SPATIAL DATA USE IN THE UK NONPROFIT SECTOR: A SOCIOTECHNICAL EXPLORATION

by

JAMES JOHN BOWLES

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Department of Social Policy, Sociology and Criminology

School of Social Policy

College of Social Sciences

University of Birmingham

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Abstract

Nonprofit organisations (NPOs) in the UK are increasingly becoming data-driven in their efforts to generate societal benefit and achieve their aims. Gaining knowledge of service users, demonstrating impact, and building relations with wider stakeholders are a few of the functions that are coming to be underpinned or supported by data and technology. This thesis explores the social and technical elements of the use of *spatial data* and associated technologies (such as geographic information systems (GIS)) by 35 UK nonprofit organisations. Spatial data refers to any data that has a location attribute, such as a postcode or administrative boundary code. We know little about contemporary use of spatial data by NPOs, particularly outside of North America. Drawing on data from documentary and visual sources, and from semi-structured interviews with staff and volunteers, the thesis presents a comprehensive overview of the ways in which nonprofit organisations use spatial data to achieve their organisational aims. A thematic overview of the primary drivers behind NPO spatial data use summarises use cases from a broad range of organisational sizes and missions.

In moving beyond a utilitarian description of current practices, the thesis makes a distinctive contribution by examining NPO spatial data use through three social constructionist theoretical approaches. Drawing on scholarship from the fields of human geography, nonprofit studies, and social studies of data, all three approaches attend to the social, technical, material and cultural elements of data construction and application. The first approach (Chapter 6) uses an organisational epistemological framework to examine how NPOs construct and apply expert knowledge of people and place using spatial data. It presents the construction of spatial data as a product of technological affordances and ever-changing organisational practice, priorities, and values. The second approach (Chapter 7) conducts a semiotic reading of spatial data visualisations as semiotic devices that build relations across and within organisations. The semiotic framework used in this chapter provides a close assessment of the social factors that facilitate the relational work of spatial data and their visualisations without neglecting the physical infrastructure on which they rest. The third approach (Chapter 8) responds to claims that

NPOs display a hybrid form and draw on the logics of three institutions (the market, the community, and the state) to guide their actions. The thesis explores the manifestation of institutional logics in spatial data use and considers strategies used by NPOs for dealing with threats to legitimacy caused by the adoption of plural logics.

Nonprofit organisations are not isolated from the pervasive datafication of organisational and social life. This thesis presents a descriptive and theoretical account of how a diverse range of nonprofit organisations are using spatial data and associated technologies amidst a rapidly changing data construction and application landscape. The social constructionist perspective used in this thesis demonstrates the capacity of NPOs to construct and use data for making claims of expertise, build relations across and within organisations, and position themselves within wider organisational and institutional fields.

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List of abbreviations

ANT	*Actor-network Theory*
API	*Application Programming Interface*
BI	*Business Intelligence*
CCG	*Clinical Commissioning Group*
CRM	*Customer Relationship Management*
ESRC	*Economic and Social Research Council*
FME	*Feature Manipulation Engine*
FOSS	*Free and Open-Source Software*
GDPR	*General Data Protection Regulation*
GIS	*Geographic Information Systems*
GPS	*Global Positioning System*
GSS	*Government Statistical Service*
HCI	*Human-Computer Interaction*
HE	*Higher Education*
ICNPO	*International Classification of Non-Profit Organizations*
IMD	*Indices of Multiple Deprivation*
IP	*Internet Protocol*
IS	*Information Systems*
IT	*Information Technology*
KM	*Knowledge Management*
KML	*Keyhole Markup Language*
KPI	*Key Performance Indicators*
LA	*Local Authority*
LSOA	*Lower Layer Super Output Area*
M&E	*Monitoring and Evaluation*
MSOA	*Middle Layer Super Output Area*
NCGIA	*National Centre for Geographic Information and Analysis*
NCVO	*National Council for Voluntary Organisations*
NDPB	*Non-departmental Public Body*
NLP	*Natural Language Processing*
NPG	*New Public Governance*
NPM	*New Public Management*
NPO(s)	*Nonprofit Organisation(s)*
ONS	*Office for National Statistics*
PPGIS	*Public Participation GIS*
QGIS	*Quantum GIS*
SCOT	*Social Construction of Technology*
SNA	*Social Network Analysis*
SQL	*Structured Query Language*
SSK	*Sociology of Scientific Knowledge*
STS	*Science, Technology and Society*
TSO	*Third Sector Organisation*
VCS	*Voluntary and Community Sector*
VGI	*Volunteered Geographic Information*

Effectively, then, a map is an engine, where an engine is a machine that converts energy to work, and a machine is any device that helps get work done. Maps are engines that convert social energy to social work

(Wood, 2010, p.1)

1. Introduction

1.1 A research imperative

Amidst a wider societal paradigm shift in the production and use of data, the UK's nonprofit sector is operating amidst a changing data landscape, typified by organisations using data across a variety of operations, new data-centric organisations coming into being, and a championing of data-informed leadership and decision making. Simultaneously, the ubiquity of spatial data and the development of analytical tools that break down the expert/amateur binary has led to a transformation in the application and significance of spatial analysis. Cartography has been "undisciplined" as actors beyond the state and academy use spatial data to craft representations of the world or make knowledge claims about it (Crampton and Krygier, 2006, p.12). Consider the development of spontaneous mapping projects during the Covid-19 pandemic; as personal geographies became locally bounded due to the coronavirus pandemic, crowdsourced data on local mutual aid groups was mapped so people who required help or wished to offer aid could find a group. For example, the map depicted in Figure 1a was developed by Covid-19 Mutual Aid UK, an entirely volunteer-run network set up to coordinate mutual aid efforts.

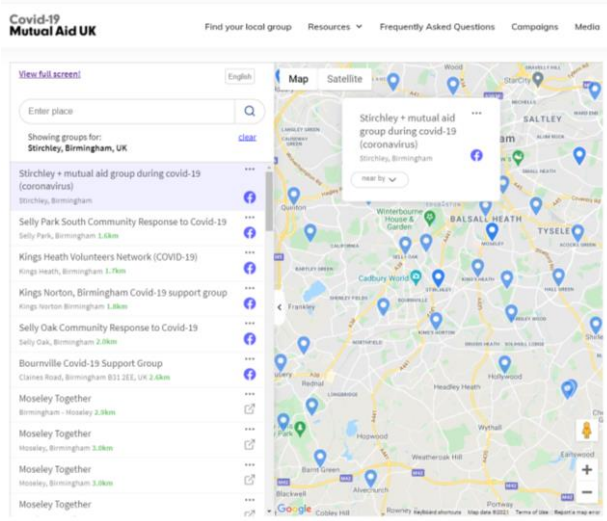


Figure 1a: Map of COVID-19 Mutual Aid groups. Source: COVID- 19 Mutual Aid UK (2021)

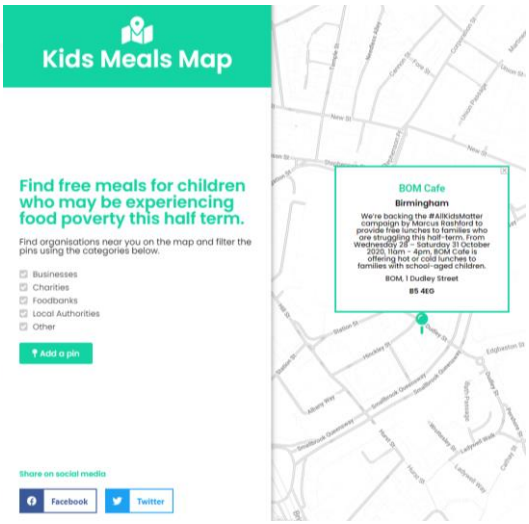


Figure 1b: Map of free meals. Source: PLMR and The Food Foundation (2021)

At a similar time, Manchester United footballer Marcus Rashford worked to significantly raise the profile of charity-led campaigns for government support for families who were experiencing food poverty during the pandemic. Government indifference was met by a response from charities and businesses who wished to offer food, and a map developed in partnership with a leading anti-food poverty charity documented free offers of food (Figure 1b).

A strategic and long-term example of both shifts in cartographic practice and the nonprofit sector's increasing use and reliance on data is The Ramblers' 'Don't Lose Your Way Campaign'. The Ramblers is a national walking charity and launched a campaign in 2020 to crowdsource data on all historic rights of way to ensure they are mapped before a legally mandated cut off in 2026. Using a bespoke online crowdsourcing mapping platform, around 4000 volunteers have mapped approximately 50,000 miles of pathways that are currently not officially recognised as public rights of way but will be in 2026.

These brief examples serve as a demonstration of the multiple ways maps perform "social work" (Wood, 2010, p.1) for nonprofit organisations (NPOs). Yet, there is a near-complete

omission of the UK's nonprofit sector in contemporary spatial data policy developments and partial omission in academic and theoretical understanding of contemporary nonprofit spatial data use. In 2018, the Cabinet Office set up the Geospatial Commission, charged with the task of coordinating public sector geospatial activity and delivering a strategy that promotes the use of location data, improving access to it, fostering growth in skills and capabilities, and setting the UK up as an international leader in this area. In prior consultation documents and the National Geospatial Strategy 2020-2025 itself, the primary domain applications and the sectors in which the "power of location can be unlocked" (Geospatial Commission, 2020) appear to solely rest with the public and private sectors. The National Geospatial Strategy stresses the importance of creating social value yet fails to implicate the role of the nonprofit sector in doing so. The more broadly focussed UK National Data Strategy (Department for Digital, Culture, Media and Sport, 2020) partially recognises the nonprofit sector and civil society actors as stakeholders with which to be consulted, but places significantly greater emphasis on working with and supporting the public and private sectors.

The review of pertinent academic scholarship (Chapter 2) presents a body of literature that fails to document both contemporary and varied uses of nonprofit spatial data use. There is growing academic interest in use of data by NPOs, with a particular emphasis on the relationship between data use and nonprofit monitoring and evaluation practices (e.g. Eckerd and Moulton, 2011). Critical examinations draw on the fields of science, technology and society (STS) and human-computer interaction (HCI) to present a deep understanding of the human and cultural context and challenges found in NPO use of data (e.g. Verma and Voida, 2016, and Bopp et al., 2017). Scholarship more closely aligned with the subject matter of this thesis, *spatial* data use, is found at the intersection of nonprofit studies and geography. Effort in the 1990s in the US to democratise access to geospatial technologies resulted in a broad research agenda which initiated academic-nonprofit partnerships and documented use cases where spatial data played an important role in the work of nonprofit organisations (e.g. Craig and Elwood, 1998). Most studies undertaken as part of this research agenda were small-scale case studies of grassroots community organisations. More recent academic studies have examined discrete issues, such as

barriers to adopting geospatial technologies (e.g. Brudney et al., 2016) and the use of online mapping tools (e.g. Johnson and Sieber, 2017).

From the absence of evidence that nonprofit organisations make use of spatial data in both academic literature and contemporary policy developments, the conclusion that nonprofit organisations simply don't use spatial data could be reached. However, there is a wide range of evidence to suggest that nonprofit organisations are increasingly engaging with digital technologies and displaying data-informed practice (discussed further in section 2.2), to the extent that "all of civil society is becoming digital civil society" (Bernholz et al., 2020, p.12). Nonprofit scholars have a clear research imperative to examine the multifaceted implications of this epochal shift.

Therefore, this thesis examines the use of spatial data and associated technologies by 35 nonprofit organisations in the UK. Before giving an overview of the thesis and the guiding research questions, it is important to provide definitional clarity. This thesis is titled *'Spatial data use in the UK nonprofit sector: a sociotechnical exploration'*.

