post'-installation phase, of the research. It has presented a series of complex findings, highlighting the impact of community-led superfast broadband in comparison to its slower counterparts, and depicting vignettes of 'types' of users in B4RN to illustrate the use of superfast broadband on the ground in rural communities in the B4RN region. From the perspective of the broadband installation, B4RN benefited from access to technical expertise within the community which facilitated planning

of a technically robust fibre broadband network. This reflects the ‘technological capital’ identified as relevant for community broadband by Wallace *et al.* (2015). This technical expertise in B4RN also contributed to an efficient and realistic installation plan that afforded the project credibility when attempts were made to secure funding from the community. B4RN also had a community comprising of individuals with the ability to contribute funding to the initiative, which made up for shortfalls in grant applications. A lack of technical expertise in B4GAL during initial planning was a hindrance and the initiative needed to re-evaluate their project plans after both the expense of fibre cabling and the difficulties of reaching all households in a timely manner were recognised. This early set-back had knock-on effects: technological and cost uncertainties meant a business plan has not been developed, and has limited the ability to make funding and grant applications. B4GAL’s experiences suggest that the pre-existing regulatory frameworks for telecommunications and high-level policy decisions about community-led models are not conducive to the successful installation of small-scale community-led broadband services. This demonstrates a critical challenge facing community-led broadband initiatives as a replicable model in the UK. It also illustrates the relevance of integrated approaches to broadband development, incorporating local and extra-local policy bodies and the telecommunications sector at the outset. B4GAL has explicitly experienced degraded trust in the public bodies contributing to the digital strategies, and this has further detracted from any meaningful collaboration. This highlights that internal resilience is not always the only component required to interact with higher scale government and industry; a joined-up approach is needed to fully engage in the telecommunications industry and experience social resilience. However, B4GAL continues to work towards providing broadband to their community and hopes to install a wireless solution in the near future.

The B4RN and B4GAL projects both have strengths and weaknesses but what has undoubtedly given B4RN ‘an edge’ is the technical expertise held within the local community, resourcefulness, and the willingness (and ability) of members of the community to pay in cash or in kind in order to develop a local broadband service.

Reflecting on social resilience and broadband use in B4RN, individuals with access to superfast broadband in B4RN appear to be empowered to participate in the wider digital society, engaging and developing new understandings of ‘digital’. This included interviewees developing an understanding about Internet-enabled devices, such as Smart TVs, and considering new future technology opportunities. Broadband again was highlighted as an

individualised tool in B4RN, a concept strengthened from Section 5.3.2, and most of the community benefit stemmed from the participatory process of broadband installation. Again in this phase, interviewees in B4RN and B4GAL discussed the potential for broadband access to renegotiate patterns of living and working in rural areas, which could lead to increased structural community change. While it was clear that evidence for such change could not be observed over the lifetime of this study (i.e. any such patterns would emerge more gradually than over a two or three year period), it would appear that individuals and community organisations (such as the village hall and church organisations) are actively taking up this dialogue and investigating future potential for their community through superfast broadband access, a discussion which could, in future, translate into rural demographic change.

7 IMPLICATIONS OF BROADBAND TECHNOLOGY FOR RESILIENCE

7.1 Introduction

This doctoral study has set out to explore the impact of the installation and use of community-led superfast broadband in rural communities in the UK. Using the lens of ‘social resilience’, this thesis has illustrated the multiplicity of community-led broadband impacts on both individual and community resilience. The literature review (Chapters Two and Three) first sought to situate our understanding of social resilience within wider academic debates, and to relate resilience directly to rural superfast broadband provision and use in the UK. Chapter Two directly detailed the evolution of ‘resilience’ as a concept for research. Contemporary resilience theorists promote its potential applications in social science research (e.g. Scott, 2013). However, resilience has yet to be applied to academic research in a uniform manner. Thus, the literature review developed a conceptual framework of social resilience, built through extensive review of the academic resilience literature and critiques thereof, to be applied to qualitative research materials. Drawing on the interdisciplinary nature of this doctoral study, Chapter Three introduced the digital dimensions of this research, extending beyond this theoretical framework of social resilience to reflect on issues of broadband technology. The review considered contemporary rural broadband provision practices, and identified emerging alternative methods for superfast broadband provision, namely community-led initiatives. These community-led broadband initiatives have become prevalent in rural areas of the UK in order to respond to the lack of market-led broadband development. Information about such initiatives in the context of the telecommunications industry and related digital policy was found to be limited. The review then identified that corresponding knowledge in relation to superfast broadband use benefits has been fragmentary and limited in current literature, often lacking depth (Ashmore *et al.*, 2015; Kenny and Kenny, 2011). Therefore, this thesis harnessed the concept of ‘social resilience’ as a framework to analyse the impacts of rural community-led superfast broadband provision and use in the UK. Application of this resilience framework to contemporary broadband provision approaches enabled analysis of community and individual resources, adaptive capacities and proactive agency, and place-based impacts. This analysis has provided insights into rural technology access, broadband installation practices, and the role of rural communities in superfast broadband provision.

The research methodology (Chapter Four) outlined the theoretical positioning of this research, and introduced the two chosen rural case studies. The chapter then developed a

qualitative, longitudinal methodology using pre- and post-installation phases for data collection. Three stages to the analytical process for the qualitative data collected for the study were introduced: open coding, 'resilience' coding and conducting relationship analysis, all of which contributed to determining the dominant relationships between resilience and community-led broadband installation and use. The multi-layer coding process was demonstrated to enable an examination of dynamic affiliations or 'phenomena' between social resilience and broadband technology. This chapter was followed by the findings and discussion of the pre-installation phase (Chapter Five) and the post-installation or follow-up phase (Chapter Six). This doctoral research has enabled diverse and in-depth reflection on the dynamics of community-led broadband as part of the wider telecommunications sector. It has provided guidance for future developments in policy, community initiatives, and the telecommunications industry as a whole.

In this concluding chapter, the key discussion points taken from the analyses presented in Chapters Five and Six are reviewed. In the first section, I review the thesis' aims and objectives, initially set out in Chapter One (Section 7.2). This is followed by an extended critical discussion of the key findings drawn from the qualitative research materials (Section 7.3). These findings explore the principle contributions made through this research to academic scholarship. The discussion firstly sets out the relevance and successful application of the conceptual framework of social resilience, highlighting its potential as an analytical tool for other areas of rural development (Section 7.3.1). Following this commentary, the components of social resilience that are relevant for community-led broadband initiatives to succeed as a method of rural broadband provision are explored (Section 7.3.2). It is here that I contend with the many diverging pathways of resilience, emphasising both those pathways of the community-led process that detract from social resilience (i.e. act as vulnerabilities) and those that contribute. I firmly place community-led broadband within its neoliberal motivations: these community initiatives are very much shaped in response to external institutions and systems. On turning this section's attention to the implications of the study's findings for policy, the relevance for comprehensive linked approaches from all levels of government to successfully generate long-term broadband installation practices for rural areas is considered. The importance of power relations and human agency, discussed by many resilience theorists (e.g. Armitage *et al.*, 2012; Cote and Nightingale, 2012), is then explored in the context of community-led broadband processes (Section 7.3.3). I explicitly express the power relationship between community-led initiatives and the national digital policy agenda, highlighting the current rising incompatibility between community-led broadband and market-

led broadband approaches. I also consider the rural/urban power relationship with respect to broadband provision. There is a general expectation that rural participative capacity will be present and able to overcome rural market failure, leaving rural communities ‘responsible’ for their own broadband development. This has ultimately created an uneven rural/urban broadband installation landscape, as urban communities are not expected, nor required, to engage with the installation process in order to achieve broadband access. Finally, I consider the implications of the ‘need for speed’ rhetoric and the use of superfast broadband in rural areas (Section 7.3.4).

The research approach is reflected upon directly in Section 7.4, providing a platform for a critical and self-reflexive commentary of the merits and shortcomings of the conceptual framework of resilience and the qualitative research approach. Finally, I identify recommendations for future research agendas (Section 7.5).

7.2 Review of thesis aims and objectives

This doctoral research has explored the impact of the installation and use of community-led superfast broadband in rural communities, seeking to uncover valuable information to better understand the impact of current telecommunications installation practices as well as develop recommendations for future rural digital policy interventions. Through the establishment of a social resilience framework, factors that affect the development or enhancement of individual and community resilience have been identified. The objectives of this study were:

- To build and critically evaluate the *concept of social resilience*.
- To develop and analyse the *potential relationship between social resilience and broadband technology*.
- To identify and characterise *trajectories of community-led broadband initiatives* and investigate *the scalar relationships* that community-led broadband initiatives exploit to obtain services.
- To elucidate how the processes of broadband acquisition are *contributing to the changing technological rural landscape* and how that may contribute to *individual and community resilience*.
- To investigate what broadband *speeds are ‘needed’ in rural communities and for what purpose* and identify how they are contributing to *individual and community resilience*.

This thesis has built and critically developed the concept of ‘social resilience’, tracing it from its origins in the physical sciences (Section 2.2.1) to its use in social disciplines (Section 2.2.2

and 2.2.3). As a concept, resilience was critically evaluated and considered in relation to other rural community development concepts (Section 2.2.4 and 2.3 respectively). Its past uses in academic and policy literature were highlighted, and the place for resilience in social research was then emphasised. The successful creation of a conceptual framework of social resilience followed (Section 2.5), and its application in this doctoral study was outlined (Section 4.7). The conceptual framework of developing resilience highlights four areas of enquiry, or analysis, including resources, agency, equity and sense of place, all of which are considered within the individual and community scale.

The concept of 'social resilience' was then related to the digital dimensions of this doctoral research, specifically community-led superfast broadband installation and use (Chapter Three). The potential relationship between broadband and individual and community resilience was discussed specifically in theoretical terms (Section 3.3). This discussion emphasised the potential for broadband to act as a resource for economic and social engagement, to encourage and maintain flexibility of agency, to enhance equity, and to create new or enhance current community, or place-based, bonds at both the individual and community scale. The research was then positioned within theoretical understandings of 'community' and 'rural' (Sections 3.3.1 and 3.3.2 respectively) to fully appreciate the implications of undertaking rural, community-based digital research.

The state of broadband development and installation in the UK was then considered (Section 3.4). I highlighted the prevalence of fixed-line broadband as the main method of broadband provision for rural communities, often due to costly and limited alternatives (Section 3.4.1). I then set out current targetted initiatives for rural broadband installation, internationally (Section 3.4.2) and within the UK (Section 3.4.3). The potential for rural community-led broadband initiatives, as a method of rolling out broadband for hard to reach locations, was highlighted here. It was then given extended treatment in Section 3.5, demonstrating the place for rural community-led broadband initiatives within the wider political economy and as a replicable model for broadband development (Section 3.5.1). I also illustrated practical business models for community-led broadband development processes (Section 3.5.2). I concluded by identifying the lack of information about the place for community-led broadband within digital policy and the wider telecommunications sector, demonstrating the motivating factor for conducting this research.

This doctoral study then examined and characterised the processes of community-led broadband installation through two case studies, introduced in Chapter Four. The analysis of the two case studies underscores the inherently political nature of broadband acquisition at the rural scale, and the difficulties of community actors engaging with higher level industry and political bodies (see Sections 5.2.4, 6.2.1.2, and 6.3.1). I investigated these scalar relationships that community-led broadband initiatives must consider, and engage with, to obtain broadband services. The challenges for extra-local interactions between community-led broadband and regional and national governments (for factors such as funding, guidance or technical support) within the two case studies has limited social resilience enhancement at both the individual and community level, as discussed in Sections 6.2.3, 6.3.3 and 6.4.

The local nature of community-led broadband acquisition, as a locally-initiated and run process, has contributed to the changing technological rural landscape as well as to individual and community resilience. Community-led broadband initiatives have led to a general community-wide interest in potential technological opportunities in both B4RN and B4GAL. This is due to individuals engaging and networking with each other throughout the local installation process of the community broadband services. This interest has perhaps increased the potential for future technological intervention and change for rural individuals. The findings also identify that the participative installation methods of community-led initiatives are contributing to both individual and community scale resilience (Sections 5.3, 6.2.1 and 6.3.2). The importance of leadership and the presence of skilled individuals for the success of community-led broadband initiatives was also identified, factors which can limit the replicability of such initiatives across the range of rural areas in the UK (Section 5.2.1). These findings underscore the complexities of community-led broadband initiatives, their development processes and the role of leadership, as well as the importance and relevance of multi-scalar relationships.

Finally, I have investigated the influence of superfast broadband speeds for rural communities in one of the case studies, identifying how an increase in broadband speeds and capacity is contributing to individual and community resilience. In B4RN, the increase in broadband speed and capacity to a 1 Gbit/s broadband connection has contributed primarily to individual resilience. Superfast broadband has, in comparison to older technologies, illustrated the potential for rural individuals to engage more widely and in an efficient and reliable manner with external bodies, communities of interest and personal networks (Section 5.3.1 and 6.2.2.1). This engagement is thought to lead to individual resilience enhancement. The

enhanced digital literacy of interviewees concerning digital services, devices and future alternatives was also a result of the community-led superfast broadband use (Section 6.2.2). This contributes to individual agency and empowerment in an increasingly digital society.

This section has served to provide an overview of the aims and objectives of the doctoral research. It has, in brief terms, outlined responses to each objective set at the outset of this doctoral study. The following section will now provide a more in-depth commentary on the thesis findings, expanding the discussion to unearth nuanced detail and consider the results within wider societal and policy implications.

7.3 Synthesis of thesis findings

Taken in its entirety, this research has multiple intersecting and diverging findings. This section will synthesise those findings, stressing the contribution this thesis has made to academic scholarship. I will discuss the findings and their relevance in relation to: 1) the furthering of academic literature on the subject of social resilience (Section 7.3.1); 2) the role of community-led broadband within local communities, as well as within the wider telecommunications sector and public policy (Section 7.3.2); 3) the relevance of power relationships impacting upon community-led broadband and rural broadband provision (Section 7.3.3); and 4) superfast broadband use for rural individuals and communities (Section 7.3.4).

7.3.1 Application and enhancement of ‘resilience’ in rural geography

The main theoretical contribution this thesis makes to academic debates is the furthering of the concept of ‘resilience’ in a social context. Within this thesis, the concept of ‘social resilience’ has been introduced, detailed and debated, and finally used within a methodological framework that applied resilience to newly collected qualitative research materials. In contemporary social science academic research, resilience, and its formal theorisation, has become more frequently present. This is evidenced by works such as Skerratt (2013) and Scott (2013). This thesis enhances this recent research interest in resilience as a social theory, concept, and tool for understanding and evaluating community development. The thesis effectively unpicks the growth and development of resilience as a concept, considers its use across multiple disciplines, and creates a multidisciplinary understanding of social resilience to be applied to the digital dimensions of this research.

The term ‘resilience’ in ecology (Holling, 1973), considered the starting point for resilience theorisation in general, has been related to the social context over the last 15 years. It was

initially introduced by Adger (2000) in his work on social-ecological resilience. In the intervening years, the definition and use of resilience has been heavily critiqued (e.g. Davidson, 2010; MacKinnon and Derickson, 2012; Walsh-Dilley *et al.*, 2013), and it is through these critiques that ‘social resilience’ as a formal concept has emerged. Using the foundation of these previous resilience and resilience-related studies, this thesis has built a formal analytical method, focussing on four dimensions of the concept. These four dimensions, resources, agency, equity, and sense of place, act as a conceptual framework to develop an understanding of the presence and enhancement of resilience within the context of the findings of qualitative research. This method is more holistic and relevant for identifying processes of becoming more resilient, rather than focussing strictly on single statistics or quantitative datasets to ascertain ‘resilience’, which is a state of being. I illustrate the four dimensions in Figure 7 - 1, first introduced in Chapter Two, demonstrating their overlapping nature.