Spatial data refers to any data that has both a location (a where), and an attribute (a what). For example, a NPO may hold a list of service users which has names (attribute) alongside their postcodes (location), or a NPO may map the coordinates (location) of their outreach centres (attribute), against need (attribute) measured at local authority level (location). Spatial data shouldn't be viewed as particularly distinct from any other form of data, except that it contains something that locates the data in space. Etymologically, spatial data is distinct from geospatial data in that spatial data refers to any measurable feature of phenomena in space. *Geo*spatial describes the measurement of space in relation to the Earth's surface. However, the terms are used interchangeably in most settings. This thesis mostly uses the term spatial data, as it is vocabulary that crosses disciplinary divides (e.g. spatial media), is more versatile (Longley et al., 2015) and is shorter than geospatial. Spatial data can be presented as raw data (a pair of coordinates), or it can be visualised in some way. Traditionally, a geographic information system (GIS) would be used to compile spatially referenced layers to produce novel digital visual insights. As data visualisation software has become more advanced, more generic data

analysis software and platforms have increased their capability for handling and visualising spatial data (see section 2.3 for a more in-depth overview of spatial data).

The UK nonprofit sector describes a group of organisations that show a clear organisational form, are independent of government, are not profit-distributing, and contain a meaningful degree of voluntary effort (Kendall and Knapp, 1993). This definition includes various organisational forms: unregistered voluntary associations, charities registered with a regulator, community-interest companies (CICs) and social enterprises. The empirical reality of drawing a boundary around the nonprofit sector is complex and open to challenge, not least because many organisations possess hybrid identities that draw on the values and logics of multiple sectors. This thesis uses the term nonprofit organisations (NPOs) instead of voluntary sector organisations, charities, social sector organisations or third sector organisations (TSOs). In the UK, organisations are more commonly described as voluntary or third sector organisations. However, most of the literature which this thesis is influenced by and builds on, and the wider debates that it contributes to, originate in the United States where the term nonprofit is overwhelmingly favoured.

The thesis is a *sociotechnical exploration* in that it doesn't give primacy to either the technical or social elements of data use, instead recognising that both are human constructs which are mutually constitutive. Whilst they can be separated for analytical purposes, in practice, society shapes technology, and technology shapes society (Bijker, 1995). The thesis accounts for the social construction of data within a wider sociotechnical system, comprising a unique social context, differing value judgements, power imbalances, legacy technical systems and technical capabilities (Selbst et al., 2019). The thesis is both a theoretical and empirical exploration: the paucity of documented nonprofit uses of spatial data means there is an element of venturing into the unknown. Upon finding examples of NPO spatial data use, the thesis examines the empirical data through alternative and complementary social constructionist theoretical framings.

1.2 Guiding research questions and overview of the thesis

This thesis responds to three overarching research questions.

RQ1: *How is spatial data used by UK nonprofit organisations to construct and represent reality? (organisational)*

This research question seeks to explore the extent to which spatial data is itself constructed within a wider data assemblage (Kitchin and Lauriualt, 2014) and is used in organisational settings to collectively understand and act in the world.

RQ2: *How is spatial data used by UK nonprofit organisations to position themselves within and across sectors? (organisational and institutional)*

This research question seeks to explore how nonprofit organisations use spatial data to position themselves and build relations within and across sectoral and institutional boundaries.

RQ3: *How can nonprofit spatial data use be theorised using frameworks drawn from the fields of human geography, nonprofit research, and social studies of data? (theoretical)*

This research question gives the interdisciplinary study space to draw on and contribute to theoretical perspectives from several academic fields. The question does not presuppose a deep division between disciplines but seeks to explore productive synergies that can arise from a plurality of perspectives.

The thesis is divided into nine chapters. The following chapter serves as a narrative literature review to provide the foundation for an analysis of nonprofit spatial data use. It provides an overview of the dominant theoretical framings in nonprofit studies and a description of the UK nonprofit operating environment, before situating the study amidst a paradigm shift in nonprofit use of data. Chapter 2 then turns to spatial data, to its foundational topics and ontological structure, changing forms and uses, and the nuanced and critical understanding provided by geography and nonprofit scholars. The chapter draws to a close by providing a thematic meta-analysis of studies which explicitly assess

the use of spatial data by nonprofit organisations. It provides a summary of the key topics and debates, as well as a descriptive overview of studies that are closest in form and subject matter to this thesis.

This study is highly interdisciplinary and draws from and contributes to multiple scholarly canons. Chapter 3 positions the study at the intersection of the fields of human geography, social policy (nonprofit studies), and social studies of data. Despite drawing from a broad base of literature, it maintains cohesion through adopting social constructionism as a unifying framework. Chapter 3 states the founding tenets of the social constructionist approach taken and its application in understanding data, maps and spatial media, and organisations and institutions. Following the review of literature in Chapter 2, and development of a cohesive theoretical framework earlier in Chapter 3, the research gap and guiding research questions are presented.

Chapter 4 lays the groundwork for the methodological approach taken and starts with a reflection on the disciplinary background which informed the original PhD proposal and research questions. The chapter follows the chronological order of the research, starting with the process of collecting qualitative and mixed material sources of data from 35 UK nonprofit organisations. The chapter outlines the recruitment approach, describes the cases recruited, and gives an assessment of the types of material and documentary sources and qualitative interview data which underpins the theoretically informed analysis in the thesis. The second half of chapter 4 presents the initial process of thematically coding and analysing the data before a theoretical shift in favour of social constructionism required a renewed set of research questions and approach to data analysis and presentation. The chapter ends by critically examining the thesis against Tracy's (2010) *Eight "Big-Tent" Criteria for Excellent Qualitative Research.*

Chapter 5 marks the first empirical chapter of the thesis. It presents a thematic descriptive analysis of the use of spatial data and associated tools (such as GIS) by the 35 nonprofit organisations. The primary drivers behind the use of spatial data by NPOs can be summarised as a need to map assets or administrative boundaries, to inform service delivery, to inform policy and advocacy efforts, and engage stakeholders for both financial and nonfinancial purposes. The chapter summarises the types and sources of primary and

secondary data used, as well as the software and tools adopted by the case studies. The chapter concludes by reporting on the organisational capacities and cultures in the sample organisations.

Chapters 6-8 adopt a theoretical interpretation of the data gathered. Each chapter is a theoretical exploration, with the title of the chapter describing the primary theoretical approach. The analytical scale of the chapters increases throughout Chapters 6-8, with Chapter 6 focusing on the internal workings of organisations (micro), Chapter 7 looking at intra- and inter-organisational working and relations across sectoral boundaries (meso), and Chapter 8 looking at wider institutional influences (macro).

Chapter 6 uses an organisational epistemology framework to show all stages in the construction and application of data-informed knowledge in NPOs. It presents the construction of spatial data as contingent upon and shaped by the context and affordances which surround their collection. The framework shows how the application of data as knowledge allows NPOs to apply discretion when acting in the world. Chapter 6 demonstrates that organisational knowledge is continuously reworked and is a product of ever-changing practice, priorities and values. The primary contribution of Chapter 6 is a move away from static and instrumentalist perspectives of data and towards one where data and organisational knowledge is viewed as socially constructed.

Chapter 7 positions spatial data and spatial data visualisations as relational devices that work across intra- and inter-organisational boundaries. Using an organisational semiotic framework, the infrastructural and technical components of spatial data visualisation are explicated alongside the relational work that data visualisations perform. As with Chapter 6, Chapter 7 uses case studies of NPO spatial data use to reveal the socially constructed nature of spatial data and its utility in carrying narratives and lived realities across organisational boundaries and brokering new relations and partnership working practices. The primary contribution of Chapter 7 is the introduction of a form of semiotic analysis that accounts for both the social and technical, and material and cultural, components of spatial data visualisation and the relational work they perform.

Chapter 8 analytically nests nonprofit organisations within institutional and exogenous settings. Using neo-institutional theory, the chapter explores the manifestation of institutional logics (notably from the market, community, or state) in spatial data use. The chapter explores the situations in which these logics manifest, and the tensions caused by the adoption of logics that may appear to conflict with other logics or the organisation's mission and aims. The chapter identifies four strategies undertaken by the organisations studied in this thesis to ensure their output or normative legitimacy is not compromised: organisations may act reflexively; actively resist the adoption of logics; display polyphonic communications; or maintain a values-first approach. Finally, the chapter builds on previous suggestions that an independent 'data logic' may exist to explore what a specifically 'nonprofit data logic' may look like, based on the findings of this study.

In the conclusion of the thesis (Chapter 9), I answer the research questions in turn by drawing on the analysis presented in Chapters 6-8. The chapter concludes by detailing the theoretical, heuristic, and practical significance of the thesis before discussing future research areas and future trends in nonprofit use of spatial data.

2. Background literature and concepts

2.1 The UK nonprofit sector: theoretical and contextual overview

A plurality of theories and schools of thought seek to define and draw a boundary around the nonprofit sector, explore its reason for existing, and question whether it can be regarded as a codified 'sector' at all. A complete account of these theories would be superfluous for the purposes of this thesis. Therefore, this section provides a cursory overview of theoretical approaches to the nonprofit sector, before outlining the composition of the contemporary UK nonprofit sector and its operating environment.

2.1.1 Constructing the nonprofit sector

This thesis adopts the commonly used definition of nonprofit organisations, which outlines fundamental characteristics of their structure and operation. Developed by Salamon and Anheier (1992) alongside the International Classification of Nonprofit Organisations (ICNPO), the structural-operational definition provides a clear demarcation in a field characterised by miscellany and porous boundaries. Applying Salamon and Anheier's criteria to the UK context, Kendall and Knapp (1993) state organisations must be:

- *Formal:* they possess a clear organisational form, with some sort of constitution or rules for governance. In the UK, this includes charities registered with the Charity Commission, nonprofit and charitable companies, Community Interest Companies (CICs) and social enterprises. Informal and unconstituted groups are therefore discounted from this definition.
- *Independent of government and self-governing:* they possess internal decision making structures and are not controlled by a for-profit organisation or government. Of course, many organisations vary in independence from other sectors (e.g. state 'manufactured' organisations explored by Hodgson, 2004), but ultimate independence is proven through the ability of an organisation to dissolve itself (Salamon and Sokolowski, 2016).

- *Not profit-distributing:* they cannot distribute net earnings (profit) to any individuals, such as shareholders, members, directors, or trustees. Net earnings must be reinvested back into the organisation in some way. This excludes most cooperatives but includes housing associations and some educational organisations.
- *Voluntary:* they must benefit from a "meaningful degree" (p. 18) of philanthropy or voluntary effort. As with other criteria, the extent to which this is met is displayed along a continuum; some organisations will be staffed entirely by volunteers, whereas others will only make use of voluntary effort for governance in the form of unpaid trustees.

To meet the legal definition of a charity and therefore be registered with the Charity Commission for England and Wales, organisations will also need to display 'public benefit'. This means an organisation's purpose(s) must generate net benefit for the public in general, or a sufficient section of the public (Charity Commission for England and Wales, 2017).

Kendall and Knapp (1993) demarcate a sector of interest but don't explain its raison d'etre. Several prominent theories that seek to explain the existence of a nonprofit sector are predicated on demand for their services. Burton Weisbrod's (1975) public goods theorem explains the nonprofit sector as satisfying a demand for goods and services for which democratic endorsement is lacking. Government failure theory, the underpinning tenet of Weisbrod's (1975) model, suggests that the government will provide goods (particularly finite quasi-public goods) that appeal to the median voters' preference and therefore will provide goods with the broadest appeal. Public goods are typically not provided by private firms due to the likelihood of free-riding. As societal preferences are diverse, secondary markets, including NPOs, develop to meet demand. The public goods theorem would predict that the nonprofit sector serves as a supplement to governmental provision and that the diversity of the sector is inversely related to the diversity of government provision (Lecy and Van Slyke, 2012).

Equally prominent is Henry Hansmann's (1980) demand-side trustworthiness theory. Hansmann argues that the nondistribution constraint which prevents nonprofits from distributing profit to patrons, shareholders, or investors is the fundamental point of division between the for-profit and nonprofit markets. The nonprofit producer lacks incentives to raise prices and cut quality as patrons do not receive financial benefits beyond their wage, therefore the purchaser of the good or service endows a level of trust in the organisation. This is a reaction to market failures that occur (albeit not exclusively) in the for-profit market, namely contractual failure, and information asymmetry. Whilst trustworthiness is a hard concept to prove, the nondistribution constraint ensures that donors can have faith that the organisation will only use the money in pursuit of an organisational mission; this distinguishes NPOs from profit making ventures which will add the money to revenues, or government which will use the donation as a subsidy (James, 1983).

The dominant theories posited by Weisbrod and Hansmann explain the nonprofit sector as being reactionary to the failure of either the public or private sector. Turning this on its head, Salamon (1987) rejects the view that the nonprofit sector responds to government and market failure, but is instead the primary supplier of collective goods, with government providing in cases of "voluntary failure" (p.38). Central to this idea is that transaction costs are lower in mobilising nonprofit resources than wieldy public sector resources. Therefore, the nonprofit sector should be the provider of collective goods. However, Salamon (1987) determines four "voluntary failures" that justify government support to the voluntary sector:

- Philanthropic insufficiency from the failure to generate resources that are sufficient in terms of scale and stability.
- Philanthropic particularism for specific causes and community groups leaves gaps in service coverage.
- Philanthropic paternalism means beneficiaries are not always represented amongst decision-makers, who hold the balance of power, resources and influence.
- Philanthropic amateurism results from volunteer involvement who, while well-meaning, are not experienced in dealing with the issue at hand.

The four failures of the nonprofit sector given by Salamon recognise that the voluntary sector carries inherent faults. A notable critique is put forward by Rutherford (2010), who claims that the overarching theories of contract failure (Hansmann, 1980), government failure (Weisbrod, 1975) and voluntary failure (Salamon, 1987) neglect the role that altruism and a 'warm glow' has to play in the behaviour of charities and philanthropic efforts. Altruism is a concern for others that is detached from an individual's selfish concerns, with a distinction to be made between observable altruistic acts and the internal altruistic motivation experienced by the agent (Rutherford, 2010).

The theories outlined so far view the nonprofit sector as a set of organisations that operate at the field level as a distinct group unified by a shared purpose. Viewing nonprofit organisations as characterised by hybridity questions the existence of a uniform and discrete sector. Theories of hybridity posit that nonprofit organisations sit on a continuum between the state, the community, and the market, and that individual organisations adopt the practices, logics, and characteristics of all three to varying degrees (Evers and Laville, 2004; Billis, 2010; Macmillan, 2013; Skelcher and Smith, 2015). Hybrid nonprofit organisations are seen to act within a tension field of all three sectors, particularly when acting within the wider pluralistic welfare mix (Evers, 1995; Evers and Laville, 2004). Billis and Glennester (1998) theorise that a hybrid constitution may give nonprofit organisations a comparative advantage over for-profit and public organisations; their distinctive ambiguous and hybrid structures enable them to traverse issues that other sectors experience, notably "the principal-agent gap, median voter reluctance and lack of market interest" (p. 95). As hybrid organisations, they can work at the intersection of each sector and pragmatically use skills and resources.

A significant contribution for our understanding of hybridity in the nonprofit sector is Skelcher and Smith's (2015) institutional logics approach. The concept of institutional logics is explained more fully in section 2.5.2 and utilised for explanatory purposes in Chapter 8. Thornton and Ocasio (1999, p. 804) define institutional logics as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality". Skelcher and Smith (2015)

argue that nonprofit organisations are hybrids that display plural institutional logics; in each nonprofit a distinct set of rules, practices, and values are found that are historically contingent upon the institutional positioning of the organisation (McMullin and Skelcher, 2018). This approach to hybridity recognises the influence of competing rationalities and operating environments while allowing scholars to acknowledge the agency of organisations. For example, a "segmented hybrid nonprofit" (Skelcher and Smith, 2015, p. 440) may deliver a service to beneficiaries that is in part funded by donations, and cross-subsided through a for-profit enterprise activity.

The institutional logics approach unites scholars that reject viewing the nonprofit sector as a residual entity and instead advocate for a processual or relational perspective. The nonprofit sector can be seen as emerging over time and only made intelligible through its relations to the actors in and around it (Corry, 2010). It is a process "of potential cooperation or conflict, depending on the social forces at work" (Corry, p.12) and is constructed through continual communicative interaction between actors. Claims of sectoral distinction are often made by positioning the sector in relation to something else; "'Us' and 'them' dynamics are a familiar feature of the third sector" (Macmillan, 2013, p. 49), but this relational positioning is in fact what gives the sector its capacity to translate abstract policy directives into concrete, everyday realities for service users and the public (Trudeau and Veronis, 2009). Adopting a neo-Marxist approach, DeVerteuil et al., (2019) explicate the nonprofit sector as constituting a series of "symbiotic relationships in the persistent constitutive dependencies between the voluntary sector and the state, its clients and internal spaces, and its external spaces" (p. 922).

2.1.2 The UK nonprofit sector in 2021

The UK's nonprofit sector comprises a variety of legal and organisational forms. The National Council for Voluntary Organisations (NCVO) maps the sector's composition within the tripartite of the state, the market, and communities (Figure 2, NCVO, 2020). The organisations studied in this thesis will largely be represented under NCVO's 'general charities' definition. The 166,592 'general charities' in 2020's NCVO Almanac (2017/18 data) are the 83% of organisations registered with the Charity Commission for England

and Wales that meet NCVO's definition of possessing a formal structure, being independent from the state or private sector, being nonprofit distributing, and possessing an aspect of voluntarism and displaying public benefit. By this definition, NCVO removes organisations such as housing associations, government-controlled bodies, and places of worship. Estimates on the size of wider civil society (unregistered organisations, mutual, cooperatives, social enterprises and exempt charities) vary, with NCVO's estimate of civil society organisations in the UK totalling 400,000, increasing to 900,000 if informal groups are included.

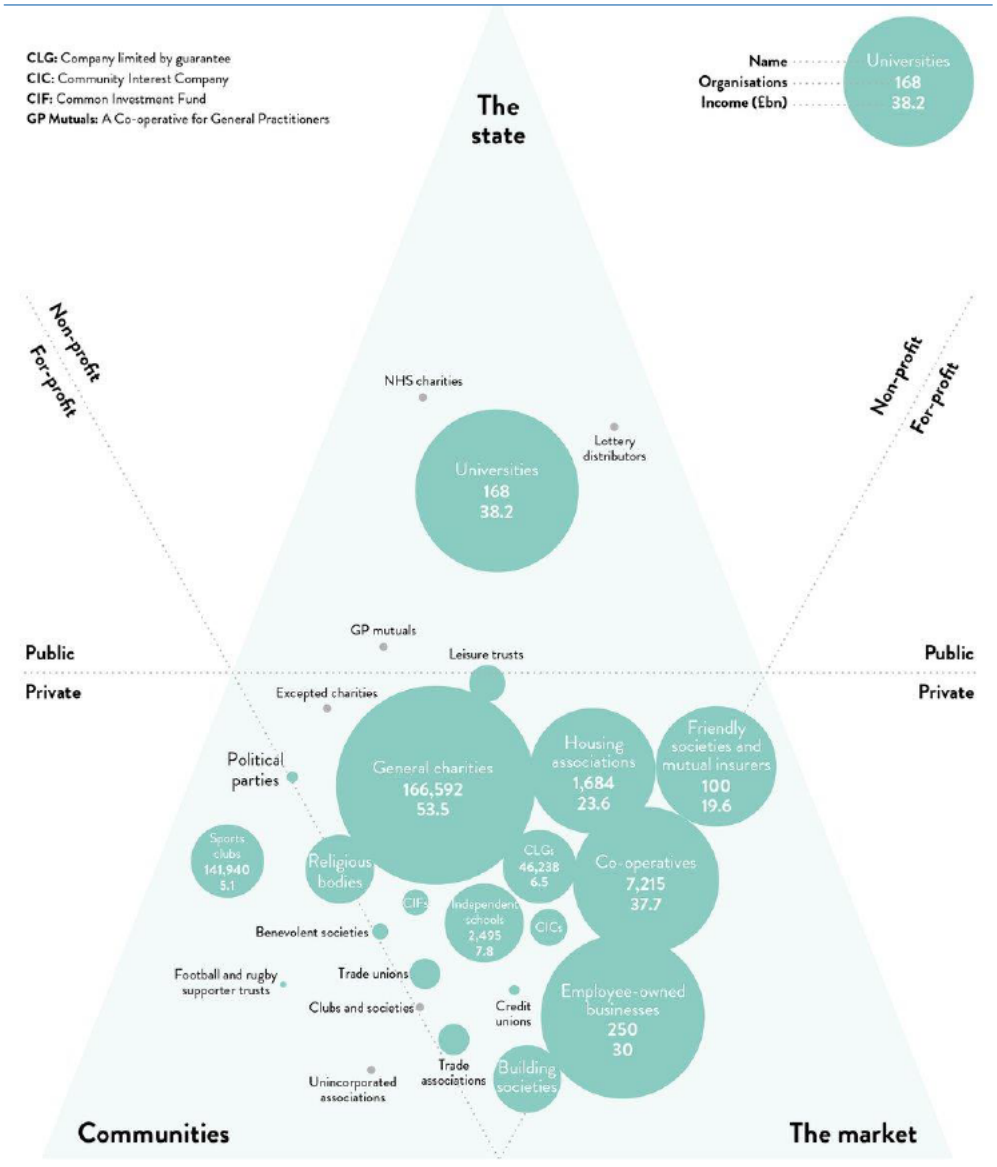


Figure 2: UK Civil Society Organisations 2017/18 (NCVO, 2020)

Looking more closely at the 166,592 general charities (Figure 3), we can see the positively skewed nature of organisational size (micro and small organisations with annual incomes of <£100,000 comprise 81% of the total size of the sector, of which 57% have an income of <£10k), but negatively skewed percentage of total sector income (organisations with an income >£1m p.a. comprise 82% of the total sector income).