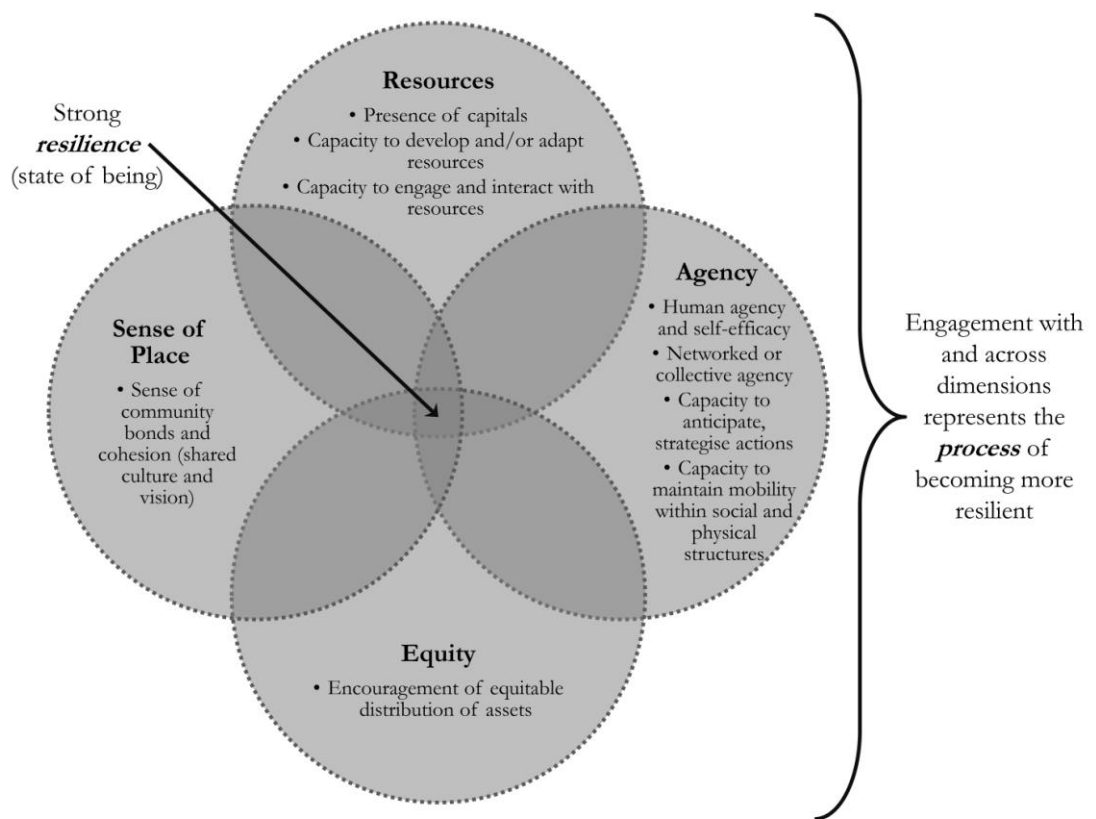


Figure 7 - 1 Dimensions of resilience

Following the construction of this conceptual framework, it was then applied through a systematic coding process to the qualitative research materials collected for this research. This ultimately led to the creation of a network analysis between grounded findings concerning

community-led broadband and potential resilience in the case studies and represents the first instance of identifying resilience dimensions through a robust conceptual framework. Conducting this study in a phased longitudinal manner, as a pre- and post-installation study, also represents the recent shift in developing and identifying resilience as a process, whereby findings from one single point in time cannot accurately reflect that community's resilience (e.g. Skerratt, 2013). Resilience of social systems is considered to follow many transitional pathways (e.g. Curtis, 2010), and therefore applying resilience to a process-driven methodological approach allowed for analysis of individual and community development as they related to community-led broadband over time.

The use of resilience in the context of technological shifts provides a unique case for reflection on the effectiveness of the concept of social resilience. For example, let us consider the two case studies in direct relation to Figure 7 – 1. Simplistically B4RN had high levels of individual *agency* in its volunteering structure that were able to engage with *resources* effectively, and through key individuals with *strong technological and human capital*, build a broadband network. I believe that this presents an argument for the interdependency between agency and resources within social resilience theory. With respect to the other dimensions, within B4RN there was a strong *sense of place*, particularly over specific villages which propelled the building process. The strong sentiment across the region to get rural areas 'caught up' to urban areas technologically represented the focus on increasing *equity* across the UK with respect to broadband resources. Applying these features to my illustration of developing resilience, I believe B4RN to have positive, active features of each dimension, leading it to be strongly resilient. B4GAL, interestingly, has similar features which must be understood in their context to reflect on the ultimately different outcomes that were present during this research. B4GAL does have active *agents* with high levels of motivation and intentions for equitable access to broadband. However, there was a *lack of technological knowledge and capital* within the B4GAL team, which slowed progress as external parties needed to be consulted (representing an alternative pathway). This illustrates that having proactive individuals is beneficial, but its influence on developing resilience is limited due to the interdependency between agency and the resources available. While some place-based bonds existed, there was *less cohesion* within the region, limiting the potential of 'sense of place' to play a role in developing resilience. Simplistically each dimension of developing resilience was present. However, the fluctuating levels of each dimension have limited the development of strong resilience for B4GAL. I have ultimately demonstrated that a social resilience analytical framework can unearth nuanced understandings of community and policy narratives (as theorised by Scott, 2013) that would

not have been identified and discussed otherwise. This was particularly relevant when analysing the relative success of B4RN and the presence of resilience characteristics on an individual and community scale in comparison to B4GAL. I have been able to identify unique interdependencies, such as those between agency and resources, the sensitivity of resilience development to fluctuating levels of place-based bonds, and critical components for resilience development in the context of broadband (technological knowledge and capitals).

Considering social resilience theory more broadly and for future research, it can now be applied to assess a wide range of rural development challenges. For example, resilience theory can be used to characterise rural economic development processes, identifying any problematic or effective features for social resilience. A recent study applied social resilience when discussing the challenges facing the coastal fishing industry, namely fisherman recruitment and business sustainability (White, 2015). In this case, the authors emphasised the holistic approach required for enhancing the resilience of rural coastal development in such fishing communities. In contrast, focussing on single policy strategies such as funded education had proven problematic for the industry's resilience. Social resilience theory can also provide a useful perspective when considering participation in rural community organisations and local groups. This has been demonstrated through this thesis' work on broadband organisations. Parkhill *et al.*'s (2015) recent study on community-led energy initiatives similarly applied resilience thinking. Here, the authors emphasised the challenges for place-based community energy organisations due to both internal challenges and actions of external forces, such as the changing energy market. These issues influenced civic engagement and social capital of the rural communities. They stated that: "Enforced change at national level can threaten local resilience and adaptability, but stability or rigidity at this scale can also be a powerful barrier to change. Community resilience can thus be threatened by action at other scales (e.g. at the scale of national policy), but it could also be supported and enhanced there" (Parkhill *et al.*, 2015, p. 9). The ability to identify the impact of policy strategies and scalar relationships on community industries and organisations is a beneficial feature of using a social resilience framework. From the literature reviewed in Chapter Two, to these two more recent works on social resilience presented here, it is clear that social resilience theory can act as a tool for communities to understand and enhance their development, as well as an analytical tool for academic researchers across a wide range of sectors to underscore pathways to rural community development.

In relation to the understanding of social resilience developed throughout this thesis, I argue that social resilience theory is now ideally placed to contribute to our understanding of rural communities and their development. Social resilience, as a conceptual framework, has been demonstrated within this thesis to have the ability to:

- Examine linkages between local and extra-local actors and understand their role for rural development (emphasised by Mackinnon and Derickson, 2013 and Parkhill *et al.*, 2015).
- Examine and understand individual and community resources or capitals including physical, economic, and social resources (emphasised as an intrinsic part of resilience by Wilson, 2012b).
- Contribute to our understanding of the development of adaptive capacities by both individuals and community organisations (developed across the resilience literature, and summarised by Skerratt, 2013).
- Identify leadership practices and their influence on individual and community action (placed central to social resilience thinking by Berkes and Ross, 2013).
- Contribute to our understanding of a community's sense of place and place-making, and the influence that has on community engagement and development (emphasised by Lyon, 2014).

These features have then been related to the enhancement or detracting of social resilience across multiple pathways for the rural broadband case study initiatives. Broadly, understanding these processes is critical for rural development research, and therefore social resilience theory has been developed in this thesis to be highly useful and relevant to rural community researchers.

7.3.2 Implications of technology installation from a community-led perspective

Community involvement in broadband development is very important and of particular relevance in the context of service installation in rural, geographically disadvantaged, communities (e.g. Carnegie UK Trust, 2012; Gillett *et al.*, 2004). Community-led broadband initiatives, as examined within this thesis, contribute to the development and enhancement of social resilience through several pathways. Firstly, community-led broadband initiatives are reliant on the emergence and presence of local leaders who provide credibility and traction to such technical projects. Strong leadership is critical to encouraging collective motivation and, ultimately, is linked to the enhancement of social resilience within the community organisation (Roberts and Townsend, 2015). This is similar to the finding from Wallace *et al.*'s (2015) work,

which identified the importance of internal social capital for community broadband initiatives. Secondly, individual participation and interest in technological advancement from a ‘community-led’ perspective was reliant on both individual’s local, spatially-oriented identity (whether they were concerned about community participation and interaction with their community) and their individual Internet technology identity (how much they chose to use and interact with broadband-enabled resources). Both of these facets of identity can alter an individual’s resilience. For example, participation with the community-led volunteer-based process can help to develop new social relationships, and strengthen local identity for those individuals involved. However, the fluidity of the community-led installation process in both B4RN and B4GAL, due to its voluntary nature and informal communication, hindered some levels of adoption. Potential users, mainly those interested in the broadband services due to their Internet technology identity, were left with little information or irregular communication (particularly during the B4RN installation process). This has detracted from their individual agency and ability to engage, demonstrating a vulnerability to the community-led process.

In order to understand the pathways to capacity building within the B4RN and B4GAL initiatives, it is relevant to consider the relationships between local and extra-local actors and organisations within each initiative. These local and extra-local relationships are considered to be highly relevant for developing social resilience (e.g. Keck and Sakdapolrak, 2013). Community-led broadband must engage with the policy bodies and telecommunications industry rolling out broadband to the rest of the UK. This engagement could be to obtain funding, advice, planning permission for building, or to determine backhaul access points. This political engagement is a central part of resilience, introduced in Chapter Five, and became particularly evident in the in-depth discussions presented in Chapter Six. Multi-scalar interactions with national and county/local authority level policy bodies played out in the two case study areas in differing ways, but with remarkably similar outcomes.

As discussed in Chapter Six, the symmetry between both the B4RN and B4GAL case study’s interaction with higher scale government bodies, despite one case study being successful in installing a superfast network and one currently not, highlights the failure of central government policy strategies to meaningfully support community-led broadband developments. Although both case studies intended to scale up and interact with government organisations such as the Rural Community Broadband Fund (RCBF) and Community Broadband Scotland (CBS), both B4RN and B4GAL found that they were not provided with any useful assistance. In addition, when they did interact, they felt hindered by the extra-local

involvement. Within resilience thinking, these multi-scalar interactions are paramount to building social resilience. Keck and Sakdapolrak (2013), for example, consider social resilience to be a *product* of both local and extra-local interactions. This tension between government and the community-led broadband initiatives has left these community groups with little leverage and as a result felt they had wasted time and energy by engaging with these governmental organisations. This stands in contrast to other policy discourses actively encouraging community activity and engagement. Internal resilience, while present in both case studies, is not a wholly useful trait without the external, or extra-local, linkages to support and contribute to community-based action.

Both case studies found that, while their linkages with government and the traditional telecommunications industry were often fractured or non-existent, by creating an active networking node of parallel community-led broadband initiatives they were able, to a degree, to proactively manage their project's progress and enhance the community initiative's resilience. This is representative of developing external relationships and 'bridging social capital' (Wallace *et al.*, 2015). This node of community broadband initiatives has grown organically, and while there is no central point of contact, it is apparent that the community-led broadband initiatives in the UK (beyond the two presented in this doctoral study) connect and intersect and, importantly, collectively contribute to other projects.

The current policy framework in the UK for rural broadband provision includes community-led broadband initiatives as a positive method of installation and is set up to provide support and funding to communities that wish to pursue such methods. However, in practice, the regulatory nature of BDUK has proven cumbersome and at times a hindrance to the community-led broadband development itself. This research critiques the policy delivery mechanisms of BDUK, and highlights key areas of deficiencies within the community/policy relationship, primarily the lack of transparent dialogue between national providers under BDUK and those community groups wishing to engage with BDUK related funds. For example, B4GAL struggled to ensure transparent communication with their communities, which in turn influences participation and interest levels, due to the need to maintain commercial sensitivities when negotiating for BDUK funds. This demonstrates that the 'community-led' process faces additional challenges compared to market-led provision, particularly when maintaining information flow with limited volunteers and time to dedicate to such endeavours.

This study of community-led broadband contributes to our understanding of the importance and complexity of the interaction between local and extra-local forces for rural communities. It is apparent from the evidence presented throughout this thesis and in this section, that there are numerous pathways through which community-led broadband initiatives can engage with policy and the wider telecommunications sector. However, despite the increasing interest for community-led approaches to contribute to rural broadband provision (e.g. Carnegie Trust UK, 2012; Dubinsky, 2015), these initiatives are not well integrated into UK national digital policy. As illustrated by the Independent Networks Cooperative Association (INCA) (2012), policy is relevant for rural broadband. It is generally suggested within both government and broadband interest groups, such as INCA, that community-led broadband is an appropriate method for rural broadband provision, and that it is an approach that could be supported by national level policy strategies (e.g. Buneman and Hughes, 2013). However, there is a lack of 'clear and coherent' policy structure from government to support the potential for ICT use. Laffin and Ormston (2013) contextualise this gap by highlighting that our understanding of the causal relationships underlying policy problems is poor because of the range and complexity of the factors involved in social problems. I argue from this that the piecemeal understanding of the influence digital policy has on broadband installation in general has diminished the potential for improving broadband installation approaches in rural areas. Ineffective digital policy for rural broadband provision has ultimately limited the ability to create greater integration between the many broadband provision methods, including market-led and community-led initiatives. Reisdorf and Oostveen (2015) discuss the most recent digital strategy from government, that 'nearly all homes' in the UK should be able to receive superfast broadband speeds of up to 100Mbit/s. However, basic broadband services, of low speed and capacity, remain common in rural and remote areas and timelines for improvements to these services remain vague. Arguably, certain elements of digital installation policies and strategies need to be reevaluated to accelerate the installation and adoption of superfast broadband for rural areas (LaRose *et al.* 2014). If not, this geographical digital divide will continue to deepen.

The eagerness of policy makers to encourage a 'superfast Britain' and to create universal broadband coverage rather than universal superfast broadband coverage (e.g. BIS, 2010a), aided by the actions of such community-led broadband entities, is misguided if there continues to be a lack of guidance for communities on best practice for interacting with the wider, often publicly subsidised, neoliberal rural telecommunications market. One-off national scale policy interventions, including BDUK, targeting the 'majority' of limited access

communities, are unlikely to conclusively and successfully create a 'superfast Britain'. Existing policies are more likely to need support of additional infrastructure projects in the near future as hard to reach locations remain underserved and new technology opportunities are developed which require capacity that is beyond the installed rural infrastructure.

On turning our attention to the organisation of community-led broadband, I can begin to place community-led broadband initiatives in relation to rural development paradigms. This provides another perspective to understanding their influence on social resilience within rural communities. Community-led broadband initiatives represent a strategic response from rural communities to improve stagnating rural telecommunications infrastructure (e.g. Carnegie UK Trust, 2012). Community-led broadband, considered in wider, more theoretical terms, is initially reflective of Hildreth's (2011) model of community localism, where power is decentralised from the central or local state to the people and their local communities. The presence of the RCBF and other bodies, including the CBS in Scotland, exemplify national government's role in directing responsibility for rural broadband from themselves and commercial providers to the local communities. Shucksmith and Talbot (2015) have since extended Hildreth's model and emphasise the many examples of rural development that come directly from local people, rather than being more directly related to local or national state action. They place the state in a minor role in terms of stimulating the action. I argue that community-led broadband is indeed an example of Shucksmith and Talbot's (2015) understanding of community localism. Community-led broadband initiatives have, largely, come from local people. However, the role of the state remains exceedingly complex. Firstly, community-led broadband interestingly stands as an example of 'community localism', with the community directing local broadband development. Secondly, community-led broadband is a *result*, not necessarily of direct government devolution of responsibility for broadband, but of ongoing national government ideology which places the 'responsibility' for rural development at the local level. The neoliberal ideology that underpins the telecommunications industry has resulted in lower commercial investment across rural communities as time has passed (Simpson, 2010; Sutherland, 2015). This overarching mentality has pushed some rural communities to begin to build broadband networks, as a method of 'staying connected' and ensuring their own social and economic resilience as individuals and communities. However, national government has rarely acted as an 'initiator' to this process, as noted in Wallace *et al.* (2015). This has resulted in community-led broadband initiatives potentially entrenching ideas of rural 'self-sufficiency', where rural communities are able, and willing, to respond to varying degrees of change or market failure to enhance their own resilience. This proliferation of the

perspective that rural spaces are wholly self-sufficient can create conflict for communities unable to participate and yet being held responsible for their failure to gain infrastructure and resources from a national government perspective. Resilience thinking has highlighted this aspect as well (e.g. Walsh-Dilley *et al.*, 2013). Particularly from the digital infrastructure perspective, communities lacking technological capital may not be able to engage productively with broadband installation and adoption, illustrated by the differences between B4RN and B4GAL set out in this thesis, as well as by Wallace *et al.* (2015).