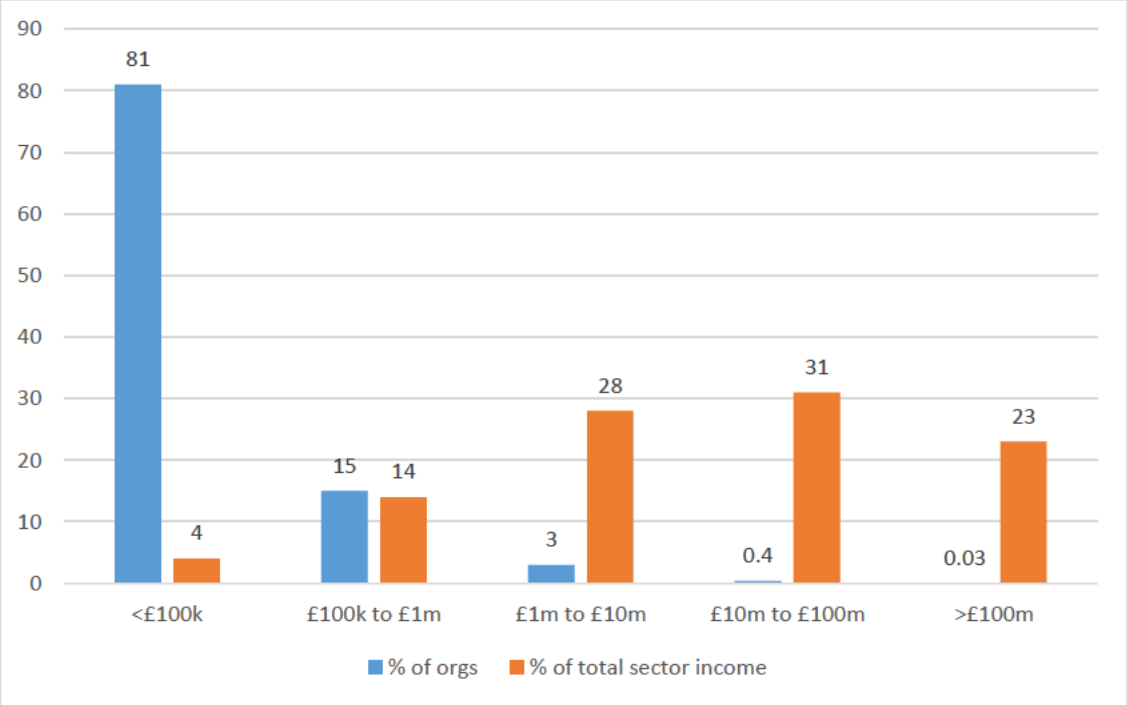


Figure 3: Breakdown of 'general charities' by income (%). (2017/18, in NCVO, 2020)

It is important to note that while the number of general charities has remained stable over the past decade, organisations with an income of over £10m have been steadily increasing as a proportion of the sector. While some of this growth is due to inflation, it could also mark the wider 'professionalisation' of the sector. The sector is reliant on income from the public (47%) and the government (29%), but has seen income from the public rise over time, and income from the government fall (NCVO, 2020; McDonnell and Mohan, 2019).

The breakdown of general charities by International Classification of Nonprofit Organisations (ICNPO) (Salamon and Anheier, 1992) grouping, in Figure 4, shows social service organisations to be the most numerous (19%) and receiving the greatest single percentage of income (22%). Culture and recreation and religious organisations make up 14% and 9% of the sector, respectively. Examples can be seen of numerous organisations

that require few resources, such as parent-teacher associations and village halls. They can be compared to few organisations that require a lot by way of resource, such as research and environmentally focussed NPOs.

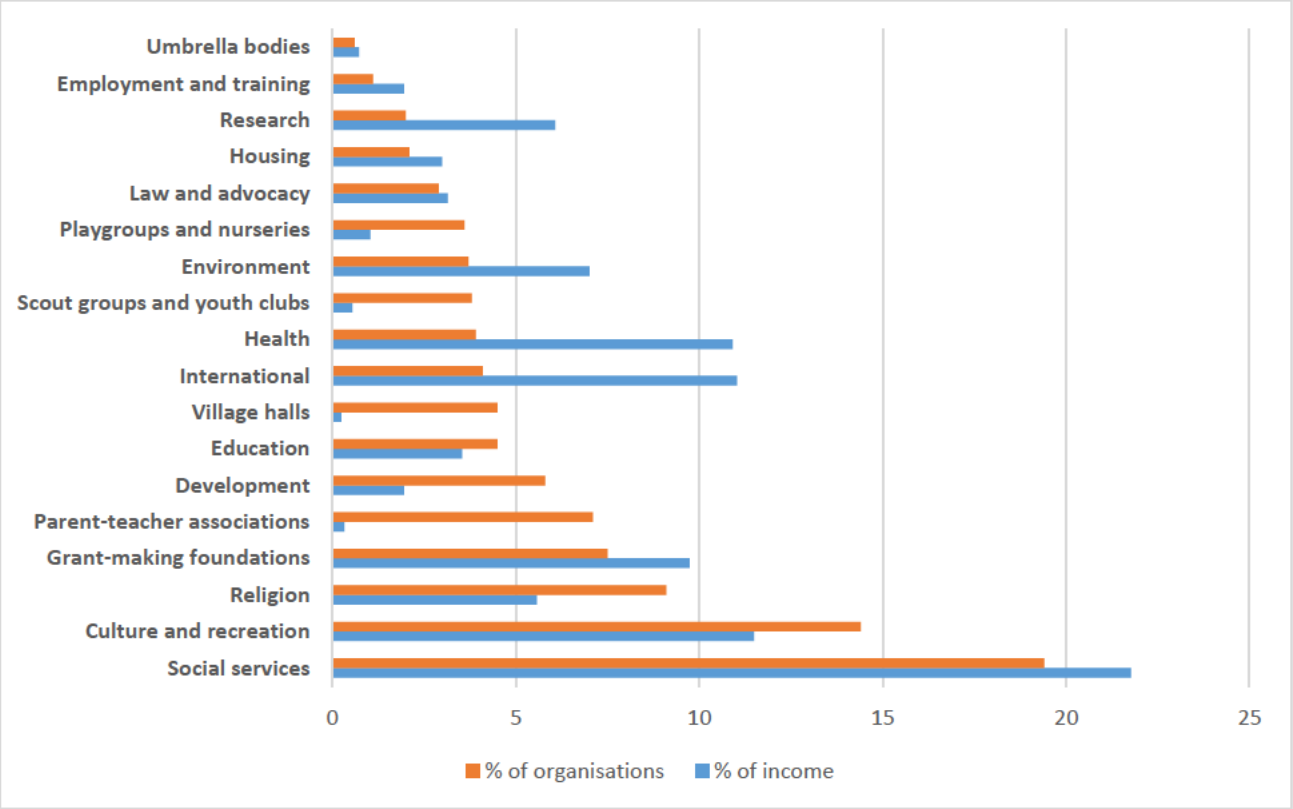


Figure 4: Breakdown of 'general charities' (2017/18, in NCVO, 2020) by ICNPO activity (%).

In addition to assessing the size and activity undertaken by registered charities, visualising their area of operation by size of organisations (Figure 4) shows the majority of organisations work at the local level, except for super-major organisations (income >£100m p.a.), where 67% of organisations work at the national level. While a fairly banal and assumed observation, Figure 5 demonstrates the local nature of the registered nonprofit sector in England and Wales.

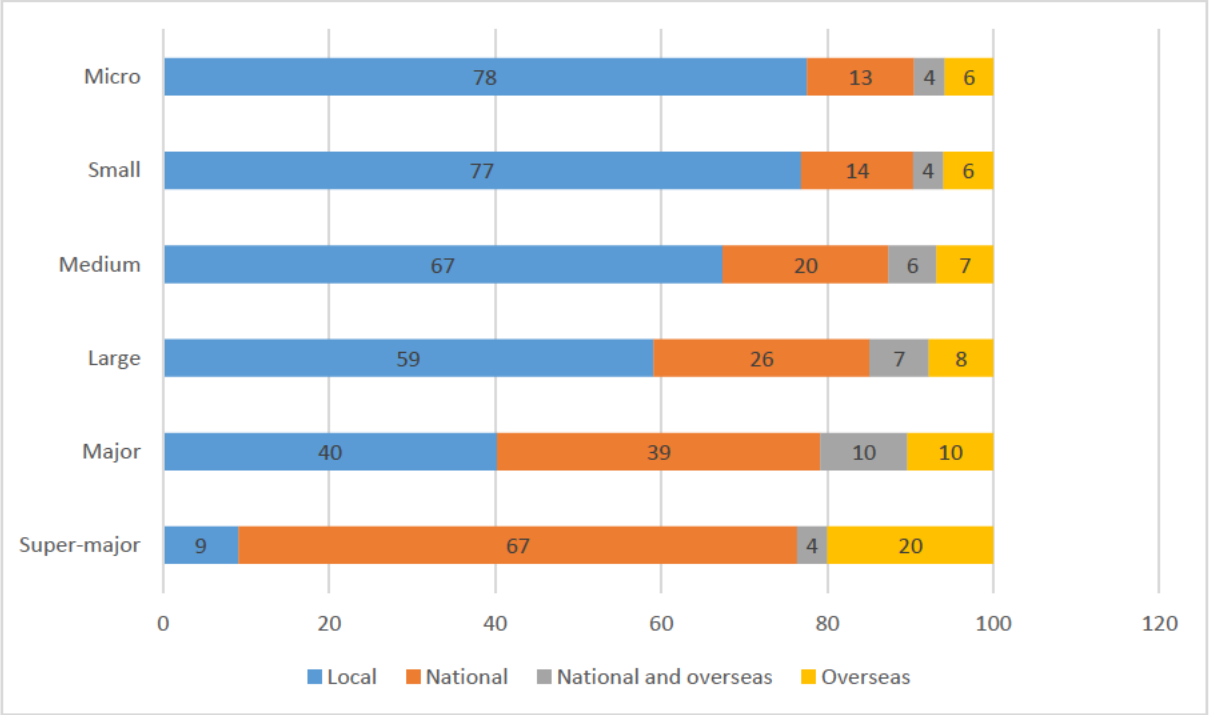


Figure 5: Breakdown of 'general charities' by geographic area of operation and size (%).(2017/18, in NCVO, 2020)

The operating environment for nonprofit organisations in the UK is characterised by a strong culture of New Public Management (NPM), with elements of New Public Governance (NPG) emerging more recently. The ideological adoption of NPM in the 1980s is seen in the public sector implementation of businesses management techniques, a focus on efficiency and service delivery, and the introduction of market mechanisms and competition into public life (Taylor, 2002). The nonprofit sector became a "genuine alternative provider base" (Alcock, 2010, p.5) as part of the mixed economy of welfare and provider of public sector services. The nonprofit sector's role in the contracted delivery of public services intensified under New Labour, leading to concerns about the erosion of autonomy, risk of mission drift and a loss of sectoral independence (Buckingham and Rees, 2016). Critical perspectives viewed the sector as a "governable terrain" (Carmel and Harlock, 2008, p.157) in which the delivery of public or human services has lead to NPOs being governed through discourses, strategies and policy changes; increased partnership with government, reliance on procurement processes and monitoring of performance has

allowed the nonprofit sector to become a political tool that responds to the desires of central government. The proliferation of market logic and competitive tendering practices necessitated the professionalisation of the sector; some "organisations display a focus on performance, measurable outcomes, accountability, and the use of private-sector management tools to structure activity, develop strategy, and improve efficiency and effectiveness" (Marberg et al., 2019, p.116). The fields of mental health, employment and training, and social services are all highly professionalised and receive a significant percentage of their funding from statutory bodies (Mohan and Clifford, 2016). The coalition government of 2010-2015 implemented a wide-reaching programme of austerity, which restricted the flow of public sector funding to NPOs (Buckingham and Rees, 2016) and was felt unequally across parts of the voluntary sector (Jones et al., 2016). It required organisations to diversify funding sources, increase collaboration or specialisation, or undertake organisational restructuring to survive in an increasingly competitive landscape (Jones et al., 2016; Kirsop-Taylor, 2019).

Despite the persistence of market logics shaping UK public sector – nonprofit sector relations, a shift to New Public Governance (NPG) has seen the development of "a plural state, where multiple inter-dependent actors contribute to the delivery of public services and a pluralist state, where multiple processes inform the policy making system." (Osborne, 2006). Hierarchical relationships are replaced to a degree by networks of interdependence, where trust and interorganisational ties are the central currency (Dickinson, 2016). A pluralist approach means the outsourced delivery of public services is driven by a focus on social value and not on organisational form, meaning nonprofit organisations are simultaneously working with and competing against the public and private sectors to demonstrate their past impact and capacity to deliver social value in service delivery (Bennett et al., 2019). They are competing in a fragmented field characterised by hybrid and emerging organisational forms such as Community Interest Companies, Social Enterprises, and Public Service Mutuals (Myers, 2017). In the absence of a clear-cut shift from NPM to NPG, a complex arrangement of organisational forms comprising features of different governance systems coexists (Dickinson, 2016). This leaves nonprofit organisations striving to meet the collaborative and relational demands

of NPG, while being hamstrung by NPM's legacy of contractualism and intra- and inter-sectoral hierarchical power-imbalances (Lindsay et al., 2014; Harris, 2017).

In 2018 the Civil Society Futures Inquiry presented an in-depth research report that depicted local, national, and global trends that the sector is being shaped by and engaging with. Three inter-linked trends that are pertinent to this thesis are place-based approaches, spatial inequality, and changing and deepening social issues. The adoption of digital and data-informed practices is a significant trend but is explored in isolation in section 2.2

'Place' as an organising concept is in vogue in the nonprofit sector; from 'working in place' to 'place-based approaches', organisations are directing funding and resources in a particular geographic area while working holistically with multiple stakeholders to achieve joined-up systems change (Taylor and Buckly, 2017). Organisations might target interventions or funding based upon indicators of need, as mandated in governing documents, to test a model or approach or respond to external policy changes. Place as a spatially bound entity varies in size, from hyperlocal approaches that connect groups and direct action at the neighbourhood level, to working within a town or city (IVAR, 2017). Places (as distinct from spaces) are the physical nexus of human emotion and feeling coming together with the built environment and everyday practice. Communities have a deep sense of belonging to a particular place, and nonprofit organisations that adopt a place-based approach seek to empower the community to develop local responses to issues.

Place-based approaches are being implemented amidst widely-held concern over entrenched and widening spatial inequalities in the UK. The UK is one of the most unequal countries in the developed world, with significant health and economic inequality occurring within and between regions (McCann, 2020; Marmot et al., 2020). Local Trust (2019) has identified 204 'left behind' areas with a combined population of over 2 million people that have experienced a loss of civic infrastructure and have high unemployment and child poverty rates and display indicators of poor health. The nonprofit sector has been urged to respond to spatial inequality by ensuring equitable allocation of voluntary

sector resources (Corry, 2020) and work under a proposed covenant with the Government and commit to 'levelling up' the country (Kruger, 2020).

Finally, nonprofit organisations are responding to a number of pressing social needs, such as the growth of in-work poverty: in 2017/18 58% of households in poverty were classed as working, compared to 41% in 1997-98 (IFS, 2019). This seems paradoxical when viewed against record employment but is explained by wage and productivity stagnation since 2008, meaning households are working more hours to account for loss of earnings relative to inflation (Bell and Gardiner, 2019). This has led to record use of charitably provided services such as food banks (Trussell Trust, 2019) and debt advice services (StepChange, 2019), despite civil society funding being hardest hit in the most deprived geographic areas (Clifford, 2017). The second social issue is a demographic shift towards an ageing population, as people live longer and have fewer children. In 2018, approximately 1 in 5 people in the UK were aged 65 or over, this is set to increase to 1 in 4 by 2050 (Office for National Statistics, 2018), resulting in shifts in health and social care demands on the nonprofit sector. Thirdly, loneliness and social isolation have been high on the agenda of nonprofit organisations and government, primarily due to research findings demonstrating a strong link between loneliness and poor health at all stages of the life course (Holt-Lunstad et al., 2010). Government initiatives such as the £11.5m Building Connections Fund seek to support the nonprofit sector to tackle loneliness and isolation.

2.2 The changing data landscape: nonprofit use of data and analytics

This section first provides a theoretical and contextual background to general changes in data use before looking at the specific changes that are observable in the UK nonprofit sector.

2.2.1 A general paradigm shift in data capture and use

This research takes place amidst a grand paradigm shift in the ways data are generated, collected, analysed, used, and stored by citizens and organisations. Greater internet user rates and adoption of internet-enabled devices have created a deluge of data on all manner of things; from where and when people shop to the risk factor of an individual getting a certain disease. At the same time, lower cost of storage, powerful computing, machines and greater levels of education has meant that data is often cited as 'the new oil' or the 'fuel of the future'. In a capitalist economy that is driven by data, data becomes a form of capital from which value is extracted (Sadowski, 2019). Value is extracted from the increased quantification of human life, termed 'datafication', in which infrastructures collect, process and store data, before value is generated from it (Mejias and Couldry, 2019). The infrastructure necessary for capturing data on human life includes the material, such as software, servers, cables, microprocessors, smart watches and fitness trackers, mobile phones, laptops etc., as well as the organisations and intermediaries that run platforms and employ analysts to generate value from data.

The extraction of value from data has been theorised through the lens of rentiership, in which value is seen to be extracted from an asset without selling it. Amazon Web Service (AWS) rents out the infrastructure on which much of the internet runs, allowing Amazon to "extract absolute rents" (Sadowski, 2020, p.569). Platforms insert themselves into the production process and capture the data through being an intermediary, which in turn places them in a powerful position to extract value (read rent) from data (Sadowski, 2020). Kitchin (2014a) theorises this new epoch of continual data production as part of a wider *Data Revolution*, characterised by the development of small data, big data, data infrastructures, data assemblages and open data. All data are a representation of a

phenomenon, with big data typically describing the whole phenomenon or study population. Big Data is measured in terms of its volume, velocity and variety. Small data is a subset of that population data; it is a sample that aims to answer specific questions in detail. All data capture is shaped by the sampling parameters, technologies and platforms, data ontology and the regulatory environment (Kitchin, 2014b); there is no such thing as 'raw data', it is an oxymoron (Bowker, 2006).

In the UK, the public, private and nonprofit sectors seek to utilise the increased availability of data for economic and societal gain while guarding against and mitigating risks and harms. The UK National Data Strategy, published by the Department for Digital, Culture, Media and Sport (DCMS) (2020), aims to address four interconnected issues: the quality of data in the UK (including standardised collection formats); the skills and capacity within the economy to produce and analyse data; the wider availability of data and transfer between organisations and sectors; and the responsible and ethical production, storage, use and sharing of data. The UK government successfully fostered a culture of open data by launching the data.gov.uk portal of open government datasets in 2010, followed by passing the 2015 Local Government Transparency Code, under which local authorities are required to publish data on how money is spent, their use of assets, how decisions are taken and locally pertinent datasets. The wider UK data ecosystem is populated by organisations such as the Open Data Institute, a nonprofit organisation founded in 2012 to champion data as a public good, develop governance models and promote a culture of open data. NESTA, formerly the National Endowment for Science and Technology, continues to research and pioneer a variety of strategies and programmes to facilitate data-driven innovation in all three sectors. The Ada Lovelace Institute was founded in 2018 by a variety of partners to ensure artificial intelligence (AI) development in the UK and its ensuing impact enhance individual and societal well-being, and are equitably distributed. Numerous university-led initiatives take a multifaceted approach to critically studying the use of data in society, with prominent examples being the Data Justice Lab at Cardiff University, and the Living With Data research projects at the University of Sheffield.

2.2.2 The use of data by nonprofit organisations

Use of data to measure and evaluate impact

The principal characteristic of the changing data landscape in nonprofit data use is the explicit and implicit requirement to monitor performance and demonstrate evidence of impact for the benefit of a wide range of stakeholders. Parallel shifts can be seen in the public sector, as the rhetoric of data-informed decision making has permeated policy-making, often referred to under the broader paradigm shift to 'Gov 2.0' (Chun et al., 2010). Society more widely consigns great authority and factual power to metrics, as new ways of informing and governing are increasingly founded on the sorting, filtering and directing of data (Beer, 2016).

A developed body of literature presents and analyses the trends, opportunities, and challenges inherent in nonprofit performance measurement and impact reporting. Useful in synthesising the wide body of literature on nonprofit performance metrics is Eckerd and Moulton's (2011, drawing on King and Pechman, 1984) categories of monitoring and evaluation (M&E) practices: *instrumental* uses, where metrics are used to improve quality, ensure mission consistency and determine spending priorities; *conceptual* uses, where metrics are used to satisfy funder requirements, inform the board, and motivate staff; and *symbolic* uses, where wider legitimacy is demonstrated and the work of the NPO is marketed. The three M&E purposes of instrumental, conceptual, and symbolic can each be, in part, explained by the pressures of isomorphism. Drawing on neo-institutional theory, isomorphism describes the process of organisations within the same field becoming more homogenous, often resulting from experiencing the same institutional pressures. DiMaggio and Powell (1983) outline three forms of isomorphism: normative, coercive and mimetic. While neither the three evaluation uses and drivers of isomorphism are mutually exclusive, together, they help demonstrate and explain the uses of data for performance and impact measurement purposes.

Instrumental uses driven by normative isomorphism

NPOs use performance measurement metrics to improve the quality of their work, ensure mission consistency and determine spending priorities (Eckerd and Moulton, 2011).

Performance measures such as programme spending to total income, quality of product/service and customer satisfaction are the three most important performance measurements captured for nonprofit organisations (Boateng et al., 2016). Such measurements are an integral part of the organisational and sectoral social learning systems, where evaluation data is used in the future design and implementation of programmes (Bixler et al., 2018). Organisations that regularly use performance measures increase the self-reported effectiveness of their strategic decision making (LeRoux and Wright, 2010; Ógáin et al., 2012), however, the use of performance measurement metrics for instrumental purposes is not universal across the sector; Ógáin et al's (2012) survey found 25% of UK charities do not measure their work at all, and many lack the capacity to do so (Bach-Mortensen and Montgomery, 2018).

The concept of normative isomorphism goes some way to explaining instrumental M&E uses of data. Normative isomorphism is driven primarily by the professionalisation of the sector, as organisations come to be reliant on paid professionals that emphasise the same need for and ongoing measurement of outcomes, development of long-term strategy and a culture of rationalization (Hwang and Powell, 2009; Marberg et al., 2019). Professional authority and legitimacy are drawn from formal education and inter- and intra-sectoral transfer of skills and knowledge. An increased uptake of specialist nonprofit management and leadership programmes has led to a paid workforce that can implement advanced working practices and carry a taught set of uniform institutional rules and vocabularies that increase organizational and sectoral legitimacy. LeRoux and Wright (2010) report a positive relationship between the education level of an executive director and use of performance metrics. The use of performance and evidence data by NPOs in the UK is heavily supported and influenced by senior leaders, particularly when an organisation's funding base is mixed or reliant on an individual or private donor (Ógáin et al., 2012). Secondly, professional networks that span organisations and sectors are the conduits for transfer of best practice and sharpening a sense of the correct and optimal practice within the norms of their sector and field (DiMaggio and Powell, 1983). The Inspiring Impact network of influential UK nonprofit organisations has served to embed impact measurement as standard practice within the sector (Harlock and Metcalf, 2016). The open-source grantmaking data provider 360Giving run an annual Data Champions

programme, in which nonprofit staff members learn new skills from their peers and learn how to embed a culture of data use in their organisations (360Giving, 2020). The recently formed Data Collective seeks to, among other things, "create a space for a supportive community of organisations to come together, share best practice, and learn how they can share their data or use others' data - and why they might want to" (DataKind, 2020). Staff may also transfer between sectors, bringing skills with them, or intermediaries such as consultants may act as carriers of the latest "managerial know-how" (Hwang and Powell, 2009, p. 275).

Conceptual uses driven by coercive isomorphism

Eckerd and Moulton (2011) use the term *conceptual* to refer to uses of performance data that directly feed into programme evaluations required by funders, and that which contributes to long-term conceptual change in the perspectives of staff and board members. While this departs from King and Pechman's (1984) purist and clear-cut use of the term 'conceptual', it is conceivable that Eckerd and Moulton (2011) believe performance data satisfices the needs of M & E metrics demanded by funders and contributes to long-term conceptual change in the funders' perspectives. DiMaggio and Powell (1983) attribute coercive pressures from funders and other organisations more generally as leading to homogeneity in sectoral practice. Common legal environments, standardised grant reporting practices, and wider societal expectations of the metrics that should be provided by NPOs all lead to the adoption of similar performance evaluation practices.