Community-led broadband initiatives are, in a neoliberal agenda, essentially rural development projects, exemplifying the benefits of local development approaches (i.e. being able to understand and develop a network that can work for the area) but also the importance of extra-local forces for both motivating and contributing to such development (i.e. both in being the force that created the need for community broadband, but also the more practical nature of providing access to backhaul and global networks). The following section will more succinctly refine our understanding of the specific ‘power’ relationships at play within community-led broadband processes.

7.3.3 Power and agency in rural broadband access

A complementary discussion about power and agency in rural broadband access, specifically in community-led processes, is necessary to fully appreciate the implications of both community-led superfast broadband case studies for social resilience.

B4RN and B4GAL represent two strands of community-led broadband initiatives: one which has built upon existing resilience qualities that have been harnessed effectively and used to create a broadband network; and one which, although the community initiative has many resilience traits, has struggled to overcome many external challenges and multi-year delays that have culminated in a smaller network than initially envisaged. This illustrates that the current, *ad hoc*, nature of community-led broadband in general potentially creates power imbalances between rural communities and continues to contribute to uneven broadband development across the UK. This is in spite of the general aim of community-led broadband to create equitable broadband provision for rural areas of the UK.

By using the resilience framework for analysis I have identified that B4RN, which presented a beneficial combination of internal resilience traits including high levels of proactive agents with technical skills, time and community funding mechanisms, has succeeded in developing community-led broadband. In essence, B4RN was able to draw on local resources to succeed.

However, that is not to say that it is a ‘rural-proof’ method for broadband development that can and should be replicated across rural UK. Both B4RN and B4GAL are community-led, *voluntary* initiatives which were established by interested individuals and leaders. These individuals have the potential to entrench existing social structures and ideals of rural self-sufficiency. This can limit the agency of other individuals in that community and limit the potential such individuals have to contribute to the community-led initiatives. B4RN’s specific limitations as a replicable model include its reliance on local resources (such as motivated individuals and financial capital identified as also relevant for community-led broadband success by Wallace *et al.*, 2015), and its lack of a working relationship with higher levels of government. The latter point, emphasised by Saleminck and Bosworth (2014) as relevant for community broadband development, undermined its potential (see Section 6.2.1). Ultimately, there was a lack of successful networking in B4RN between the local community and the wider regional and national government. Shucksmith and Talbot (2015) discuss the need for local and extra-local resources when considering ‘networked rural development’ on a wider scale, stating that:

‘Networked rural development as a form of localism is about local people having greater control over local development. It is not, however, about them only drawing on local resources to do this. It is predicated on the need for local control, but drawing on the resources of extra-local networks, with the state having an important role to play...This form of localism would be significantly damaged by a reduced capacity in central and local government...these circumstances raise the spectre of localism as reversion to self-help: in other words a bottom up development model, in which rural community are increasingly left to themselves...Some would say this is the essence of the UK Coalition Government’s ‘Big Society’ idea. This is a recipe for growing inequality and a ‘two-speed countryside’ (p. 271).

In both cases, B4RN and B4GAL, the communities are being ‘privileged’ in the sense that they are being made responsible for their broadband at a local level (Walsh-Dillely *et al.* 2013). I argue that this responsibility cannot realistically be realised in every rural area. Extra-local resources are often needed for rural communities to succeed, reflecting the ethos of networked rural development. Due to the problematic nature of extra-local interaction, as identified in this research, these community-led broadband initiatives have been ‘significantly damaged’ (Shucksmith and Talbot, 2015). In addition, comparing rural communities to urban areas identifies that urban communities are not required to take part in any way in their broadband provision, provision which is guaranteed by the prevailing market forces. This rural ‘privilege’ then has led to the expectation of increased participative capacity within rural areas. This increases potential uneven development and diminishes community resilience

(Lorenz, 2010). The expectation that rural communities ‘do it for themselves’, as represented through community-led broadband, has links to the wider policy rhetoric discussed in Section 7.3.2. This rhetoric is rarely, if ever, considered in the urban context. This process of local rural broadband provision has then continued to entrench power and service provision imbalances between rural and urban areas. Not simply because urban areas are more likely to have broadband development through market forces with little action required on the part of the residents, but because it continuously expects and requires rural areas to generate and contribute more participative action for their development.

Finally, I argue that the existing regulatory state of the telecommunications sector (as summarised by Sutherland, 2015) has created an imbalance of power in provision at the national scale, favouring nationally-directed provision and subsidies such as the main BDUK programme over grassroots opportunities. Despite policy encouraging, from a theoretical perspective, community-led, grassroots responses to rural market failure, national governments and related agencies do not have adequate mechanisms in place to work with local level telecommunications initiatives. Both B4RN and B4GAL sought to engage with BDUK funding mechanisms for their community networks. BDUK processes, the current method for public intervention in rural areas of the UK, operate under the auspices of a regulatory state shaped by the current neoliberal political atmosphere (e.g. Sutherland, 2015). This resultant regulatory BDUK framework inhibits the likely success of community-led broadband and, in the case of B4RN and B4GAL, limited any successful realisation of funding for their community networks. The current structure, requiring community-led organisations to ‘prove’ that no other public funds will be allocated to their area, has essentially placed community-led organisations in competition with other publicly-subsidised alternatives through the main BDUK programme. Conversely, privilege has been granted to those corporations engaged with the main BDUK programme, allowing their coverage plans to remain inaccessible to community groups or individuals. This immediately disadvantages a volunteer-run community organisation with limited resources to engage in the ultimately protracted debate to determine coverage patterns. Therefore, interplay between commercial realities for the telecommunications industry (i.e. maintaining a competitive edge and not disclosing coverage) and the desire for community-led initiative transparency remains problematic, and often does not occur in a positive, resilient manner. This was explicitly demonstrated in B4GAL. As B4GAL entered negotiations with industry to determine if they could play a role in their local broadband provision, all discussions became confidential, leaving residents and early supporters of the project with little sense of what was happening. B4RN and B4GAL

have both demonstrated challenges of interacting with policy, demonstrating the need for increased guidance on how to engage with local and regional government (such as for state aid or backhaul access) and increased guidance on technology alternatives to enhance the dialogue between community organisations and potential broadband providers. This lack of a comprehensive approach within rural publicly-subsidised telecommunications provision has led to the potential for broadband networks being built on top of each other, as has been demonstrated in the case of B4RN (local community funded) and the overlapping Superfast Lancashire (BDUK, public taxpayer funded).

The power imbalance between both B4RN and B4GAL and the national digital policy regime has been compounded by suggestions that community-led broadband sits unharmoniously alongside the national telecommunications industry, inference that again limits the opportunity for extra-local linkages. This perceived ‘difference’ between community-led approaches compared to national approaches highlights the ‘us versus them’ argument discussed by MacLeod and Emejulu (2014) in their research on asset-based community development. This overarching dynamic between different provision methods for broadband ultimately illustrates an imbalance in communication between community-led organisations, industry, and government. This has led to a perceived lack of recognition of certain projects (i.e. community-led alternatives) compared to other, nationally-led if not publicly-subsidised, projects (e.g. Wakefield, 2013).

Power and privilege tensions, with respect to broadband access and exemplified by the two community-led superfast broadband case studies in this thesis, are found within and between rural communities, between rural and urban communities, and between rural communities and the telecommunications industry and policymakers. All of these relationships have been demonstrated to impact upon the success and replicability, or the resilience, of community-led broadband practices in rural UK. The following section will now turn our attention from the process of broadband installation and related policy matters to the use of superfast broadband for rural individuals and communities.

7.3.4 Implications of the ‘need for speed’ and ‘future proofing’ in a rural context

The analysis outlined above is complemented by the associated discussion that this research presents on the first account of what a significant increase of speed (from generally 2Mbit/s or less) to superfast (30Mbit/s and upwards) influences in terms of individual and community actions, opinions and satisfaction, and their overarching resilience. This relationship, between superfast broadband speeds and resilience has not yet been examined in academic literature.

The findings presented here represent a complementary area of knowledge to feed into both policy decisions for rural broadband installation and the ongoing community-led broadband debate being held both nationally and internationally.

Chapters Five and Six both highlighted the perceived and actual importance of superfast broadband services for adequate participation in modern social and economic life. An initial increase and interest in digital services has been a result, with individuals in B4RN retaining knowledge about digital solutions and the future opportunities of such broadband-enabled services. This included developing an understanding about Internet-enabled devices, such as Smart TVs, and considering new future technology opportunities, such as the Internet of Things (IoT). Reliability was presented by interviewees as a key feature of superfast broadband connectivity, and this is tied to ideas of efficiency. The need to ‘future proof’ rural Internet access was a critical component to the involvement of community-led broadband processes in responding to the lack of contemporary commercial investment in their infrastructure. Superfast broadband use has empowered individuals by allowing them to participate fully in online life, from simple media choices to economic opportunities, making them feel part of, and able to engage with, a wider community or digital society. The interest in, and adoption of, superfast broadband has continued to be dependent on both personal perspectives and knowledge of Internet-enabled services, but also the implications broadband access may have for personal wellbeing and empowerment, contributing to individual resilience.

On a structural level, community-led superfast broadband networks improve rural assets and provide new opportunities for community growth. It is worth reflecting on community-led superfast broadband in relation to community enhancement through renegotiating patterns of living and working, and possibly supporting the development of new resources and capacities. Although this was considered throughout the study the timescale of doctoral research is not enough to conclusively identify evidence of such change. It does remain a part of the dialogue in both B4RN and B4GAL. Both the society and economy of the rural area encompassed by B4RN and B4GAL perceive broadband as an individualised tool, having links primarily with the individual household and business scale, which can enhance individuals’ social connectivity and perceived empowerment, as well as skill building and economic empowerment (which can be influential to an existing business, or lead to the creation of new entrepreneurial ventures). The use of streaming video and VoIP services, both for personal connections and employment, was heavily favoured by interviewees and discussed following the switch to superfast broadband. For both rural society and the rural economy, superfast

broadband access presents an opportunity to better engage with external networks, creating or enhancing existing individual linkages.

7.4 Critiquing the research approach

This doctoral study would not be complete without some critical reflections on the research approach. This includes reflection on the development and use of a conceptual framework for social resilience, as well as the decision to undertake a qualitative longitudinal study over alternative methods.

I believe that the use of ‘social resilience’ as a conceptual framework for this research has allowed for a more in-depth analysis of the *process* of superfast broadband installation and use than would have been achieved using another methodological approach. It has enabled a critical understanding of individual and community scale impacts to be developed, and has allowed for discussion of such impacts over time and through many pathways. The use of social resilience as an analytical tool has generated a robust method to discuss the interplay between local actions and external actions, often exhibited at the national scale. Without the use of such a method, the results would perhaps not be as meaningful in understanding the influence and implications of community-led superfast broadband within the wider telecommunications sector and public policy agendas.

For any future application of a social resilience conceptual framework in qualitative research, I suggest an amendment to its structure. It is clear that while equity is integral to resilience thinking, operationally it is embedded in the other three dimensions of resilience, rather than sitting on its own. Attempting to analyse ‘equity’ often led to a discussion about it in relation to capitals or resources, agency, or place-based bonds, as was often the case within this thesis. For example, equity was relevant when interviewees commented on the need for equitable broadband access for rural spaces. It was also relevant when considering how individuals, regardless of where they live, should have equitable access to public services (services which could be delivered via broadband). These broadly represent the need for improved, equitable community resources or capitals. Equity, similarly, was reflected upon when considering rural human agency, and the need for individual voices to be heard within the broadband debate. Effectively, interviewees wished to demonstrate that all voices, including those people in hard to reach locations, should have ‘power’ to contribute to the debate around broadband provision. Attempting to analyse ‘equity’ separately resulted in the context and value of that dimension being potentially lost within the framework. Therefore, I propose the following amended conceptual framework of social resilience for future research: it analyses the crux of

resources, agency and sense of place. Within each of those three characteristics lie the multiple dimensions that influence resilience enhancement as outlined in Chapter Two, and used throughout Chapters Five and Six, with the addition of equity when considering resources, agency and sense of place. This is illustrated in Figure 7 - 2.

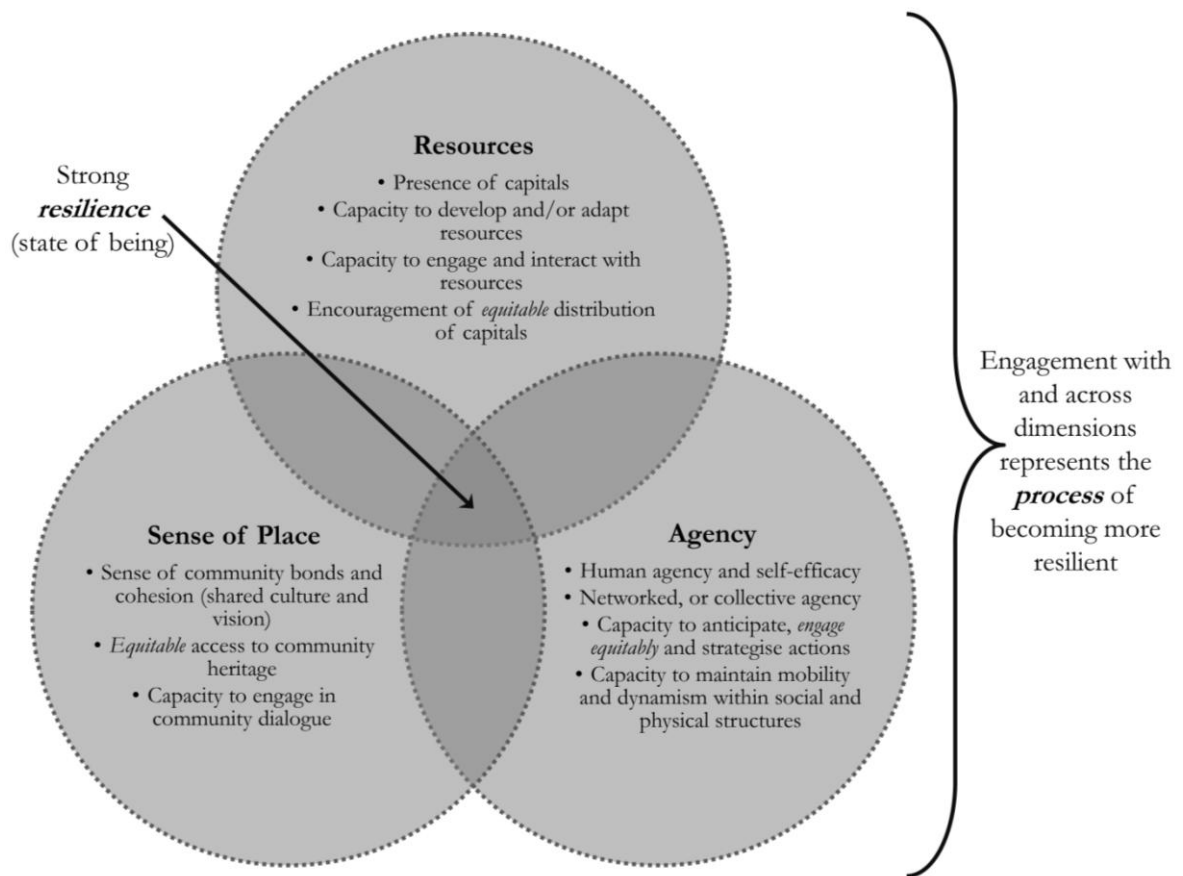


Figure 7 - 2 Dimensions of Resilience

Reflecting on the qualitative case study approach, the robustness of the study could have been improved by the addition of other case studies. This would have enabled greater cross-discussion across the UK in relation to both the processes of community-led broadband and the influence of superfast broadband accessibility. Practically, this proved impossible due to the time and consideration put into developing community relationships, and gaining research interviewees against the time restrictions of a doctoral programme. The chosen qualitative, longitudinal methodology was useful to conduct an in-depth analysis of individual and community processes. Alternatives, such as a survey-based quantitative methodological design, would have lacked the ability to explore the process of social resilience, made possible through in-depth conversations with rural residents in both B4RN and B4GAL.