In the UK, the coerced use of M&E methods by NPOs can be traced back to the implementation of 'area-based initiatives' by successive governments from the 1980s onwards. Area-based initiatives, such as the Single Regeneration Budget and the New Deal for Communities, aimed to reduce spatial inequality through targeted intervention. They were characterised by New Public Management (NPM) ideals of competition and cross-sector collaboration leading to efficient and effective local area regeneration (Taylor, 2002). Nonprofit organisations were encouraged to establish partnerships with public and private sector partners and use a variety of indicators of need to enhance their bid (Rhodes et al., 2003). Despite the inconsistent development of indicators leading to

contestation over priority neighbourhoods (Lee, 1999), the targeting of funding to areas most in need was essential to securing funding and was underpinned by data portals such as the Neighbourhood Statistics Service and the creation of the Indices of Multiple Deprivation (Lupton et al., 2013). Accompanying the shift to evidence-informed intervention was an explosion of performance management practices and general audit culture, generating significant pressure on NPOs to produce quantifiable evidence of successful neighbourhood change (Alcock, 2004).

The pervasiveness of NPM audit culture has continued through government concern with the delivery of 'social value', and philanthropic funding arrangements which view impact audits as essential to accountability procedures (Arvidson and Lyon, 2014; Harlock and Metcalf, 2016). "Organisations can no longer 'know' that they are having an impact, they have to show this to the outside world…" (Dawson, 2010, p. 531). Satisfying the demands of funders is the most documented use of performance and measurement data by NPOs (of all sizes) (Ogain et al., 2012; Basker, 2017). Organisations that are mainly dependent on governmental resources and financial loans are more likely to comply with requested auditing and performance evaluation procedures (Verbruggen et al., 2011).

Symbolic uses driven by mimetic isomorphism

Thirdly, Eckerd and Moulton (2011) explain M&E data as being used for symbolic purposes: an organisation may use "the mere existence of the evaluation, rather than any aspect of its results, to persuade or to convince" (Johnson et al., 2009, p.378). This could be to persuade potential donors that the organisation is legitimate and worth supporting, promote or market the organisation more widely, or obtain some sort of certification for using evaluation data (Eckerd and Moulton, 2011). In this situation, an organisation is typically not concerned about the process or the outcome of the evaluation, rather its ability to signal legitimacy. DiMaggio and Powell (1983) explain widespread adoption of symbolic data use as occurring through mimetic pressures; organisations that operate in an unstable environment or whose goals are ambiguous will look to model themselves on 'successful' organisations and gain legitimacy by adopting the same practices.

Mimetic isomorphism may lead organisations to 'decouple' structure and action (Meyer and Rowan, 1977), allowing organisations to "abide only superficially by institutional pressure and adopt new structures without necessarily implementing the related practices" (Boxenbaum and Jonsson, 2013, p. 81). Interestingly, increased nonprofit hybridity and adoption of multiple sectoral and institutional logics (Skelcher and Smith, 2015) has been accompanied by the adoption of practices that may be incongruent with each other and the wider organisational mission. The act of 'strategic decoupling' allows managers and nonprofit organisations to proactively navigate change by decoupling differing activities and intra-organisational structures from one another, to create an organisation that displays multiple rationales under one identity (Bromley et al., 2012; Arvidson and Lyon, 2014).

NPO isomorphism arises through institutional, coercive, and mimetic pressures to adopt instrumental, conceptual, and symbolic evaluation metrics and impact measurement practices. Isomorphism, and particularly the ubiquitous adoption of evaluation and impact measurement techniques, is followed by concern that the nonprofit sector may be constrained in its ability to enact rational and pragmatic decision-making procedures (DiMaggio and Powell, 1983). In adopting business-like approaches, it is feared that organisations may lose their distinctive value-driven approach and suffer from mission-drift (Eikenberry and Kluver, 2004; Maier et al., 2016). Maier et al.'s (2016) substantial systematic review of research on NPOs adopting commercial practices (inc. M&E practices) reports inconclusive findings over whether mission-drift follows commercialization.

Bopp et al.'s (2017) detailed study of 13 US NPOs that use data in M&E practices presents three negative consequences of M&E practices that lead to organisational disempowerment: erosion of autonomy; data drift; and data fragmentation. Organisations lose autonomy over the type of data collected and the method of collection, as preferences are put forward by funders and boards of trustees (notably for quantitative data rather than qualitative), leaving "organizations juggling everyone's needs except their own" (p.6). Secondly, organisations suffer from data-drift, as they collect data in accordance with the funder's desires and not their own. Over time, the organisation aligns

its practices with the data desired by funders, leading to mission-drift. Bopp et al. (2017) therefore identify data-drift as a precursor to mission-drift. Finally, the competing data-demands of multiple funders can leave organisations with datasets that are fragmented by storage location, thematically, or time period. Taken together, Bopp et al. (2017) contend that erosion of autonomy, data drift, and data fragmentation leads to NPOs that are neither empowered nor able to exercise agency and undertake long-term strategic planning. Empirical data from a study of 521 Swiss NPOs suggests whilst coercive isomorphic pressures (such as those described by Bopp et al.,) are more likely to lead to mission-drift than mimetic and normative isomorphic pressures, the existence of a strong managerial culture and strategic outlook can act as a backstop against ongoing mission-drift (Hersberger-Langloh et al., 2021). Similarly, NPOs that maintain a strong strategic perspective can exercise agency through proactive or defensive strategic decoupling practices rather than take external directives without resistance (Arvidson and Lyon, 2014).

Besides the prospect of mission-drift, isomorphic pressures to adopt M&E practices can lead to organisations collecting vast amounts of data that are not relevant to internal or external measurement needs (Snibbe, 2006; Bopp et al., 2017). The work undertaken by NPOs is often poorly suited to quantified measurement due to comprising intangible outcomes or taking place within a much wider time frame or system, which makes identifying regular change extremely difficult (Polonsky et al., 2016). NPOs may simply lack the technical and financial resources to undertake M&E, with Bach-Mortensen and Montgomery (2018) finding that capability and capacity are the most significant barriers to NPO M&E practices, despite significant pressure from funders to do so. However, NPOs that engage a range of M&E practices are likely to report greater organisational effectiveness of both strategic decision making and realised outputs (LeRoux and Wright, 2010; Ogain et al., 2012). There may also be interesting recruitment implications for NPOs that adopt M&E practices; while Millennial employees are likely to be most concerned with intrinsic job satisfaction (with the exception of those with advanced education) (McGinnis Johnson and Ng, 2016), the opportunity to work within an innovative environment and contribute to innovation is highly attractive to Millennial leaders and therefore the use of M&E practices may signal an innovative environment that attracts top talent (Grotkamp et al., 2020).

Contextual factors in nonprofit data use

The use of data by NPOs to monitor and evaluate impact is discussed in a significant body of literature that employs notable theoretical strands such as isomorphism, resource dependency, professionalisation, and organisational agency. A smaller body of academic and grey literature paints a broader contextual picture of NPO data use. The use of data analytics software, organisational cultures towards data use, and the development of data intermediaries are developments in the nonprofit sector's changing data landscape that run parallel to the increased use of M&E practices and are subject to similar isomorphic pressures.

Analytics and data visualisation

Data is only given value and made useful when it is analysed and can be interpreted. Before discussing literature on data analysis and visualisation tools specific to spatial data, it is worth grounding the GIS literature in a more general overview of NPO data analysis and visualisation. In the book Data Driven Nonprofits, MacLaughlin (2016, p.37) lists 4 stages of NPO data analysis maturity or complexity:

1 – Descriptive analytics: looking at what happened with basic reports and visualisation
2 – Diagnostic analytics: looking at why it happened with more advanced analytics, possibly including dashboards and alerts
3 – Predictive analytics: looking at what will happen, using predictive modelling and statistical analysis
4 – Prescriptive analytics: looking at what should be done, using performance optimization and decision support tools

Organisations may use a Customer Relationship Management (CRM) tool such as Salesforce or Blackbaud (MacLaughlin's own product), which holds data on stakeholders, events, and relationships to undertake the first few stages of analytics. McNutt describes simple databases as the "workhorse of nonprofit technology" (p. 253). Business Intelligence (BI) tools such as Microsoft PowerBI and Tableau allow more detailed analytics

to be undertaken and can produce intelligible and interactive visualisations for internal and external stakeholders.

In a critical analysis of the promises of data analytics companies, Beer (2018) describes an emerging industry that employs a 'data gaze' across the social world, at the heart of which is a 'data imaginary' that sells the promise of knowing and revealing, solving grand problems, and generally containing a revolutionary potential. Specifically, data analytics companies present their products as "speedy, accessible, revealing, panoramic, prophetic, and smart" (p.22). For nonprofit organisations, these "mythologies" (Verma and Voida, 2016) propagated by data analytics and BI firms are often not able to be realised due to poor access to data to feed into them and a lack of human and financial capital to sustain their use (Goldberg, 2020). While the prophetic powers of BI are appealing, in practice NPOs typically use such tools reactively rather than proactively (Johnson, 2015). For small organisations (which make up the bulk of the UK's nonprofit sector), the promises of big data may not even be appealing, as they focus on day-to-day service delivery and organisational survival (Johnson, 2015).

NPOs that do adopt data analysis and BI systems may be frustrated by the epistemic bias towards quantitative data that underpins the realisation of the "mythologies" propagated by software providers (Verma and Voida, 2016). Aggregated data analysis and visualisation are used to signal legitimacy and meet wider isomorphic pressures, yet the 'human' element behind the data point that NPOs so often rely on to tell a more emotionally connected story is left behind. There is, therefore, something of a disconnect between the prophetic mythologies propagated by software providers, and the desire of NPOs to drill down into individual data points and analyse data from a relational, qualitative perspective (Verma and Voida, 2016).

As NPOs continue to adopt software and data analytics procedures that are typically developed for use by the private sector (which are underpinned by entirely different value sets), further research by Information Systems (IS) and Human-Computer Interaction (HCI) scholars on the adoption of data analysis software by NPOs presents an opportunity to identify further opportunities and challenges for both NPOs and software providers (Umapathy and Connolly, 2017).

Organisational Culture

A central factor in the adoption and ongoing use of data by NPOs is the organisational culture towards data use. Data Orchard's Data Maturity Framework (2019) for NPOs gives a sense of how different organisational cultures are presented: in NPOs without a culture of data use, nobody is interested in data, data may be accessible by only a few people, or is seen as part of administrative procedures. NPOs with a developing culture of data use may begin to share data across silos, develop data governance frameworks, and regularly discuss data access and use between different levels of seniority. An organisation with a mature culture of data use would see data use as a team effort and a critical asset for the organisation. Everyone can access data, insights are widely shared, and an open culture of challenging practices and innovating with data is encouraged.

Organisations with a mature culture of data use, or one that aspires to be, may adopt 'data use' as a key organisational value, in the same way accountability or democratic practices may be considered key values (Kline and Dolamore, 2019). Rather than viewing data use as a punitive or administrative practice, instead, it is seen as underpinning rather than hindering, mission-driven work (Reynolds et al., 2019). In practice, values that seek to foster a culture of data use may be articulated as "'data-driven', 'predictive and proactive', 'shared accountability', and 'inquisitiveness'" (Verma and Voida, 2016, p. 328). Barriers to realising a culture of data use may come from a lack of shared understanding across the organisation; frontline service staff may prefer to use 'soft data' such as qualitative feedback from service users, whereas management may prefer 'hard data' that can be aligned with Key Performance Indicators (KPI) and provide a succinct overview (Maxwell et al., 2016; Kline and Dolamore, 2019). Both forms of data have their uses, as soft data can help mediate relationships, while hard data builds external credibility and offers transparency. However, a lack of shared understanding can lead to tension over data systems and collection practices within the organisation (Maxwell et al., 2016; Kline and Dolamore, 2019), or a decoupling of the apparent use of data and its actual use (Macintyre, 2020a). Attempts to implement novel data-driven ways of working from external stakeholders (such as funders) may fail if the data culture is not adequately developed and shared across the organisation (Maxwell et al., 2016).