It is also necessary here to reflect on the dynamic nature of contemporary human-centric research: it is very fluid, and the need to change the research parameters in the ‘post-installation’ phase, due to unforeseen challenges and delays for B4GAL, exemplifies this. While this could have derailed the potential findings, it provided the opportunity to reflect more closely on community-led broadband initiatives as an entity in a community context as well as in a commercial, or market, context. This proved to be exceedingly interesting to myself as the researcher, and also highly meaningful in terms of the contribution to academic literature and relevance for public policy.

7.5 Future research agendas

There are several key areas for future research that would take forward the work presented in this thesis. As discussed in Section 7.4, additional case studies would provide the opportunity to further validate findings and contribute to a deeper, more robust understanding of relationships between individual and community resilience and superfast broadband technology use. Analysing a range of installation methods, including regional or national-scale public intervention and market-led approaches, would also be particularly beneficial. Studying this range of installation methods would contribute to understanding what, if any, of those superfast broadband use impacts identified within this thesis’ findings are associated solely with the participative community-led broadband development approach, and what are associated solely with the broadband technology itself, and not reliant on installation methods.

Findings from this research have also identified three areas of further enquiry that would provide timely and relevant research. Firstly, this thesis has illustrated that the influence of national policy relationships with local communities in rural areas has profoundly impacted upon their patterns of working as broadband providers. Future studies focussed specifically on the influence of external policy decisions for rural community-led technological projects would provide a significant study. A study like this could, in turn, inform future policy directions for public digital interventions in rural areas. Secondly, the potential for renegotiated patterns of living and working in rural areas was indicated by interviewees following the introduction of superfast broadband. My research has demonstrated that, in these initial phases of building broadband, community-led initiatives have aided in the preservation of local communities through the establishment of a common purpose and social capital building. Longer-term investigation would be able to identify evidence of the expected structural changes to communities through superfast broadband access (such as a greater variety of ages for residents and altered economic opportunities). Thirdly, there appears to be a paradox, that the ‘community’ that is resilient may not be the same as the spatially defined

community. This is evident in both B4RN and B4GAL, where, despite being spatially defined as organisations, the individuals running them were developing resilience as a ‘community of interest’. This ‘community’ does not always map directly to the spatial community. There are pockets of disengagement and disempowerment as demonstrated by the findings and discussions with non-adopters. Further work would be able to investigate the interactions between communities of interest and spatial communities and how this interaction influences the development of community resilience.

This doctoral study was not able to provide generalisable results in relation to the influence of superfast broadband connectivity due to its qualitative, exploratory methods. In a more generalisable study it would be relevant and possible to capture a more equal gender split, and also target younger participants to obtain better demographic representation. Quantifiable studies, such as wide-scale surveys, could be pursued to achieve such generalisable results across the UK, underpinned by the conceptual framework of social resilience. This would be a suitable future avenue of research. Alongside this, additional studies with multiple methods (such as a combination of surveys, interviews, ethnographic research and so on) to continue to robustly improve the social resilience framework would prove beneficial.

7.6 Conclusion

This thesis contributes to the investigation of community-led superfast broadband installation and use, and its impacts across rural society. Community-led broadband installation methods have been explored, stressing the influence of existing resilience traits, such as strong leadership and technical skills, to the installation process. I have emphasised the creation of new pathways for social resilience through individual participation and related superfast broadband use (i.e. new social networks and ‘communities of interest’ via participation in the installation process). Community-led broadband is part of wider rural development patterns that reflect the concept of ‘community localism’. However, these patterns of development have proliferated not simply due to rural communities acting in a proactive manner, but also as a direct result of existing national digital policy and the entrenched neoliberal market ideology particularly prevalent in the UK telecommunications industry. I have identified and critiqued the currently unstable relationship community-led broadband initiatives have with the wider telecommunications sector. In the cases of both B4RN and B4GAL, negative interaction with national government has undermined their efforts for broadband roll out, with national government neither acting as an ‘initiator’, nor as an engaged ‘facilitator’ for these localism approaches. For rural individuals and communities, the implications of increasing broadband access from negligible speeds to superfast speeds have been investigated

in a small scale but focussed manner. I have highlighted increasing digital literacy and the potential for renegotiating rural living and working patterns as direct results of obtaining superfast broadband.

This thesis, ultimately, has contributed to wider academic discourse in three ways, reflecting social resilience theory, digital policy, and broadband technology itself. Theoretically, I have contributed to the development of social resilience as a concept, and an analytical tool for qualitative data analysis. With respect to rural digital policy, I have conducted an in-depth analysis of community-led broadband alternatives, resulting in a complex commentary of their place within rural broadband provision and policy. I have then critiqued the current public policy measures for rural broadband provision in relation to community-led initiatives, identifying the need for improved local and extra-local relationships for successful rural broadband provision. Complementing this critique is my identification of the various power and privilege tensions that currently impact community-led alternatives as a replicable model for rural broadband provision. Finally, I have provided a small-scale yet robust analysis of the influence of superfast broadband technology access itself for the resilience of individuals and communities in relation to older technologies.

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APPENDICES

Appendix I: Glossary of Technical Terms

Term	Definition
Adigitals	One of the ‘five cultures of the Internet’ as introduced by Dutton <i>et al.</i> (2013). This is a group of users that does not think the Internet makes them more efficient, nor do they enjoy being online simply to pass the time or escape from the real world. To members of this culture, the Internet is likely to be perceived as out of their control, potentially controlled by others. For example, they feel frustrated because the Internet is difficult to use. The adigital group appears to resonate mostly with the problems generated by the Internet. They feel more excluded from a technological context that is ‘not made for them’. The adigital culture fits about 14% of the UK’s online population.
ADSL	See *DSL .
Asymmetric	When upload and download speeds are different. Upload is much slower than download in ADSL and FTTC broadband. See also symmetric .
Average Modem sync speed	The average maximum speeds of the existing broadband connections. More specifically, the speed at which the modem communicates with the exchange as opposed to the speed of the data transfer, which is known as bandwidth speed. See also bandwidth .
backhaul	The connection from the local sub-network (community) to the Internet core network. In most small communities connections will be aggregated at a single point, usually the local telephone exchange. Lack of backhaul results in no connection to the Internet.
bandwidth	The rate or maximum speed of data transfer across an Internet connection, differing from the modem sync speed. Expressed in bits/second or multiples of it (kilobits/s, megabits/s etcetera (For example 25Mbit/s). Every communication channel has a limited bandwidth, often referred to colloquially as its ‘speed’.
bit(b)	The smallest unit of measurement of information – a bit can take one of two values (0 or 1). Communication bandwidth (speed) is normally measure in bits per second (bit/s).
BDUK	Broadband Delivery UK is the chief delivery method for subsidised broadband in the UK. It is positioned as a team within the Department for Culture, Media and Sport. See also gap-funding .
byte (B)	Eight bits – the unit of information normally used to measure the volume of stored data.
broadband	It is a term used broadly to describe Internet that is always on, high-speed, and is significantly faster than earlier dial-up technology. It can be delivered through telephone, cable, fibre or wireless and satellite connections. This usage has been overtaken by improvements in technology, and policy debates in various countries have sought to redefine the minimum speed for acceptable ‘broadband’, for example, at 1Mb/s (Finland), 2Mb/s (UK), and 4Mb/s (USA).
Broadband Enabling Technology (BET)	Fixed line solution to obtaining broadband in rural areas. As most Internet connections diminish and get slower the further away it gets from the telephone exchange, BET bonds telephone lines together to allow the connection to travel further distances. It is used by BT to enhance copper wires so that they can deliver speeds of up to 2Mbps up to 12km from the exchange. It can cost around £1000 per premise.
Broadband Take-up	The number of existing broadband connections as a proportion of residential and non-residential addresses.
Cabinet	A green box that you might see on a street corner in a town or city that connects telephone lines to the exchange. Also known as a primary connection point .
Cable Broadband	Cable broadband is broadband that uses the same fibre optic technology as cable TV (e.g. Virgin Media). It provides high speed broadband, but is only available in communities that have cable service in the area – mostly urban areas with high population.
Community Broadband Scotland (CBS)	Community Broadband Scotland is a partnership between the Scottish Government, Scottish Enterprise, Highlands and Islands Enterprise, COSLA, Scottish Local Authorities Economic Development Group, Carnegie UK Trust, Cairngorms National Park

	Authority and Loch Lomond and the Trossachs National Park Authority. It operates as a resource for communities with limited or no broadband access, offering advice, seed funding and project assistance to help communities develop broadband networks, reaching the 10 to 15 percent of rural Scotland that is not subject to market intervention.
cloud computing	Location-independent computing model for enabling convenient, on demand access (“through the cloud”) to a shared pool of resources (documents, applications, services etcetera) by storing it on remote servers, accessible over the Internet. Everything happens ‘in the cloud’, and the user does not need to know where and how data is stored nor where computations are performed.
computing science (CS)	The science of communication and computation. It is a rigorous academic discipline, encompassing the systematic study of methodical processes for the acquisition, representation, processing, storage, communication of information, and also the software and hardware tools required to implement these processes.
contention	This refers to the number of properties sharing a broadband connection, and thus sharing a set amount of bandwidth. The majority of broadband connections are contended, as it is unlikely that all users would be using their broadband at the same time. Contention is expressed in ratios, for example 50:1 (a maximum number of 50 users access one connection).
Cyber-moderates	Defined by Dutton <i>et al.</i> (2013), cyber-moderates are a cluster of users, or a culture, most clearly defined by patterns of attitudes and beliefs that show them to be more moderate in their view of the Internet. It is seen as a good place to pass the time, an efficient way to find information or shop, or a good way to maintain and enhance their social relationships. On the other hand, they are also not uniformly fearful that there is a risk that the Internet will expose them to immoral material, pose a threat to their privacy, or waste their time. They seem to be moderate in both hopes and fears. They are the largest single cluster of Internet users in Britain, accounting for 37% of users.
Cyber-savvy	Defined by Dutton <i>et al.</i> (2013), these are a cluster of users who express mixed feelings and beliefs about the Internet, holding somewhat ambivalent views. On the one hand, they enjoy being online, in order to pass time, easily find information, and become part of a community in which they can escape and meet people. On the other hand, they also feel as if the Internet, to a greater or lesser degree, can be frustrating, wastes time, and invades their privacy. Rather than always feeling in control, they feel that they might lose control to technology, which could drain them of time and privacy. Despite their concerns, they fully exploit the Internet as a pastime, as an efficient information resource, and as a social tool. For this reason, they are in some sense street wise, or cybersavvy, living comfortably in an Internet world but aware of the risks. They represent nearly one in five (19%) of the UK’s Internet users.
Dark fibre	Fibre optic cable which has been laid, but isn’t yet being used, or has no active equipment attached. Also called unlit fibre.
Dial-up Internet Access	Now the slowest method for connection to the Internet, it is Internet access that uses public switched telephone network (PSTN) to establish a connection to an Internet service provider via a normal telephone line. Typically understood to reach up to 56kbit/s speed. Main difference from broadband, besides speed, is that the normal telephone cannot be used while connected to the Internet. It is no longer a realistic option for getting online in the UK.
digital	Relating to information represented by discrete values (digits); hence, involving or relating to the use of current technologies for computation and communication, which are digital.
digital divide	The differences in economic and social opportunity between those who can benefit from digital technologies and those who cannot.
digital infrastructure	The physical, economic and organisational structures that allow individuals and organisations to access and use digital communications and computation as public utilities. These include both passive and active components of IT networks.
Download speed	The speed at which a user is able to download (transfer) data from the Internet to their computer/device.
*DSL	Digital Subscriber Line, a family of technologies that use legacy copper telephone wires to carry digital data across the ‘final mile’ to the home. Speeds are limited by the length of

	the copper connection. In the UK, Asymmetric DSL (ADSL) was introduced in 2000 to deliver ‘up to 8Mb/s’ broadband. Limited connectivity exists on this type of connection the further the premises is from the exchange. ADSL2+, launched in 2006, supports ‘up to 24 Mb/s’ download speed for those close to the exchange, but, just like ADSL, it can deliver only 4 Mb/s over 4km of copper. Very-high-bit-rate DSL (VDSL, VDSL2) is used for the Cabinet-to-Premises for BT’s FTTC, marketed as ‘up to 80 Mb/s’. It can only deliver speeds over 30 Mb/s over copper lines shorter than 1.2km, and beyond 1.6km it has the same download speeds as ADSL2+.
Ducts	Underground pipes that hold copper or fibre cables.
e-Mersives	Considered one of the five cultures of the Internet by the OxIS 2013 report, this group of users is comfortable and naturally at home in the online world and happy being online. They are pleased to use the Internet as an escape, to pass time online, and think of it as somewhere they feel they can meet people and be part of a community. They see the Internet as a technology they can control—a tool they can employ—to make their life easier, to save time, and to keep in touch with people. They are immersed in the Internet as part of their everyday life and work. They comprise only about 12% of the UK’s Internet users (Figure 1).
Fibre Optic Cable Broadband	Broadband services provided through flexible, thin glass pipes called fibre optic cables using waves of light. Generally regarded as the successor to traditional copper cabling, it can deliver higher speeds over longer distances without the loss seen in traditional metal cables. Speeds vary, and can exceed 1 Gbit/s.
final mile	The communications channel linking the end-user to the communications network.
FTTC	Fibre to the Cabinet, or Fibre to the Copper: FTTC replaces the existing copper connection between the exchange and the green street cabinet with fibre and installs VDSL (Very-High-Speed Digital Subscriber Line) equipment in an upgraded street cabinet into which the existing customer copper lines connect. This means there is a shorter length of copper between the customer and the high speed fibre network which means faster connections can be provided. Headline speeds from FTTC are 80Mbps download and near 20Mbps upload.
FTTH	Fibre to the Home See FTTP*
FTTP*	Fibre to the Premises, a fibre connection that runs directly into the home or premise of the user, with no copper lines used to transmit the connection. Identical in nature to FTTH and occasionally used interchangeably, it is the more commonly used term by the technical community.
gap-funding	Funding mechanism to cover the ‘gap’ between infrastructure cost and commercial investment. The BDUK programme has awarded direct monetary grants to BT to build, manage and commercially exploit a broadband network. These grants are intended to cover the ‘investment gap’ between the infrastructure cost and the investment BT is willing to make on a commercial basis.
GB	Gigabyte = 230 bytes (~10 ⁹)
information technology (IT)	The branch of engineering that produces the systems used in industry, commerce, the arts and elsewhere, for digital communication and computation.
Internet	An interconnected network of networks. The Internet is an Internet that connects one third of the world’s population to almost a billion hosts.
ISP	An Internet service provider (ISP) is a company that provides a broadband service.
latency	The minimum round-trip time for a query and response, between two points, measured as the time for a ‘ping’ to be answered. High-latency is encountered with satellite broadband, caused by the long distances (up to a satellite and back) that the broadband signal has to travel. This can limit the use of many real-time applications (e.g. Voice over IP (VoIP), video conferencing and online gaming).
MB	Megabyte = 220 bytes (~10 ⁶)
Mbit/s	Megabits per second, a unit of communication bandwidth referring to the rate at which information is transferred.
Mast	Masts are powerful radio transmitters and receivers which allow mobile phones and computers to connect to the Internet or mobile phone networks.

median	The median value of a statistic is the number which divides population into two equal halves, one half having values less than that the median and the other having values above the median.
middle mile	The segment of a telecommunications network that links communities to the high-speed core network.
Mobile Broadband	Broadband Internet delivered through mobile carriers to a portable modem such as mobiles, tablets or other device. Speeds are typically less than fixed broadband services. See also 2G, 3G, and 4G .
Mobile Not Spot	Areas where there is no mobile coverage as reported from the latest OFCOM report.
next generation broadband	High speed broadband that exceeds the capabilities of copper-based (or similar) broadband infrastructure. Speeds will vary depending on the technology used (satellite, fibre, wireless etcetera) While the UK has no target speed for Next Generation, the European Commission's Digital Agenda sets 30Mbit/s as a minimum target. Next generation broadband is also used as the marketing term by BT to describe broadband delivered over both advanced copper (ADSL+) and fibre-optic FTTC or FTTP.
Not spot	A geographic post-code area where customers do not have access to fixed line or wireless broadband
Ofcom	Office of Communications – the UK's independent telecommunications regulator and competition authority.
RCBF	Rural Community Broadband Fund, a now concluded open fund that invited applications from community groups to fund the development of broadband networks explicitly for rural areas in England.
Satellite Broadband	Broadband services delivered though a satellite in orbit around the earth that communicates with a computer or host of computers through a satellite dish on the premises
Slow Spot	A geographic postcode area where customers have access to fixed line or wireless broadband at access speeds below 2Mbit/s
social media	interaction among people in which they create, share, and/or exchange information and ideas in virtual communities and networks through mobile and web technologies
superfast	A term described by Ofcom and the European Union to describe next generation broadband services with download speeds of at least thirty megabits per second (30Mbit/s). DCMS defined SFBB as more than 24Mbit/s (24Mbit/s being the maximum speed of ADSL technology). Typically, at a wholesale level, the underlying capability can be measured in gigabits. The retail market then takes this capability and delivers affordable propositions.
State Aid	State Aid refers to forms of assistance from a public body, or publicly-funded body, given to selected undertakings (any entity which puts goods or services on the given market), which has the potential to distort competition and affect trade between member states of the European Union. The European Commission monitors and controls State Aid in the EU. Member States are obliged to notify and seek approval from the Commission before granting State Aid. This gives the Commission the opportunity to approve or refuse to approve the proposed measure.
Streaming	Streaming refers to watching or listening to digital video or audio content online, without it being stored on your computer or device.
symmetric	Internet connections with equal bandwidth for both upload and download of data.
Techno-pragmatists	A term introduced by the OxIS 2013 report, this cluster of users stands out by the centrality they accord to using the Internet to save time and make their lives easier. Like the e-mersives, they feel in control of the Internet, employing it for instrumental reasons that enhance the efficiency of their day-to-day life and work. Unlike the e-mersives, the pragmatists do not view the Internet as an escape, nor do they often go online just for the fun of it. Theirs is a more instrumental agenda of efficiency. Pragmatists constitute about 17% of the UK's Internet users.
Upload Speed	The speed at which a user is able to upload (transfer) data from their computer/device to the Internet.
VDSL, VDSL2	See *DSL

Voice over Internet Protocol (VoIP)	VoIP is a technology that allows you to make telephone calls using your broadband Internet connection instead of your analogue phone line. Your voice is broken up by special software into small packets of data, sent through the Internet, and reassembled at the other end. This happens almost instantaneously, with no discernible time lag and at good quality – as good as a landline call.
Wayleave	A wayleave is a contractual agreement between a landowner and a utility provider which allows the provider to install plant and equipment on private land and have access rights to maintain and repair it.
Wi-Fi	Stands for Wireless-Fidelity, and is short-range wireless technology that enables home computers, tablets or other devices to communicate and access the Internet when in range of the wireless network currently connected to the Internet. Wi-Fi networks are often used in areas where wires or cabling would be difficult to install due to terrain and other issues
wired infrastructure	Digital telecommunications infrastructure consisting of fibre and copper lines either independent of each other, or in some combination.
Wireless Broadband	Broadband services delivered through radio waves, usually via Wi-Fi network access points. However, some companies use other technologies
2G	Second generation of mobile telephony. Uses a mobile phone signal to deliver voice and slow data services (including SMS text). Upper range 2G services can provide data rates of up to 236.8 Kbit/s
3G	Third generation of mobile telephony. Uses a mobile phone signal and can deliver up to 7 to 8 Mbit/s. Broadly speaking, 3G coverage is poor outside of the Central Belt and Scottish cities
4G	Fourth-generation wireless networks, offering download speeds up to 100 Mb/s on mobile devices.

Source: Skerratt *et al.* (2012), Royal Society of Edinburgh (2014), Dutton *et al.* (2013), CBS (2013), and Ofcom (2014a, 2014b, 2014c, 2013a, 2013b), Yiu and Fink (2012).

Appendix II: Rural-urban classifications in the UK

	England	Scotland	Definition	Wales	Northern Ireland	Definition
Rural	Rural: Hamlets and Isolated Dwellings in a Sparse Setting	Very Remote Rural	Areas with a population of less than 3,000 people, and with a drive time of over 60 minutes to a settlement of 10,000 or more.	Rural: Hamlets and Isolated Dwellings in a Sparse Setting	Small Village, Hamlet and Open Countryside	Settlements of less than 1000 people and open countryside (outside BMUA and DUA)
	Rural: Hamlets and Isolated Dwellings	Remote Rural	Areas with a population of less than 3,000 people, and with a drive time of over 30 minutes to a settlement of 10,000 or more.	Rural: Hamlets and Isolated Dwellings	Village	1000 or more and under 2250 people (outside BMUA and DUA)
	Rural: Village in a Sparse Setting	Accessible Rural	Areas with a population of less than 3,000 people, and within a 30 minute drive time of a settlement of 10,000 or more.	Rural: Village in a Sparse Setting	Intermediate Settlement	2250 or more and under 4500 people (outside BMUA and DUA)
	Rural: Village	Very Remote Small Towns	Settlements of between 3,000 and 10,000 people and with a drive time of over 60 minutes to a settlement of 10,000 or more.	Rural: Village	Small Town	4500 or more and under 10000 people (outside BMUA and DUA)
	Rural: Town and Fringe in a Sparse Setting	Remote Small Towns	Settlements of between 3,000 and 10,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more.	Rural: Town and Fringe in a Sparse Setting	Medium Town	10000 or more and under 18000 people (outside BMUA and DUA)
	Rural: Town and Fringe	Accessible Small Towns	Settlements of between 3,000 and 10,000 people and with a drive time of over 30 minutes to a settlement of 10,000 or more.	Rural: Town and Fringe	Large Town	18000 or more and under 75000 people (outside BMUA and DUA)
	Urban: City and Town in a Sparse Setting	Other Urban Areas	Settlements of 10,000 to 125,000 people.	Urban: City and Town in a Sparse Setting	Derry Urban Area (DUA)	c 90000 people
	Urban: City and Town	Large Urban Areas	Settlements of over 125,000 people.	Urban: City and Town	Belfast Metropolitan Urban Area (BMUA)	c 580000 people
	Urban: Minor Conurbation			Urban: Minor Conurbation		
	Urban	Urban: Major Conurbation			Urban: Major Conurbation	

2011 ONS Rural and Urban Areas

Scottish Government Urban Rural Classification

2011 ONS Rural and Urban Areas

Northern Ireland Statistics and Research Agency

Source: *England/Wales Information*: Office for National Statistics, see <http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/2011-rural-urban/index.html>. *Scotland Information*: Scottish Government, see <http://www.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification>. *Northern Ireland Information*: Northern Ireland Statistics and Research Agency, see <http://www.nisra.gov.uk/archive/geography/review-of-the-statistical-classification-and-delineation-of-settlements-march-2015.pdf>

Appendix III: A note on broadband network development

This appendix outlines the processes undertaken by a community to fully build a broadband network³⁶. Specific emphasis is on the processes followed by B4RN as relevant to this thesis and language used in the discussion. However, alternative methods for network facilitation and building are discussed. This guide covers four topics: planning, funding, building, and daily operations of a community broadband network. A following discussion on facilitating networks (rather than building) is also included. A shortened version of this guide is featured in Chapter 3, Figure 3 – 4.

1. Planning the network

As a community, it is relevant to first consider potential developments such as planned cabinet upgrades via BT Openreach to receive fibre optic cables. Any imminent upgrades could negate the need for a community broadband network. Once this is determined, it is recommended that the community form an official group. Demand aggregation is an important element in broadband projects, and by increasing demand you have a greater chance of success.

It is important here to identify a project leader, or community champion who should have the passion to reach a successful outcome, but does not need all the technical knowledge. Additional responsibilities such as funding coordination, supplier engagement and surveying the community could be assigned at this stage to members of the group.

It is then relevant to undertake a community survey to establish current levels of broadband provision. Templates are available from organisations such as CBS. This survey should also be used to determine demand for alternative or improved broadband services (what CBS/INCA term Stage 2). This can inform early business plan documents. It can also inform a document called the Community Scoping Overview, which is used by CBS in Scotland to provide local area information, BT exchange(s) service, existing broadband services, mobile performance, mobile mast sites, local demand, usage, technical studies, funding sources, outcomes and a scoping map.

Once the need and demand for broadband within the community is determined, an initiative would determine what type of network business model is appropriate (what INCA term Stage 3): As identified by the RCBF there are three models that encompass a community enterprise approach:

- Partnership – community raises some of the finance but has a partner bring in the rest of the investment and designs, builds and operates the network on the community's behalf
- Concession – community raises all of the finance but offers a concession to a company to design, build, and operates the network on your behalf. This is similar in

³⁶ References used to develop this guide include CBS (2013); DCMS (2011); Forde (2013), INCA (2012); and Rural Broadband Partnership (2015).

nature to the resultant method followed by B4GAL. However, management of the daily operation of the network was intended to remain with the community initiative.

- DIY – the community raises finances, as well as designs, builds and operates the network. This is otherwise known as a full public control model and is essentially the process B4RN followed.

Depending on the business model, a community broadband initiative may also wish to gain charitable status (as B4RN and B4GAL have both done) which can be relevant for funding. The selection of a business model will then aid in the development of a technical map of the proposed broadband network, the backhaul source, and cost. The technical map is often completed during the development of a business plan or case, and the amount of detail will vary depending on the chosen business model. As discussed in INCA's literature, the plan could be mainly a procurement exercise inviting suppliers to design a technical solution based on the area characteristics, or it can consider complete technical information, including and up to network reliability, customer support as well as future expansion and upgrades. At this stage identifying support organisations, such as HUBS (High Speed Universal Broadband for Scotland) in Scotland, can assist in generating advice on network planning and technical help on network configuration and management. This mapping exercise would result in a network design that would consider the various types of broadband delivery (wireless, FTTC, FTTH and so on) for the community broadband initiative to identify the best fit based on location, cost and expected demand.

It is critical for a community initiative to consider the backhaul source alongside development of a technical map, or the procurement of a cost-effective delivery of broadband. The location and cost of backhaul can dictate some of the network design. Appointing a supplier for technical goods and services also requires consideration about what suppliers are available and your network requirements.

The network should be costed out depending on expected business model, and can include capital costs of digging and equipment, marketing and operating costs. Typically it will fall into two streams:

- The cost of delivering the community service (core costs of building the network initially, accessing backhaul and so on)
- The end user costs (installation and set-up cost plus the monthly subscription)

2. Funding the network

Once cost and the business case are established, it would be prudent to determine the best funding source. There are many different sources available for community broadband initiatives including:

- Government grant or loan
- Charitable awards schemes
- Charitable organisations for equipment loan (such as HUBS in Scotland)
- Private community funds (such as SSE Hydro's community fund in the B4GAL region)
- Angel investors or banks

- The community itself (such as B4RN's community and labour share method)
- In-kind payments – often used when considering the physical laying of cables across fields, a landowner may accept a free connection or some other offering in lieu of payment (used in B4RN).
- Parish councils
- Village Fetes
- Business sponsorship

These funding sources can cover a majority of the network build (and occasionally are accessed for planning purposes, such as the CBS Seed Fund which provides funds for activities outlined in Planning the Network) or can contribute piecemeal amounts at strategic times to boost or support promotion, or network installation. For example, the loan B4RN secured from the Prince's Trust was reflective of a piecemeal funding pot to support network build directly. The Prince's Trust provided a Land Rover free for use for 1 year, a vehicle which was then customised by the B4RN team to be used to install fibre cables in the land. Having charitable status as a community broadband initiative can also be useful for applying to certain grants which may be only accessible to charities.

As discussed by INCA and considered throughout this thesis, if government funding is involved, community initiatives must consider rules and regulations around state aid, which can delay a project (such as the B4GAL case) or at worst require repayment of funding plus interest. In some cases, if state aid is already being used to increase broadband coverage in the desired area (such as in the form of the main BDUK programme), the community initiative will not be able to additionally access certain public funds. Expert advice is recommended, although the funding, or access points, for such advice is not particularly evident.

Additional considerations must be made at the planning stage concerning gaining (and paying for) any required wayleaves to access private property if needed (i.e. lay cabling, or build masts for wireless), any planning permission from local authorities or councils to build cabinets if needed, and the potential costs and time delays those may incur for the community broadband initiative.

3. Building the network

Once the network plan and cost has been detailed, funding sources identified, the initiative can consider the best method for building the broadband network. In the case of this thesis, the technology was FTTH, which requires a basic set of actions to be built.

1. Trenches to 'lay' the fibre optic cabling must be dug. This can be done by hand or with specialised equipment, such as a farm plough. Traditionally this is done under highways and associated road verges, acting as arterial routes for the broadband network in and out of rural areas. The method of alongside roads is relatively costly due to costs associated with complying with health and safety during build, aligning with the Street Works Act, and the eventual need to reinstate tarmac and road signage. Costs for digging also range in expense from highest to lowest from highway, footway, or soft digging (such as a field). B4RN opted to dig the trenches across farmland, which was all soft digging, and required none of the additional costs of road repair and so on. This does require the presence of wayleaves for access across land. However,

- B4RN often limited the need to pay for access through community benefit arguments and in-kind payment, reducing costs. Trenches of this nature can also be dug by agricultural workers or volunteers.
2. In order to lay the cables, ducts must be placed in the trenches. B4RN installed a narrow bore duct, and then the fibre cabling is 'blown' through, to connect to the backhaul source, along what is often considered a 'core route' and then into each settlement or isolated dwelling.
 3. The cables are laid along a central core route. Strategic network nodes are placed along this route to then send cabling towards each settlement or isolated dwelling. In the case of B4RN, 12 network nodes were needed. From these nodes, 73 trunk routes radiate out which pass all properties in the coverage area. The core route must be connected to a source of backhaul to make the community network live. In the case of B4RN, they have connected to Telecity in Manchester, at a distance of 128km.
 4. At appropriate locations, access chambers are placed along the trunk route for the cable to be broken into pairs of fibre for local distribution in B4RN. Additional trenches are dug and a small duct is placed between the access chambers to each local property, and then the pair of fibre is blown through.
 5. Home installation must then connect the receiver box in the home to this cable to provide the home with FTTH service.

These actions can be undertaken by the community, as has been exemplified in B4RN, with volunteers gaining free wayleaves from landowners, undertaking specialist training (offered through sponsorship deals or working with other community broadband initiative) to blow fibre, split it at the access chambers, and then village level volunteers assist in connecting the homes³⁷. The entire process can also be contracted out to professional contractors, which would then require the initiative to put an invitation out to tender and have suppliers provide bids for a cost-effective delivery of services.

Separate requirements for building would need to be considered if deploying a different network, such as wireless. Typically the development of a wireless network would require the technical map to identify best mast locations, whereby the initiative can purchase and install the masts and house receivers, connect wirelessly to a backhaul source, and connect users. This again could be done at the community level, or with professional contractors. Similar to FTTH development, wayleaves would need to be gained for mast locations, as well as consider the planning guidelines of your local authority area for mast development.

4. Running the network

The operation of the built community broadband network can vary depending on business model. If run as a full public control model, the community entity would also run services as an ISP. However, some companies may choose to lease out the network and therefore would not be involved in actual service provision. If running as a full public service model, the following considerations could be taken:

³⁷ The technical, construction process employed by B4RN is thoroughly explained in a document written by volunteers (Hamlett, 2015). It is available at: <http://austwick.org/wp-content/uploads/2015/03/BuildingtheB4RNnetwork-9-1-15.pdf>.

- Setting up a store front or accessible office for customers with adequate opening hours and response times.
- How best to take monthly payments. Costs can be associated with purchasing access to a company like SAGE World Pay or other service.
- Setting up a Help desk or troubleshooting point of contact for customers. Due to the 24 hour, on demand nature of other large telecommunications companies, community initiatives may wish to consider how they can best serve their customers comparatively.
- Ensure adequate planning for emergency repairs should the line go down due to damage, faults and so on. This will often be done early in the planning and build stage. However, it is relevant to ensure adequate support should the line go down for customers. B4RN for example has built redundancies into the network.

Particularly with B4RN, there does seem to be some informality with respect to the daily operation of the ISP that is expected as it is a full public control model, with majority volunteers. This will be dependent on location and the initiative will need to consider the desires of the community of users when they go live.

Alternatives: Facilitating broadband networks

Communities wishing to engage with broadband, but are not interested in building a network themselves, can engage through generating demand for broadband alternatives, from both private companies such as Gigaclear, or working with the Local Authority. RCBF guidance highlights two business models that focus on, ‘facilitating investment by companies installing broadband networks under contract to the Local Authority’, emphasising Demand Registration (also used by companies such as Gigaclear). Demand registration is where community members formally sign contracts to adopt the broadband technology at a set price when installed, which can lower the risk for network providers to build in smaller areas. Gigaclear for example as a private firm require 30% of the potential population to formally sign up via contract before they will begin to build a network. Another model emphasised by RCBF guidance is Build and Benefit, whereby the community agree to participate in delivering the superfast solution, such as arranging wayleaves, digging trenches, or paying higher installation charges to lower the costs to the Local Authority’s broadband network providers.