Capacity and training

A lack of capacity (financial, technical, and human) to analyse and make use of data is consistently highlighted as a significant barrier for NPOs (Ogain et al., 2012; Basker, 2017; Bach-Mortensen and Montgomery, 2018). It may be the case that due to isomorphic pressures, organisations are collecting vast amounts of data, but lack the capacity to do anything useful with it (Snibbe, 2006). Even if they can analyse the data, it may be that they lack the political capacity needed to engage stakeholders and present their findings to affect real world change (Lee and Clerkin, 2017).

As discussed previously, the professionalisation of the nonprofit sector means that staff are more likely than previously to possess the relevant skills already to analyse data and present actionable insights. Yet, there is concern that the draw of high salaries offered by industry, and structural barriers to moving between sectors, means that the sectoral distribution of data analysis and science skills in the UK is unequal (The Royal Society, 2019). A short-term solution that works well for organisations that require ad-hoc or infrequent data analysis is pro-bono volunteering schemes where a skilled volunteer is paired with an organisation for a period of time. DataKind UK, Pro Bono Economics and the Royal Statistical Society's 'Statisticians for Society' are good examples of this practice. The UK NPO data ecosystem includes consultancies (such as NPC) and individual consultants undertaking piecemeal evaluation and data support work.

However, in-house capacity is best developed through sustained capacity building programmes which deliver group training sessions over a reasonable period and offer in-depth technical assistance (Despard, 2016; Kline and Dolamore, 2019). Capacity-building efforts that aim to improve data analysis skills typically focus on technical, rather than social, dimensions of data use. The concept of 'data literacy' goes beyond technical capability, and includes a critical awareness of data ethics, the fallacy of objectivity, and accessible and intelligible forms of data presentation. Drawing on a series of data literacy workshops for NPOs in the UK, Fotopoulou (2021) deftly summarises some normative principles that should be included in civil society data skills training and workshops: data practices should take into account the institutional, social, political and economic contexts and structures within which data is analysed, and care should be taken with data

pertaining to socially vulnerable groups. By including data literacies alongside statistical and information literacies, organisations become aware of the sociotechnical nature of data and are informed of their agency and need for context awareness and social responsibility (Fotopoulou, 2021).

Open data and data intermediaries

Over the past decade, conversations around open data have shifted from the realm of a small group of activists to the centre stage, where giving widespread and free access to data curated by the public, private and nonprofit sectors is seen as a public good (Davies et al., 2019). Civil society actors have been central to advancing the open data agenda, yet many open-data initiatives have been designed with only the private or public sectors in mind (Wilson, 2019). The few exceptions to this are best described as 'data intermediaries'; organisations that facilitate the (re)use of data by and for communities, acting to democratise its use and serve as a 'keystone' in the wider nonprofit data ecosystem (Yoon et al., 2018). Data intermediaries may collate data and display it in a data portal with an intelligible front-end, so that NPOs can use external data to narrate organisational progress and engage in "storytelling" acts (Erete et al., 2016). They may help broker relationships between organisations for data-sharing or mutual support purposes, or simply add existing value to data by cleaning, aggregating or standardising it (Yoon et al., 2018). Data intermediaries' central position in the nonprofit data ecosystem allows them to broker relationships and remedy gaps in data skills and literacies by either delivering training themselves or partnering with organisations that can (Benjamin et al., 2018; Yoon et al., 2018).

Notable examples of successful nonprofit data intermediaries in the UK include 360giving and Superhighways. 360giving run an open-data portal that displays historic grantmaking data in a standardised format. They currently hold data on 478,000 grants from 186 organisations, including government departments and the UK's largest foundations. They convene a network of grantmakers and organisations that wish to use 360giving data in their work. Superhighways is an offshoot of a nonprofit infrastructure support organisation with a dedicated focus on helping small and medium charities in London use

data and digital technology. Superhighways' Datawise London project brings together a partnership of data publishers, data literacy and skills experts and small charities to establish where needs are currently unmet, offer training, and broker relationships.

2.2.3 Use and adoption of technology by nonprofits

While the central concern of this thesis is data and not technology, the two are invariably intertwined and there exists considerable overlap in motivations and barriers to adoption. As with data use, technology is becoming a central part of NPO service delivery. In certain situations, service users come to expect a user experience akin to dealing with an online retailer (McNutt, 2020). NPOs may want to adopt new technologies to drive organisational efficiencies or improve user experiences but may find themselves unsure of where to start, or lack time to invest in implementing a new technology (McNutt et al., 2018; Caffyn and Hale, 2019). The adoption of new IT by NPOs is driven by normative and symbolic isomorphic pressures, particularly in NPOs where senior leaders have previous IT experience and look to signal sectoral leadership (Zorn et al., 2011). For Software-as-a-Service (SaaS) products in particular, its perceived complexity, cost, support from senior leadership, and previous experience of IT adoption by leaders are all deciding factors for whether new software is implemented (Wright et al., 2017). NPOs typically face changing and complex task environments, where they are required to switch between types of work and partnerships at relatively short notice, and in a form of 'shapeshifting', adopt new technologies to suit emerging needs; it is for this reason that perceived complexity is a significant barrier to IT adoption (Wright et al., 2017; Caffyn and Hale, 2019). When nonprofit organisations adopt new digital practices, changes in technology and data use can cause tensions between values and aims and the desired output, as organisations reconcile their values with nascent data and technological trends (Burt and Taylor, 2003). A pragmatic trade-off between efficiencies gained by innovating and holding firm to underlying principles and values can inhibit the adoption of digital technologies in the nonprofit sector (Zhang et al., 2010; Walker et al., 2020).

Areas of particular interest to scholars are the use of social media, and the adoption of AI and the promises of the fourth industrial revolution. Nonprofit organisations make use of social media to keep in contact with stakeholders, raise awareness of their cause and engage in advocacy work, and galvanise fundraising efforts (Guo and Saxton, 2020). The interactive, dynamic and relational aspects of social media serve NPOs well for participatory engagement with local communities and overcome previous sectoral silos and power dynamics (Kanter and Fine, 2010). Facebook in particular is seen as a pivotal part in NPOs contemporary communication assemblage (Hemphill et al., 2018). For critics of NPO social media use, it invites a lazy form of activism that has little real-world impact. NPOs are fighting a losing battle by competing with well-resourced private sector bodies for attention as part of the ever expanding attention-economy (Guo and Saxton, 2020). Finally, the promises of AI and the fourth industrial revolution are in some ways, coming to fruition. Fundraising platforms, donor advisors, and philanthropy researchers are at the nascent stages of adopting artificial intelligence practices to better match donors with causes, propel public support for causes, and understand philanthropic networks (Kanter and Fine, 2020). Decentralised technologies, such as blockchain, may overcome issues of hierarchical power and trust (Davies, 2019), and automation under the wider 'Internet of Things' umbrella could assist charities with practical matters, such as alerting the organisation to when a donor collection box needs emptying (Alshammari et al., 2017).

2.3 Approaches to understanding spatial data and GIS

This section[1] provides a technical overview of spatial data and GIS, starting with deconstructing the ontological basis for knowing and representing space. It outlines contemporary (general) case uses for GIS and the current policy environment before looking at the impact of spatial media and changing epistemic forms. Finally, a brief overview of critical cartography / GIS scholarship that examines the power / knowledge nexus is given.

[1] Some of section 2.3.1 is published in *Bowles, J. (2022) Spatial approaches to the voluntary sector. In Dean, J. and Hogg, E. (Eds.) Researching Voluntary Action. Bristol Policy Press, pp. 146-159.*

2.3.1 The building blocks of spatial data and GIS

In geographic information science scholarship, ontological analyses sit somewhere between the meta-physical study of the state of nature found in philosophy and the specification of structure, hierarchies, and relationships that underpin digital applications which is found in computer science. A third ontological understanding found in GI science literature, captures both the phenomenological and application domain and helps us see spatial data as consisting of: a geographic reality (the physical phenomenon); the representation of the reality (the construction of the visualisation); and conceptualisation (its interpretation and mental representation) (Kavouras and Kokla, 2011). For representing reality, Kavouras and Kokla (2008) list four dimensions that are used to describe geographic concepts: a reference, such as a spatial, temporal, or thematic frame; semantics, the physical nature of the representation and its relation to other things; semiotics, such as the symbols used to convey meaning; and quality, such as the exactness or approximation of something's location.

Digitally, we can represent geographic data in raster and vector forms. Raster representations are a collection of pixels, which are scaled and shaded to represent geographic features. Satellite imagery and aerial photography are forms of raster representations. Vector representations are a collection of points, which are either captured individually or joined up to form lines and polygons. Vector representations are more commonly used in social, economic, and administrative mapping exercises, as they are easily adjustable to fit custom spatial representations and are lightweight. Both raster and vector representations are used in a geographic information system (GIS). A GIS compiles spatially referenced layers (Figure 6) of data to reveal novel insights.

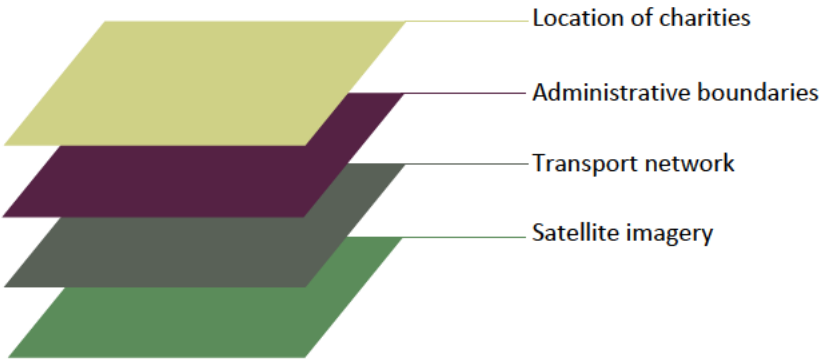


Figure 6: Illustration of GIS layers (source: author in Bowles (2022)).

In Figure 6, the satellite imagery used as a basemap will be raster, and the transport network and administrative boundaries could be a wide range of file formats, such as Shapefiles, KML, GeoJSON. Table 1 shows how the location of charities could be mapped. The charity registration number, name, classification, and postcode are imported as tabular data on the left-hand side. Using the postcode as a shared identifier, this is joined to a local authority administrative boundary shapefile, which has the centroid of the local authority area as coordinates, the Government Statistical Service (GSS) code and name included.

Org_ID	Charity Name	Classification	Postcode	Latitude	Longitude	LA_Code	LA_Name
12345678	The GIS demonstration organisation	Education	SW1A 1AA	51.501009	-0.141588	E09000033	Westminster

Table 1: Example merger of spatial data using postcode (source: author in Bowles (2022).

If we wanted to map the data as points using the coordinates, a Coordinate Reference System would correctly locate each point, resulting in a map such as Figure 7.