Conclusion

The most guidance exists for planning and funding a network, with little official sources referencing the build and operational aspects of a full public control model, despite its presence in the planning and business model stages. Past precedence in the UK and internationally exist, and it is recommended that community initiatives reach out to existing operating networks and community initiatives for information and guidance.

Appendix IV: Socio-economic statistics of B4RN and B4GAL

This appendix provides the statistical support for statements made in Section 4.3.2, the socio-demographic considerations for B4RN and B4GAL.

B4RN

The following tables and text represent the socio-economic considerations in B4RN. The tables represent the following characteristics of B4RN in comparison with the England/Wales wide average:

1. Deprivation
2. General Health
3. Economic Activity
4. Occupation
5. Highest Qualification
6. Household Type
7. Household Composition
8. Method of Travel to Work

1. Deprivation

B4RN was considered in relation to the 2010 Index of Multiple Deprivation, looking at (in order of weighting) income deprivation, employment deprivation, education, skills and training deprivation, health deprivation and disability, barriers to housing and services, crime and living environment. Information on this was not available at the specific output area level, but according to maps produced by Lancashire County Council based on 2010 data, the region is primarily considered the 'least deprived' (covering deciles 6 to 10 in a 1 to 10 scale), with some small sections considered the fifth most deprived, or in the fifth decile. The northwestern edge of B4RN also potentially has small pockets of increased deprivation, as there are clusters in and around major urban centres, including Lancaster, which it borders (see Moulding, 2010).

2. General Health		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
Very good health	51.59%	47.60%
Good health	33.59%	33.63%
Fair health	11.42%	13.16%
Bad health	2.64%	4.33%
Very bad health	0.77%	1.28%

3. Economic Activity		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
<i>Economically active: Total</i>	70.01%	69.53%
Economically active: Employee: Part-time	19.61%	19.67%
Economically active: Employee: Full-time	46.86%	55.34%
Economically active: Self-employed with employees: Part-time	6.45%	0.53%
Economically active: Self-employed with	6.45%	2.66%

employees: Full-time		
Economically active: Self-employed without employees: Part-time	6.12%	3.48%
Economically active: Self-employed without employees: Full-time	14.02%	6.97%
Economically active: Unemployed	2.38%	6.37%
Economically active: Full-time student	3.42%	4.98%
<i>Economically inactive: Total</i>	29.99%	30.47%
Economically inactive: Retired	59.34%	45.57%
Economically inactive: Student (including full-time students)	14.19%	19.02%
Economically inactive: Looking after home or family	7.97%	14.01%
Economically inactive: Long-term sick or disabled	6.49%	14.24%
Economically inactive: Other	12.01%	7.16%

4. Occupation		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
1. Managers, directors and senior officials	13.55%	10.51%
11. Managers, directors and senior officials: Corporate managers and directors	53.87%	64.69%
12. Managers, directors and senior officials: Other managers and proprietors	46.13%	35.31%
2. Professional occupations	23.46%	17.34%
21. Professional occupations: Science, research, engineering and technology professionals	16.66%	23.77%
22. Professional occupations: Health professionals	24.69%	22.70%
23. Professional occupations: Teaching and educational professionals	35.58%	25.08%
24. Professional occupations: Business, media and public service professionals	23.07%	28.45%
3. Associate professional and technical occupations	10.11%	12.58%
31. Associate professional and technical occupations: Science, engineering and technology associate professionals	11.28%	12.95%
32. Associate professional and technical occupations: Health and social care associate professionals	12.18%	9.66%
33. Associate professional and technical occupations: Protective service occupations	12.63%	11.82%
34. Associate professional and technical occupations: Culture, media and sports occupations	16.99%	15.96%
35. Associate professional and technical occupations: Business and public service associate professionals	46.92%	49.62%
4. Administrative and secretarial occupations	8.62%	11.50%
41. Administrative and secretarial occupations: Administrative occupations	64.02%	75.10%

42. Administrative and secretarial occupations: Secretarial and related occupations	35.98%	24.90%
5. Skilled trades occupations	19.23%	11.62%
51. Skilled trades occupations: Skilled agricultural and related trades	50.12%	10.23%
52. Skilled trades occupations: Skilled metal, electrical and electronic trades	16.76%	34.54%
53. Skilled trades occupations: Skilled construction and building trades	20.71%	33.88%
54. Skilled trades occupations: Textiles, printing and other skilled trades	12.41%	21.35%
6. Caring, leisure and other service occupations	7.82%	9.42%
61. Caring, leisure and other service occupations: Caring personal service occupations	78.60%	74.99%
62. Caring, leisure and other service occupations: Leisure, travel and related personal service occupations	21.40%	25.01%
7. Sales and customer service occupations	4.39%	8.56%
71. Sales and customer service occupations: Sales occupations	87.89%	81.12%
72. Sales and customer service occupations: Customer service occupations	12.11%	18.88%
8. Process, plant and machine operatives	4.35%	7.29%
81. Process, plant and machine operatives: Process, plant and machine operatives	38.81%	46.99%
82. Process, plant and machine operatives: Transport and mobile machine drivers and operatives	61.19%	53.01%
9. Elementary occupations	8.47%	11.17%
91. Elementary occupations: Elementary trades and related occupations	34.65%	15.41%
92. Elementary occupations: Elementary administration and service occupations	65.35%	84.59%

5. Highest Qualification		
<i>Type</i>	<i>BARN</i>	<i>England/Wales</i>
No qualifications	17.40%	23.19%
Highest level of qualification: Level 1 qualifications	10.70%	14.08%
Highest level of qualification: Level 2 qualifications	14.53%	15.16%
Highest level of qualification: Apprenticeship	2.91%	3.30%
Highest level of qualification: Level 3 qualifications	11.69%	12.12%
Highest level of qualification: Level 4 qualifications and above	39.13%	27.02%
Highest level of qualification: Other qualifications	3.64%	5.13%

Highest Level of Qualification is defined as:

Level 1 qualifications	1-4 O Levels/CSE/GCSEs (any grades), Entry Level, Foundation Diploma, NVQ level 1, Foundation GNVQ, Basic/Essential Skills
Level 2 qualifications	5+ O Level (Passes)/CSEs (Grade 1)/GCSEs (Grades A*-C), School Certificate, 1 A Level/ 2-3 AS Levels/VCEs, Intermediate/Higher Diploma, Welsh Baccalaureate Intermediate Diploma, NVQ level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First/General Diploma, RSA Diploma
Apprenticeships	Apprenticeships

Level 3 qualifications	2+ A Levels/VCEs, 4+ AS Levels, Higher School Certificate, Progression/Advanced Diploma, Welsh Baccalaureate Advanced Diploma, NVQ Level 3; Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma
Level 4 or above qualifications	Degree (for example BA, BSc), Higher Degree (for example MA, PhD, PGCE), NVQ Level 4-5, HNC, HND, RSA Higher Diploma, BTEC Higher level, Foundation degree (NI), Professional qualifications (for example teaching, nursing, accountancy)
Other qualifications	Other vocational/work-related Qualifications, Foreign Qualifications (Not Stated / level unknown)

6. Household Type		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
Unshared dwelling	99.96%	99.79%
Shared dwelling	0.04%	0.21%
<i>All household spaces</i>	100.00%	100.00%
Household spaces with at least one usual resident	92.42%	95.63%
Household spaces with no usual residents	7.58%	4.37%
Whole house or bungalow: Detached	47.68%	25.29%
Whole house or bungalow: Semi-detached	29.39%	32.80%
Whole house or bungalow: Terraced (including end-terrace)	17.31%	25.31%
Flat, maisonette or apartment: Purpose-built block of flats or tenement	2.49%	12.93%
Flat, maisonette or apartment: Part of a converted or shared house (including bed-sits)	1.78%	2.64%
Flat, maisonette or apartment: In a commercial building	0.71%	0.78%
Caravan or other mobile or temporary structure	0.64%	0.25%

7. Household Composition		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
<i>One person household: Total</i>	24.96%	30.58%
One person household: Aged 65 and over	49.81%	40.73%
One person household: Other	50.19%	59.27%
<i>One family only: Total</i>	69.73%	61.73%
One family only: All aged 65 and over	18.35%	13.06%
One family only: Married couple: Total	63.16%	53.61%
One family only: Married couple: No children	44.02%	36.82%
One family only: Married couple: One dependent child	14.53%	17.58%
One family only: Married couple: Two or more dependent children	25.48%	28.30%
One family only: Married couple: All children non-dependent	15.97%	17.30%
One family only: Same-sex civil partnership couple	0.39%	0.21%
One family only: Cohabiting couple: Total	10.83%	15.65%
One family only: Cohabiting couple: No children	61.83%	53.71%
One family only: Cohabiting couple: One dependent child	16.03%	20.43%
One family only: Cohabiting couple: Two or more dependent children	16.03%	20.81%

One family only: Cohabiting couple: All children non-dependent	6.11%	5.05%
One family only: Lone parent: Total	7.27%	17.47%
One family only: Lone parent: One dependent child	31.06%	37.72%
One family only: Lone parent: Two or more dependent children	25.38%	29.11%
One family only: Lone parent: All children non-dependent	43.56%	33.17%
<i>Other household types: Total</i>	5.30%	7.69%
Other household types: With one dependent child	15.94%	16.58%
Other household types: With two or more dependent children	19.57%	16.30%
Other household types: All full-time students	1.81%	7.64%
Other household types: All aged 65 and over	6.16%	3.69%
Other household types: Other	56.52%	55.79%

8. Method for Travel to Work		
<i>Type</i>	<i>B4RN</i>	<i>England/Wales</i>
Work mainly at or from home	16.69%	6.6%
Underground, metro, light rail, tram	0.08%	2.4%
Train	0.84%	3.2%
Bus, minibus or coach	1.02%	4.6%
Taxi	0.12%	0.3%
Motorcycle, scooter or moped	0.29%	0.5%
Driving a car or van	41.54%	35.1%
Passenger in a car or van	2.68%	3.2%
Bicycle	1.17%	1.8%
On foot	3.20%	6.3%
Other method of travel to work	0.45%	0.3%
Not in employment	31.92%	35.5%

B4GAL

The following tables represent the socio-economic considerations in B4GAL. The tables represent the following characteristics of B4GAL in comparison with the Scotland wide average:

1. Deprivation
2. General Health
3. Long Term Health
4. Economic Activity
5. Occupation
6. Highest Qualification
7. Household Type
8. Household Composition
9. Method of Travel to Work

1. Deprivation	
<i>SIMD Decile</i>	<i>B4GAL</i>
1 Most Deprived	0%
2	0%
3	0%
4	24.8%
5	40.2%
6	17.1%
7	6%
8	11.9%
9	0
10 Least Deprived	0

2. General Health		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
Very good health	53.42%	52.47%
Good health	29.01%	29.74%
Fair health	12.25%	12.18%
Bad health	3.74%	4.27%
Very bad health	1.58%	1.34%

3. Long Term Health		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
No condition	70.90%	70.07%
One or more conditions	29.10%	29.93%
Deafness or partial hearing loss	6.98%	6.63%
Blindness or partial sight loss	1.85%	2.37%
Learning disability	0.63%	0.50%
Learning difficulty	2.16%	2.00%
Developmental disorder	0.81%	0.60%
Physical disability	6.44%	6.71%
Mental health condition	2.79%	4.40%
Other condition	17.97%	18.67%

4. Economic Activity		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
<i>Economically Active</i>	70.02%	68.96%
Economically active: Employee: Part-time	17.52%	19.34%
Economically active: Employee: Full-time	51.16%	57.45%
Economically active: Self-employed	22.56%	10.87%
Economically active: Unemployed	6.03%	6.92%
Economically active: Full-time student	2.73%	5.42%
<i>Economically Inactive</i>	29.98%	31.02%
Economically inactive: Retired	54.25%	48.04%
Economically inactive: Student	10.42%	17.73%
Economically inactive: Looking after home or family	15.64%	11.49%
Economically inactive: Long-term sick or disabled	13.13%	16.56%
Economically inactive: Other	6.56%	6.17%
Unemployed people aged 16 to 74: Aged 16 to 24	1.98%	1.44%

Unemployed people aged 16 to 74: Aged 50 to 74	1.40%	0.88%
Unemployed people aged 16 to 74: Never worked	0.74%	0.67%
Unemployed people aged 16 to 74: Long-term unemployed	2.31%	1.85%

5. Occupation		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
1. Managers, directors and senior officials	10.97%	8.38%
2. Professional occupations	17.08%	16.75%
3. Associate professional and technical occupations	10.18%	12.65%
4. Administrative and secretarial occupations	9.82%	11.37%
5. Skilled trades occupations	20.80%	12.52%
6. Caring, leisure and other service occupations	8.32%	9.71%
7. Sales and customer service occupations	5.22%	9.31%
8. Process, plant and machine operatives	8.50%	7.69%
9. Elementary occupations	9.12%	11.61%

6. Highest Qualification		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
All people aged 16 and over: No qualifications	27.42%	26.79%
All people aged 16 and over: Level 1	21.93%	23.08%
All people aged 16 and over: Level 2	14.06%	14.33%
All people aged 16 and over: Level 3	10.29%	9.71%
All people aged 16 and over: Level 4 and above	26.29%	26.09%

Highest level of qualification is defined as:

Level 1: 0 Grade, Standard Grade, Access 3 Cluster, Intermediate 1 or 2, GCSE, CSE, Senior Certification or equivalent; GSVQ Foundation or Intermediate, SVQ level 1 or 2, SCOTVEC Module, City and Guilds Craft or equivalent; Other school qualifications not already mentioned (including foreign qualifications).

Level 2: SCE Higher Grade, Higher, Advanced Higher, CSYS, A Level, AS Level, Advanced Senior Certificate or equivalent; GSVQ Advanced, SVQ level 3, ONC, OND, SCOTVEC National Diploma, City and Guilds Advanced Craft or equivalent.

Level 3: HNC, HND, SVQ level 4 or equivalent; Other post-school but pre-Higher Education qualifications not already mentioned (including foreign qualifications).

Level 4 and above: Degree, Postgraduate qualifications, Masters, PhD, SVQ level 5 or equivalent; Professional qualifications (for example, teaching, nursing, accountancy); Other Higher Education qualifications not already mentioned (including foreign qualifications).

7. Household Type		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
Unshared dwelling: Total	100.00%	99.94%
Unshared dwelling: Whole house or bungalow	95.76%	63.40%
Unshared dwelling: Whole house or bungalow: Detached	55.72%	21.93%
Unshared dwelling: Whole house or bungalow: Semi-detached	23.22%	22.83%
Unshared dwelling: Whole house or bungalow: Terraced (including end-terrace)	21.06%	18.64%
Unshared dwelling: Flat, maisonette or apartment	3.72%	36.44%
Unshared dwelling: Flat, maisonette or apartment: Purpose-built block of flats or tenement	75.00%	93.80%
Unshared dwelling: Flat, maisonette or apartment:	11.11%	4.82%

Part of a converted or shared house (including bed-sits)		
Unshared dwelling: Flat, maisonette or apartment: In a commercial building	13.89%	1.38%
Unshared dwelling: Caravan or other mobile or temporary structure	0.52%	0.16%
Shared dwelling	0.00%	0.06%

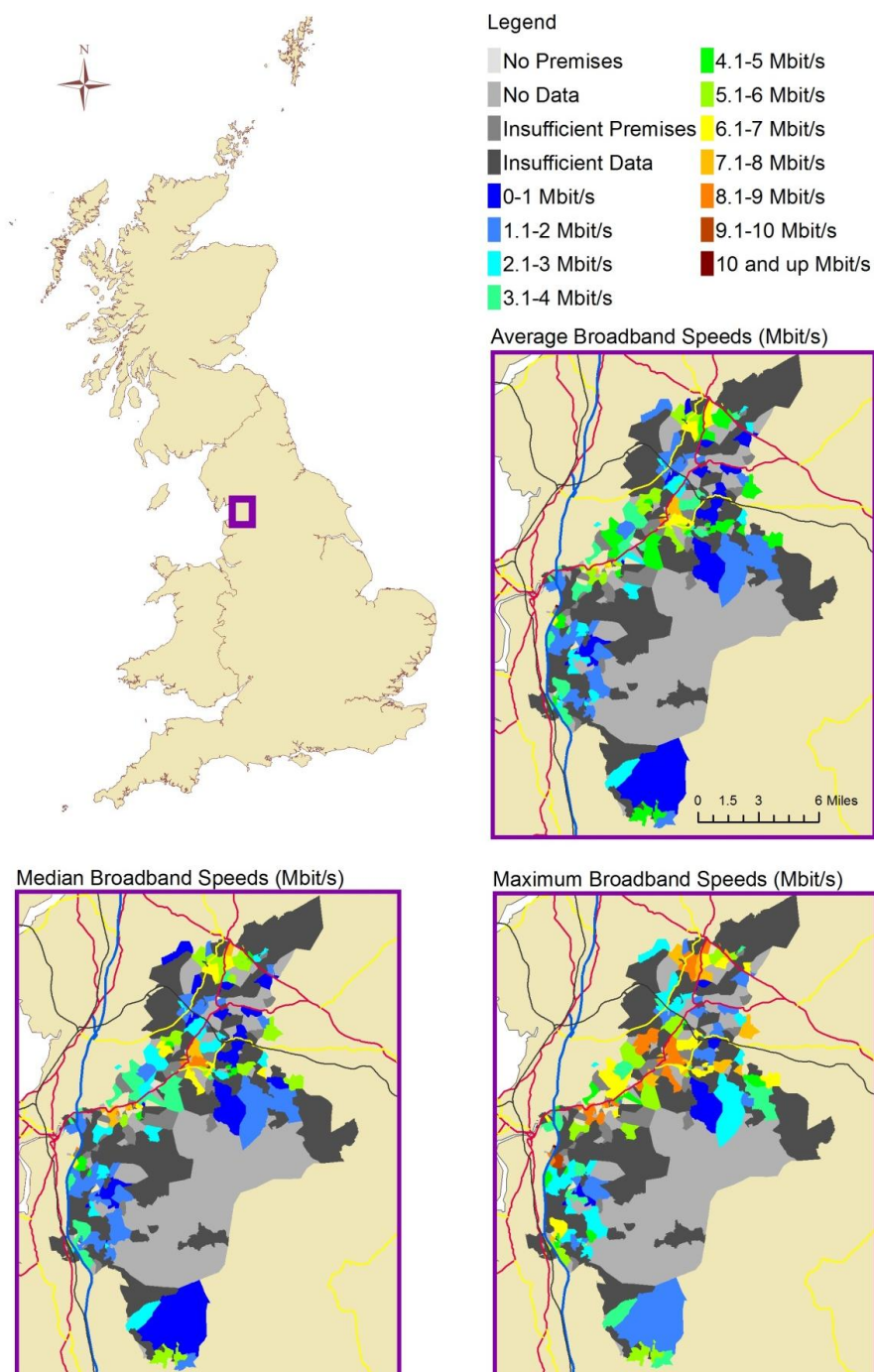
8. Household Composition		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
One person household	27.82%	15.84%
One person household: Aged 65 and over	42.01%	37.88%
One person household: Aged under 65	57.99%	62.12%
One family household	68.67%	76.00%
One family household: All aged 65 and over	10.69%	9.07%
One family household: Married couple	60.39%	58.79%
One family household: Married couple: No children	49.88%	25.44%
One family household: Married couple: One dependent child	14.46%	19.19%
One family household: Married couple: Two or more dependent children	22.69%	35.51%
One family household: Married couple: All children non-dependent	12.97%	19.85%
One family household: Same-sex civil partnership couple	0.75%	0.12%
One family household: Cohabiting couple	16.57%	15.20%
One family household: Cohabiting couple: No children	62.73%	39.20%
One family household: Cohabiting couple: One dependent child	17.27%	24.28%
One family household: Cohabiting couple: Two or more dependent children	11.82%	30.05%
One family household: Cohabiting couple: All children non-dependent	8.18%	6.47%
One family household: Lone parent family	11.60%	16.82%
One family household: Lone parent family: One dependent child	32.47%	33.00%
One family household: Lone parent family: Two or more dependent children	24.68%	36.11%
One family household: Lone parent family: All children non-dependent	42.86%	30.89%
Other household types	3.52%	8.16%
Other household types: One dependent child	20.59%	19.81%
Other household types: Two or more dependent children	29.41%	20.02%
Other household types: All full-time students	0.00%	13.50%
Other household types: All aged 65 and over	2.94%	2.91%
Other household types: Other	47.06%	43.76%

9. Method for Travel to Work		
<i>Type</i>	<i>B4GAL</i>	<i>Scotland</i>
Work mainly at or from home	24.55%	10.81%
Underground, metro, light rail or tram	0.09%	0.27%
Train	1.54%	3.72%
Bus, minibus or coach	1.90%	10.03%
Taxi or minicab	0.00%	0.58%
Driving a car or van	62.77%	55.99%
Passenger in a car or van	3.62%	5.79%
Motorcycle, scooter or moped	0.18%	0.29%
Bicycle	0.27%	1.41%
On foot	3.62%	9.92%
Other	1.45%	1.18%

Appendix V: Technological characteristics of B4RN and B4GAL

This appendix provides the statistical support for statements made in Section 4.3.3, the technical considerations for B4RN and B4GAL.

Map A - 1 Broadband Speeds (Average³⁸, Median³⁹, and Maximum⁴⁰) of the B4RN Region



Source: Map created by Author with B4RN coverage area provided by Forde (2013) and postcode level broadband speed data from Ofcom (2012c).

³⁸ Mean modem sync speed of connections in the postcode to 1 decimal place.

³⁹ Middle modem sync speed in each postcode as if they were all ordered from smallest to highest and the middle one is selected (or average of middle two values if there is an even number of values)

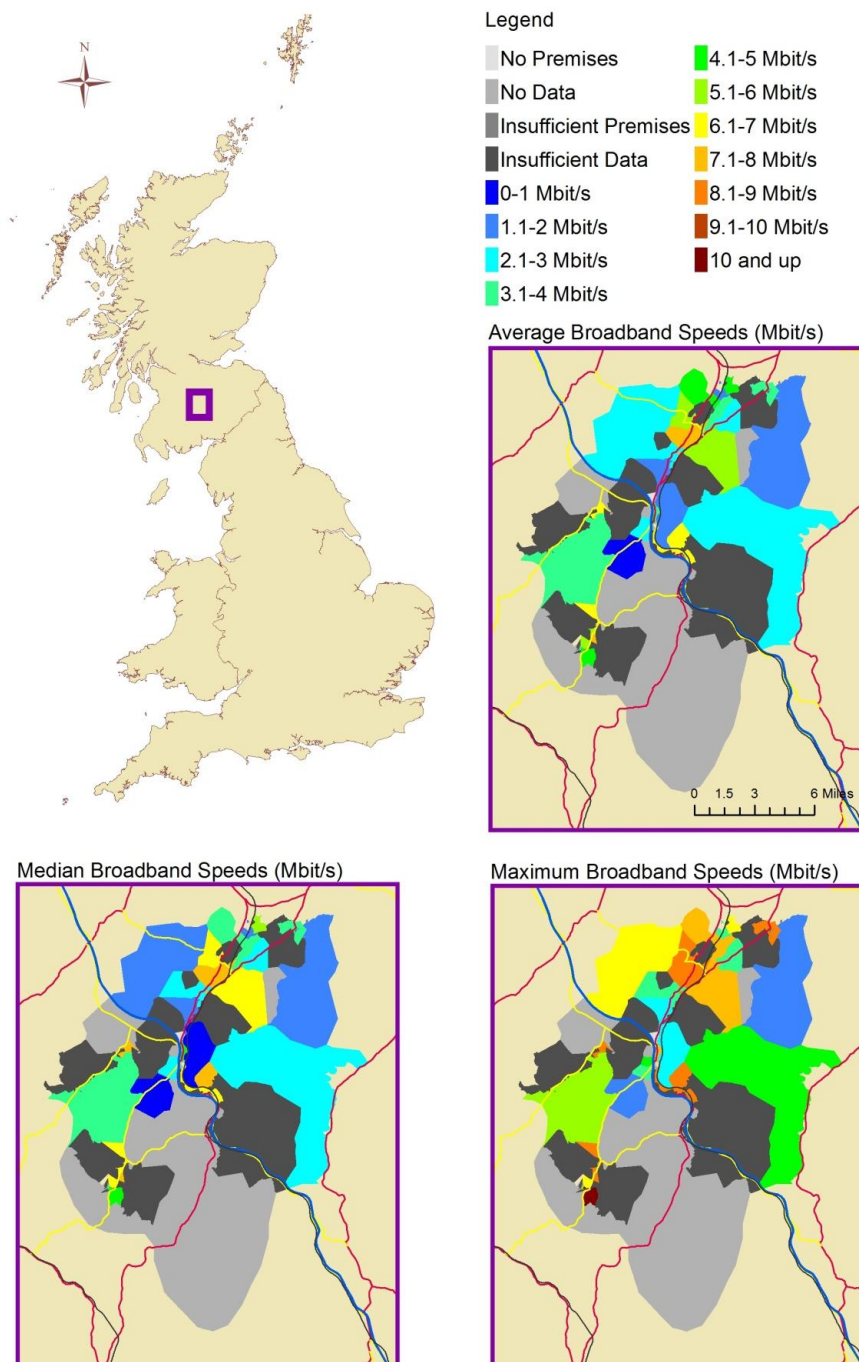
⁴⁰ Highest modem speed in each postcode in Mbit/s

This map, representing the broadband speeds accessible in B4RN prior to the commencement of this doctoral study, utilises Ofcom data collected from the major providers at the postcode level. These data were collected during the period June to July 2012, and represent the starting conditions of the case study area. Due to variations in broadband performance over time, these data are not a definitive and fixed view of the UK's fixed broadband infrastructure. There are large postcodes that have either no or insufficient data, and where there is a lack of information the areas are spatially mapped in shades of gray⁴¹. The lack of or exclusion of data can be related to a lack of premises, no data provided by Internet Service Providers (ISPs), or insufficient premises, which would compromise anonymity of data. It can be inferred that those areas of no data, covering much of the southeast of the area, in some cases do not have access to broadband (an inference supported by interviews held with individuals who remained reliant on older dialup technology in 2012). Where coverage allowed for the reporting of speed information, it is possible to see large sections with less than 2Mbit/s, and those that do have faster speeds tended to be located close to roads, or road intersections. In addition, reflecting on the average speeds in comparison to median speeds, it appears that in many cases along the roads in the northern half of the region, the average is slightly higher (by generally 1Mbit/s) than the median, demonstrating that it is possible that more premises are likely to experience lower speeds than the average presented here. In terms of maximum speeds, except for one postcode located directly adjacent to Lancaster, the maximum speeds achieved were highest near roads and road intersections, and did not exceed 9Mbit/s. These maps ultimately demonstrate the patchy, lower speeds experienced by B4RN residents, and also highlight the lack of data or information on areas, which could be due to isolated properties or no access to broadband at all.

⁴¹ The exact definition of these categories are as follows:

1. *No premises*: There are no residential or small business delivery points in the postcode. There may be large business premises. In the case of these relatively rural areas, this is unlikely.
2. *No data*: Ofcom does not hold any data on broadband connections in the postcode. This may be because consumers in the postcode have chosen not to subscribe to broadband, or that information was not included in the data provided by the largest ISPs, or that broadband is not available in the postcode.
3. *Insufficient premises*: This status means there are less than three residential or small business premises in the postcode. To protect anonymity Ofcom has not provided broadband data for these postcodes.
4. *Insufficient data*: This status means that that data is held on less than three broadband connections in the postcode. To protect anonymity Ofcom has not provided broadband data for these postcodes.

Map A - 2 Broadband speeds (average, median, and maximum) in the B4GAL region⁴²



Source: Map created by Author with B4GAL coverage area estimated from B4GAL (2014) and postcode level broadband speed data provided by Ofcom (2012c).

This data, similar to B4RN, is relatively patchy in itself, and there are several large postcode areas that have either no or insufficient data. Where coverage allowed for the reporting of speed information, it is possible to see large sections ranging from on average 1Mbit/s to 3Mbit/s in the east and north of the area near the main roads, and then higher ranges, up to 5Mbit/s in the northeastern section of the area, again located around major roads. Looking to

⁴² As with Map A - 1, the legend aligns each postcodes speed with a range of approximately 1Mbit/s. The upper limit of this was set at 10.0 Mbit/s, as the data presented to set out the baseline of these regions did not exceed such speeds.

the west of the region average speeds are up to 4Mbit/s. In addition, reflecting on the average speeds in comparison to median speeds similar to B4RN, it appears that in some cases in the middle to the north of the region, the average is slightly higher (by generally 1Mbit/s) than the median, demonstrating that it is possible that more premises are likely to experience lower speeds than the average presented here. Maximum speeds were highest near main roads and intersections (an expected conclusion again due to potential cabinet location and distance for cables), and, except for one postcode located in the southwest, and did not exceed 9Mbit/s, similar to B4RN.

Appendix VI: Pre-installation interview guides⁴³

Information sheet:

In this interview we will hear about your:

- Current experience and views on Internet access and use
- The potential B4GAL project connections
- Anticipated impact of high-speed Internet in your home/business.

We are hoping to evaluate the impact of B4GAL as a community broadband project. As social researchers, we are looking at such issues as the impact of broadband connection on the lives and work of groups and individuals in that community, and any added social benefit.

- This work will enhance a PhD project titled: *Analysing community-based superfast broadband initiatives in the UK: The process, the technology and the potential resilience*, affiliated with the broader dot.rural project on Digital Engagement and Resilience (DEAR). It aims to explore the links between a community's interaction with innovative, superfast broadband technologies and that community's actual resilience. It will analyse the extent to which rural community resilience is enhanced by the *technology itself* and/or by *the process of acquiring* technology.
- You have the right to withdraw from the session at any time.
- We will audio record the discussion in print for post-analysis. All recorded information is confidential and anonymised, and will be used only for the purpose of the research.



⁴³ The information sheet was updated at each stage to reflect the location/phase (i.e. for B4RN the information sheet referenced B4RN instead of B4GAL).

Consent Form:**Analysing community-based superfast broadband initiatives in the UK: The process, the technology and the potential for resilience**

A PhD Project

Name of Researcher(s): Fiona Heesen

Consent form for participation in research interview

Please complete the form below by ticking the relevant boxes and signing on the line below. A copy of the completed form will be given to you for your records.

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I agree to take part in the above study.
3. I understand that my participation in this research is voluntary and that I can withdraw my consent to interview, and to the record of my interview being analysed, reported and stored at any time by contacting a member of the research team.
4. I consent to the interview being recorded using a digital audio recorder and for the recording to be fully transcribed. I understand that the audio-file will be deleted once a transcript has been typed up and that I may request a copy of the interview transcript and can correct any factual errors that will be amended before the final copy of the transcript is analysed.
- OR
4. I agree to written notes being taken during the interview which will be typed up as a record of the interview. I understand that I may request a copy of the typed notes and can correct any factual errors that will be amended before the final copy of the transcript is analysed.
5. I consent to allow the anonymised data from my interview to be used for future publications and other scholarly means of disseminating the findings from the research project. I understand that any direct quotations will not be attributed to this organisation by researchers.
- OR
5. I wish to be referred to by my name; my profession; my employer or organisation (*please delete as appropriate*) if any data from my interview is used for future publications and other scholarly means of disseminating findings from the research project.
6. I understand that the digital recording/ written notes and the typed transcript/ notes of my interview will be securely stored by researchers on this project and that third parties will not have access to this material. On completion of the research, the researchers may be requested to deposit the material with the Economic and Social Data Service (ESDS), <http://www.esds.ac.uk/>, for ESDS to maintain the data in an accessible format for the research community. If this is the case *all* data will be anonymised and any future use of the data by researchers will be bound by an End User Licence that prohibits them from disseminating identifying information.

Name of participant_____
Date_____
Signature_____
Name of researcher_____
Date_____
Signature

***Pre –installation Interview Guides – B4GAL/B4RN Community Broadband Initiatives
(Public and Business Interviewees)***

A. Community Group Focus

1. How did you find out about B4GAL/B4RN?
2. What made you decide to take part in the project? If not taking part, what influenced your decision?
3. What do you expect from the new service? (Speed? Capacity? –If applicable)
4. What is your opinion on the structure of B4GAL/B4RN (such as cash shares and labour shares)?
 - a. Did this affect your decision to take part? (If applicable)
 - b. Are there any aspects of the B4GAL/B4RN community broadband project you are completely happy with?
 - c. Any aspects to improve?
5. We're researching the use and impact of broadband services; do you see high-speed Internet technology as important to the future of your region/community?
 - a. Anything else that you believe is vital for the future growth/sustainability of the community? (i.e. transport, community groups etc.)

B. Current Rural Environment

1. What are your impressions of living (and working if applicable) in a rural community?
 - a. Have you ever felt isolated living in a rural area?
2. Do you feel attached to your community and where you live?
 - a. Do you take part in any community groups/ organisations/ events? If you are involved in a local business, is it involved in the community?
 - b. Do you feel you have a say in your community actions or events?
3. With respect to the future, do you see your local areas and community growing and expanding? How?
4. How do you feel about the presence of broadband in your life? Is it an important aspect?
5. Do you trust information from online?

C. Personal and/or Business Internet Behaviour

1. How comfortable are you using the Internet?
 - a. How long have you used it?
 - b. How do you access it? (Home, work, mobile?)
 - c. How often? (daily, continuous)
 - d. Have you ever had training in Internet technology? If involved in a business, is staff provided with training?
 - e. If involved in a business, will any additional equipment be needed to take advantage of the B4GAL/B4RN service? (If applicable)
2. See page of personal and business uses.
 - a. What do you use the Internet for? (highlight with green or blue)
 - b. What do you want to use it for? (highlight with red or pink)
 1. Cloud?
 2. Networking?

3. What is your opinion of your current Internet access? (Speed? Capacity?) Are you satisfied with any interaction you have had with your provider?
4. If involved in a business, has the Internet impacted on your efficiency or functionality?
5. How would you feel if you couldn't access the Internet for a month?

D. Further Questions?

***Pre-installation Interview Guides – B4GAL/B4RN Community Broadband Initiatives
(Governance/Organiser Interviewees)***

1. How did B4GAL/B4RN come about?
 - a. Was there an initial impetus, organising figure, or group?
 - b. What skills did you require in the beginning?
2. What first step was taken to set up B4GAL/B4RN as a group?
 - a. What influenced the decision to implement fibre technology as opposed to something else?
 - b. How did you come up with the decision to access grant funding, as opposed to other methods?
 - i. Are there any limits of this?
 - ii. Can you explain the benefits of this?
3. What challenges has B4GAL/B4RN faced throughout the initial steps? What type of persistence did it require from the group?
 - a. Getting users
 - b. Physically deploying the infrastructure (i.e. private land v. public etc.)
 - c. Funding
4. How is the initiative set up (Interest corporation, volunteer group etc.) and why was one specific route chosen over another?
 - a. What are the formal mechanisms that govern the group?
 - i. How has this structure influenced the building of the broadband network and obtaining shareholders/users?
5. How do you believe B4GAL/B4RN may impact the community?
 - a. How is it being marketed?
 - b. What are the speed and capacity expectations for users?
 - i. In layman's terms, what could that type of speed allow? (Type of usage, streaming video etc.)
6. What is the long-term vision for B4GAL/B4RN? (Self-sustaining etc., volunteer led, setting an industry standard)
7. In retrospect, is there anything you would have done differently when setting up B4GAL/B4RN and striving to implement the fibre?
 - a. What skills are becoming necessary as you go about implementing the service?
8. What do you think will be future challenges with this service?

***Pre-installation Interview Guides – B4GAL/B4RN Community Broadband Initiatives
(Non-Adopter Interviewees)***

1. Do you currently have access to Internet?
2. Do you access the internet in any other way (other than a home connection – mobile, at work etc.)?
3. How would you feel if you couldn't access the Internet in the next month?
4. Do you have any specific reason for not using the B4GAL/B4RN service/technology? Is there a general reason?
 - a. For example, current low levels of internet use anyway, no connectable device (i.e. don't own a computer and have no wish to do so)
 - b. Would there be any reason you may wish to take part in a community broadband project?
5. What is your opinion on the structure of B4GAL/B4RN as a community-based initiative?
6. With respect to the future, do you see your local areas and community growing/expanding? If so, how? (i.e. specific industry growth, tourism, population etc.)
7. In general, are you satisfied with your life? (with respect to well-being and satisfaction)
 - a. We are researching the use and impact of broadband services; do you see this as an important aspect of your life?
8. Do you feel attached to your community/where you live? (are you satisfied with where you live, both with the physical location and with any local community?)
 - a. Do you take part in any community groups/organisations or events?
9. In general, do you feel isolated at all being in a more rural area?
 - a. Have you ever felt isolated? Do you often feel isolated?
10. Have you felt left out of events/things in the past?
11. Do you think in general that you can trust the information you access online?

Appendix VII: Pre-installation summaries

Community-led Broadband Research on B4RN

Fiona H. Ashmore (University of Aberdeen)

In summer 2012, we travelled to rural Lancashire to ask people about their experiences of rural life with the Internet, and the fibre broadband project, Broadband for the Rural North (B4RN). We wanted to know the potential for superfast broadband and how it may influence community. Here is a snapshot of what we heard.

"I want it more reliable than it is. I don't want to be downloading films or this sort of thing. I think it's a reliable service I want"

Superfast broadband would be **reliable**, and the high speed would enable communities and individuals to be part of a wider digital community. It was also highlighted to potentially increase **efficiency** for individuals and families .



"I think what's really come out to me is the ability to use multiple devices and not have problems...they want to work simultaneously doing multiple different things"

"Because it's a community run thing, rather than a 'big cats' - like BT and TalkTalk. I just think it's local people trying to create something good. And that's why I am all for it"

Individuals were interested in the project not just because of the superfast broadband that would be available, but primarily because they were **supporting a local initiative**, which contributed to the overall **sense of community**.



Video services were the most highlighted feature of broadband use that people were interested in exploring with superfast broadband. This included things like BBC iPlayer and Skype, but also new tools, like personal CCTV for security.

"I sometimes feel we're excluded from certain aspects of what you might call modern life because things come on iPlayer...you sort of feel a bit excluded from things that a lot of people take for granted"

Superfast broadband was also thought to **provide control to rural residents** – control over media choices, services used, such as personal finances, and so on. Even the lack of access to smaller, everyday activities like shopping online and checking travel times were highlighted as current frustrations.



"I mean...I have at least five to six online companies, a stock broker, all these different platforms...and it's just wonderful to have your own control, full control"



Potential community-level benefits included **increasing economic interest** in working in a rural area, and **increasing the value of property and land**, which could hopefully limit service decline in the small villages. This could also be a drawback, as affordable homes become scarce.

"I think that if we can get the B4RN project up and running, we can improve some of the services then I think there's potential to grow the community a little bit"



The research described here is supported by the award made by the RCUK Digital Economy programme to the dot.rural Digital Economy Hub; award reference: EP/G066051/1.

Community-led Broadband
Research on B4GAL

Fiona H. Ashmore (University of Aberdeen)

In spring 2013, we travelled to rural South Lanarkshire and Dumfries and Galloway to ask people about their experiences of rural life with the Internet, and the community project, Broadband for Glencaple and Lowther (B4GAL). We wanted to know the potential for superfast broadband and how it may influence community. Here is a snapshot of what we heard.

"It would be great to have more services so we could have it play an even bigger part of our life, so we would watch more things, I could communicate via web conferencing with work..."

Superfast broadband would be **reliable**, and the high speed would enable communities and individuals to be part of a wider digital community. It was also highlighted to potentially increase **efficiency** for individuals and families .



"...you do need that technological bridge. You know you need to be able to communicate efficiently and effectively with everybody else"

"...one of the things I do is run webinars with clients all over the world, and sometimes its public, so when I'm sitting there and I'm the main speaker, and I've got half meg connection, it doesn't allow me much opportunity"

Video services were the most highlighted feature of broadband use that people were interested in exploring with superfast broadband. This included things like BBC iPlayer and Skype, but also new tools, like personal CCTV for security, or employment-related video linking.

Superfast broadband was also thought to **provide economic opportunity** to current rural residents - opportunity to enhance current businesses, and contribute to more everyday activities such as managing finances and so on.

"We're pulling people from further away, Edinburgh, Glasgow, London, and they find the website and then taking a trip out and coming to see what we have... I would say, sort of 50% of our sales are done from the Internet, so it's very important"



"It's the first time I've felt like part of the community. We're so remote. That was my community, this house and those two over there! But now it's much broader!"

Individuals were interested in the project both because of the potential superfast broadband that would be available and because they were **supporting a local initiative**, which enhanced their **sense of community**.

Potential community-level benefits included **increasing economic interest** in working in a rural area, possibly contributing to population and economic **diversity** in the future.

"...if you want to bring young blood, talent, to places like this the you need that infrastructure"



Potential benefits arising from the community-led approach were the ability to **provide local jobs and training**, contributing again to new economic opportunity in the region.

"I think potentially as well when we are contracting other companies in, we can make it part of their contracts to take on local workers, and that's all for community benefit"

Other benefits included **increasing the value of rural property**, which could lead to more investment elsewhere. This could also be a drawback, as affordable homes become scarce.

"It's number one on the housing list! And people are buying houses now, and it's the first question, you know, do you have broadband..."



The research described here is supported by the award made by the RCUK Digital Economy programme to the dot.rural Digital Economy Hub; award reference: EP/G066051/1.

Appendix VIII: Post-installation interview guides***Post-installation Interview Guides –B4RN Community Broadband Initiatives (Public and Business Interviewees)*****A. Community Group Focus**

1. What is your opinion on the B4RN project now that it is up and running?
2. Has your involvement changed since we last spoke?
3. Are there any aspects you think have gone well, or could be improved upon?

B. Superfast Internet and the Rural Environment

1. Now that it is here, what role do you see superfast Internet playing in your region/community? Is it important?
 - a. What do you think are the benefits or drawbacks (if any) of having superfast access?
 - b. With the arrival of superfast, is there anything else that you see as important for the future growth/sustainability of the community? (i.e. transport)
 - i. (Depending on response) Do you think superfast access will encourage this?
2. With respect to the future, do you see your local areas and community growing and expanding? How?
3. What are your impressions of living (and working if applicable) in a rural community?
 - a. Do you feel any sense of isolation living in a rural area?
4. Do you feel attached to your community and where you live?
 - a. Do you take part in any community groups/ organisations/ events? If you are involved in a local business, is it involved in the community?
 - b. Do you feel you have a say in your community actions or events?
5. Has the superfast Internet changed anything for you about how you connect with the community?

C. Superfast Internet Behaviour

1. How do you feel about the presence of superfast broadband in your life? Is it an important aspect?
2. What do you use your superfast Internet for? (Sheets had been used here)
3. If you think back to when you didn't have superfast – how do you think your usage has changed? Has it changed for other members of your family? (If applicable)
4. Are you satisfied with any interaction you have had with your community provider?
5. If involved in a business, has the new superfast Internet impacted on your turnover, profits or marketing?

D. Further Questions?

Post-installation Interview Guides –B4RN Community Broadband Initiatives (Governance/Organiser Interviewees)

1. How has B4RN progressed in the last two years?
2. Has your involvement changed since we last spoke?
3. I was just wondering if you could reflect on what challenges has B4RN faced throughout the deployment process? Positive aspects?
 - a. What skills (splicing, management, and so on) has it required? Have you had to increase training? Buy in skills?
4. How do you believe B4RN is impacting the community? The wider region?
5. What is the long-term vision for B4RN?
6. In retrospect, is there anything you would have done differently when implementing B4RN?
 - a. What skills are becoming necessary as you go about implementing the service?
7. Thinking into the future, what future opportunities do you see for B4RN? Larger reach? Model? Future challenges?

Post-installation Interview Guides –B4RN Community Broadband Initiatives (Non Adopter Interviewees)

A. Community Group Focus

1. What is your opinion on the B4RN project now that it is up and running?
 - a. *Organisation?*
 - b. *Lack of progress?*
2. Has your involvement changed since we last spoke?
3. Are there any aspects you think have gone well at all?
 - a. What could have been improved upon?

B. Superfast Internet and the Rural Environment

1. Now that it is here, what role do you see superfast Internet playing in your region/community? Is it important?
 - a. What do you think are the benefits or drawbacks (if any) of having superfast access?
2. With respect to the future, do you see your local areas and community growing and expanding? How?
3. What are your impressions of living (and working if applicable) in a rural community?
 - a. Do you feel any sense of isolation living in a rural area?
4. Do you feel attached to your community and where you live?
 - a. Do you take part in any community groups/ organisations/ events? If you are involved in a local business, is it involved in the community?
 - b. Do you feel you have a say in your community actions or events?
5. With respect to your Internet use - How do you feel about the presence of it in your life? Is it an important aspect?

***Post-installation Interview Guides –B4GAL Community Broadband Initiatives
(General public and business)***

A. Community Group Focus

1. Are you aware of where the B4GAL project is now?

Follow Ups:

- a. (If known) What is your opinion on its current progress? (i.e. charitable status/funding/interest)
 - b. Is there anything you think B4GAL as an initiative should have done differently?
2. Has your involvement or opinion of it changed? (i.e. increased or decreased interest/volunteering)

B. Superfast Broadband and the Rural Environment

1. With respect to superfast broadband, how important do you think it is for you (and/or your business)?
 - a. For your community?
2. What are your impressions of living (and working if applicable) in a rural community?
 - a. Do you feel any sense of isolation living in a rural area?
3. Do you feel attached to your community and where you live?
 - a. Do you take part in any community groups/ organisations/ events? If you are involved in a local business, is it involved in the community?
 - b. Do you feel you have a say in your community actions or events?
4. Do you think superfast broadband will change anything for you about how you connect with the community? Connect with friends/family?

***Post-installation Interview Guides –B4GAL Community Broadband Initiatives
(Governance/Organiser Interviewees)***

1. At what stage is the B4GAL project?
 - a. How do you keep members of the community up to date with B4GAL's progress?
 - b. If not a core member, how do you keep up to date with developments in B4GAL?
2. What steps has the group gone through in the last year and a half? (this timescale is because that was when I last spoke with interviewees)

Follow Ups:

- a. What successes / achievements/ progress have you had? (follow up re: charitable status, policy interest, enthusiasm etc.)
- b. What challenges have you encountered? (follow up re: BT, policy, funding, volunteerism, enthusiasm etc.)
- c. Is there anything as an initiative that you have needed/wanted and felt you were lacking specifically? (i.e. support/funding/advice)
 - i. How would it have helped the initiative and/or its progress? Who would provide such information / have they had any involvement to date with B4GAL?

-
3. I have heard that there is some developments by other parties to roll out superfast and improve connectivity locally – I wonder if you could elaborate on how that aligns with or works against the B4GAL project?
 4. What are your next steps as a project?

Follow Ups:

- a. Timeline – how soon is roll out expected?
 - b. As roll out is closer – what offering are you expecting to provide?
(cost/Mbit/s any premium services)
 - c. What do you see as the long term vision for B4GAL? (replicable model/sustainable etc.)
5. Do you think there is anything you would have done differently, looking back?
 6. As a community broadband initiative, what advice would you give to other rural areas wanting to pursue a community network?
 7. With respect to superfast broadband in general, how important do you think it is for the region/community?

Appendix IX: Interviewees and associated connection times

Participant No.	Month Interviewed																												
	Aug 2012	Sept 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	June 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sept 2014	Oct 2014	Nov 2014	Dec 2014
B4RN 1	✓																												
B4RN 2	✓																												
B4RN 3	✓																												
B4RN 4	✓																												
B4RN 5	✓																												
B4RN 6	✓																												
B4RN 7	✓																												
B4RN 8	✓																												
B4RN 9	✓																												
B4RN 10	✓																												
B4RN 11	✓																												
B4RN 12	✓																												
B4RN 13	✓																												
B4RN 14	✓																												
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B4RN 23	✓																												
B4RN 24	✓																												
B4RN 25	✓																												
B4RN 26	✓																												
B4RN 27	✓																												
B4RN 28	✓																												

- ✓ Phase I Interview
- ✓ Adopter of the B4RN service
- ✓ Non-adopter of the B4RN service
- ★ Approximate date of connection to superfast broadband

Participant No.	Month Interviewed																													
	Aug 2012	Sept 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	June 2013	Jul 2013	Aug 2013	Sept 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sept 2014	Oct 2014	Nov 2014	Dec 2014	
B4GAL 1										✓																				
B4GAL 2										✓																				
B4GAL 3										✓																				
B4GAL 4										✓																				
B4GAL 5										✓																				
B4GAL 6										✓																				
B4GAL 7										✓																				
B4GAL 8										✓																				
B4GAL 9										✓																				
B4GAL 10										✓																				
B4GAL 11										✓																				

- ✓ Phase I Interview
- ✓ Follow-up Interview