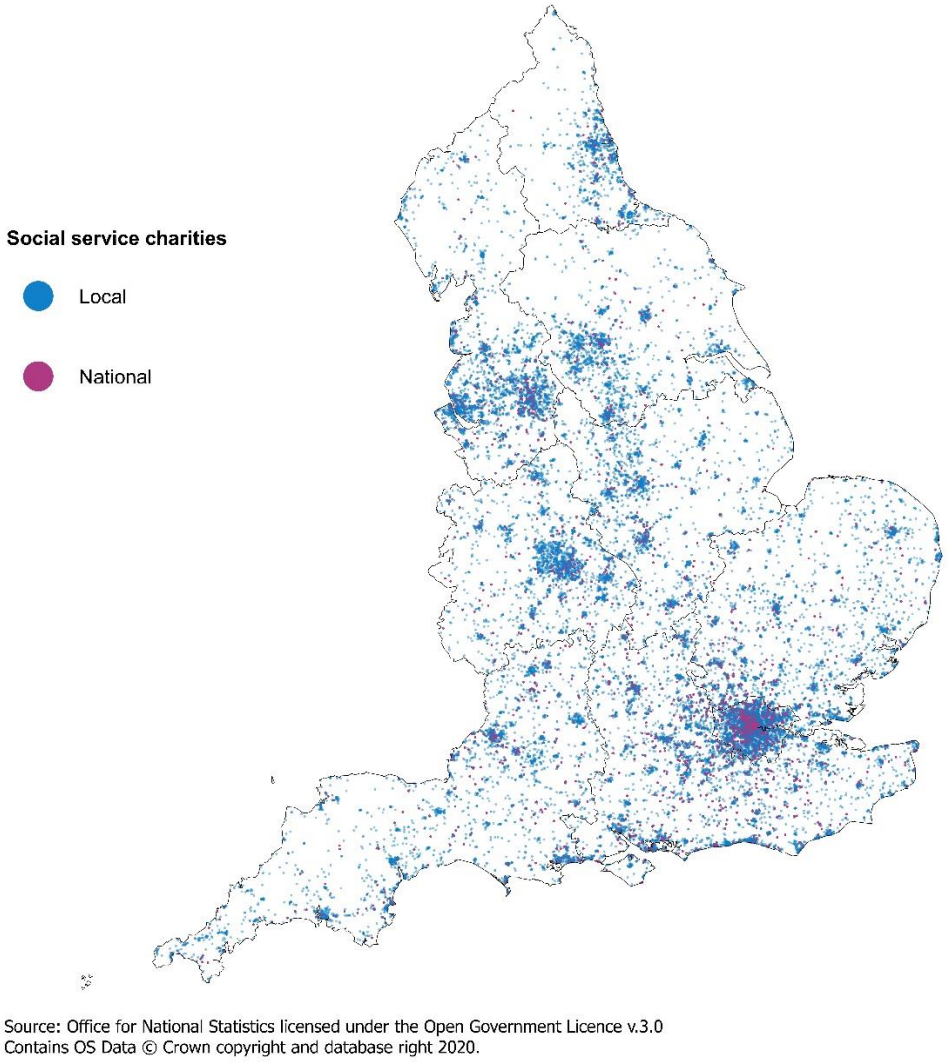


Figure 7: Dot-density map of social service charities in England in 2015. (source: author in Bowles (2022).

Or, if we wanted to map the data at local authority level, we could join the dataset to a shapefile of local authority boundaries, and generate an aggregated choropleth (Figure 8) or hexbin map (Figure 9) of charity density.

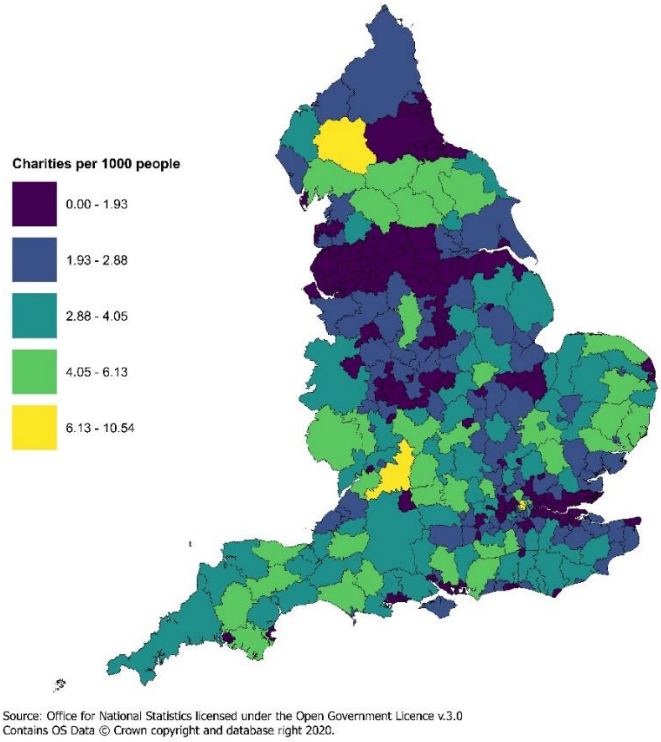


Figure 8: Choropleth map of charities per 1000 people in England by Local Authority in 2015. (source: author in Bowles (2022).

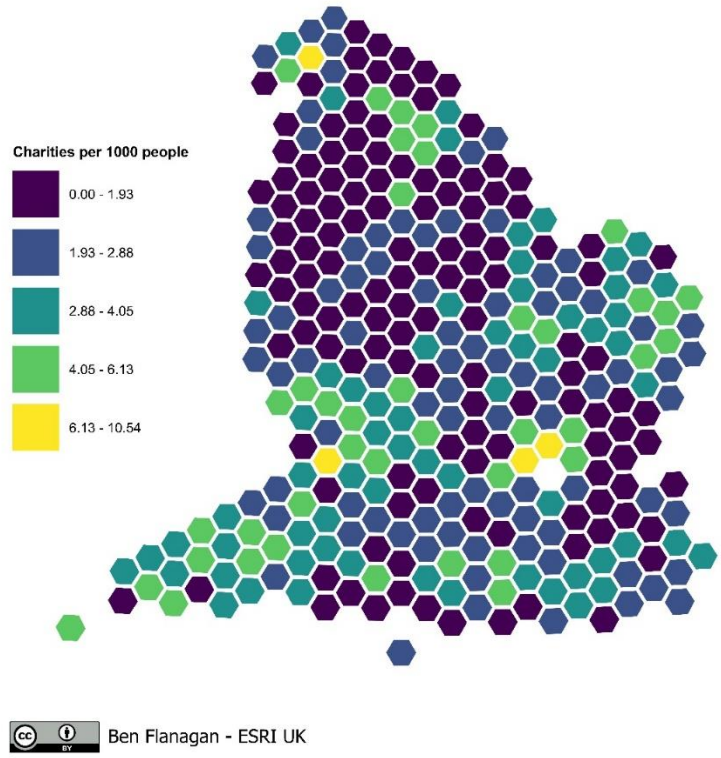


Figure 9: Hexbin map of charities per 1000 people in England by Local Authority in 2015 (excluding City of London). (source: author in Bowles (2022).

Over the past decade, business intelligence (BI) software, such as Tableau and Microsoft Power BI mentioned in section 2.2, has advanced to include geospatial mapping functions. In some ways, this makes them a form of GIS as they allow interactive mapping of multiple layers of spatially referenced data. However, they lack the capacity for more advanced geospatial analysis found in traditional GIS or computational programming packages. Esri's suite of GIS tools (ArcGIS Pro, ArcGIS Online etc.) are the most widely used products and are considered the industry standard, being taught on HE courses and used in a variety of sectors. MapInfo is another well-used proprietary GIS. In response to the high cost of many proprietary GIS programmes and an ideological preference for free and open-source software (FOSS) by many GIS users, programmes such as QGIS, GRASS and GeoDa which offer fully functioning GIS visualisation and analytical capabilities are growing in use and are well supported by active and welcoming online communities (Buil-Gil and Langton, 2020). Spatial analysis packages which allow users to perform visual and statistical GIS functions are becoming widely integrated into statistical and computational programming languages, such as R and Python (Buil-Gil and Langton, 2020).

There is a wide range of case uses for GIS by sector, with Longley et al. (2015, p.385-386) listing the driving motives behind public and private sector use of GIS and the development of geospatial infrastructure. The public sector seeks to meet the policies and promises of elected representatives, protect citizens from threats, provide good value for money, control risk, and act equitably. For the private sector, the aim is to create profit, build assets, control risk, get more from existing assets, and create new business. In the public sector, the specific case uses include the use of mobile GIS applications by adult social care teams to map new community-based services, which can then be shared with service users (Esri, 2019). In the private sector, GIS is used to run complex models across 28 million UK addresses to assess which insurance policy-holders might be affected by an environmental emergency or spot geospatial patterns in insurance fraud (Esri, 2015).

A significant development in UK geospatial data policy has been the setting of a National Geospatial Strategy (2020-2025) by the Geospatial Commission. The Commission was set up in 2018 by the Cabinet Office to coordinate public sector geospatial activity and deliver a strategy that promotes the use of location data, improves access to it, fosters growth in

skills and capabilities, and sets the UK up as an international leader in this area. Access to previously proprietary data from Ordnance Survey's MasterMap under an enhanced Public Sector Geospatial Agreement is a good example of progress led by the Commission. The work of the Commission has primarily been aimed at the public and private sectors, with the nonprofit sector notably absent from most communications and the final Geospatial Strategy. This is reflected in the responses to the Commission's call for evidence (Geospatial Commission, 2019), which are dominated by responses from medium to large businesses and public sector bodies. However, the call for evidence gives insight into contemporary spatial data and GIS uses. For example, the consultancy firm Deloitte use spatial data and GIS for analysing transport routes, small area statistics, and anonymised footfall data for individual client projects. Many responses recognise that while the UK is internationally advanced in its GIS use, there exists a significant skills gap between the demands of organisations and the supply of GIS practitioners.

2.3.2 Critical cartography and the interplay between power and knowledge

So far in this section (2.3), geospatial data and GIS have been presented as holding utility as problem-solving tools that suit a rational, Cartesian analysis. Until the early 1990s, cartography and the emerging technological infrastructure that facilitated digital mapping were largely viewed as the preserve of professional cartographers and GI analysts in government and academia (Crampton, 2010). What started out as the mild discontent of critical human geographers over GIS's roots in commercial and government military enterprise, and a creep of "naïve empiricism" erupted into what became known as the Science Wars, running from 1990-1995 (Schuurman, 2000, p.572). A gulf emerged between socio-theoretical critics of GIS who viewed it as a positivist tool that excluded emerging feminist and radical scholarship, and GIS practitioners who "saw the value of their techniques being denigrated without realizing why" (Schuurman, 2000, p. 577). Following ferocious debate, a meeting was called in Friday Harbor, Washington State in 1993 to bring together antagonists and defenders of GIS and develop an ongoing research agenda. Sheppard (1995) summarises the key concerns of critics (summarised in

Schuurman, 2000): that technological designs have far-reaching implications; that GIS was socially and historically contingent; it risked privileging certain worldviews over others and failed to examine its epistemologies; and that the technology was not physically or technically accessible to those beyond industry or large academic institutions. The post-1995 debate was less antagonistic and more theoretically influenced and led to a diverse set of 'critical cartography / GIS' scholarship that hangs together through an "invisible thread" (Elwood et al., 2011).

The 'critique' offered by critical cartography is founded in the Frankfurt School tradition, with Crampton and Krygier (2005) describing it as deploying politics of knowledge, that examines the grounds of our decision-making knowledges and the relationship between power and knowledge from a historical perspective, and that it "resists, challenges and sometimes overthrows our categories of thought" (p. 14). Critical cartography offers a "one-two punch" of theoretical critique, and critical mapping practices (Crampton and Krygier, 2006, p. 12). The theoretical critique is centred on the proposition that maps are not neutral and passive representations of the world, instead they actively construct the very world they are purported to represent, and they exercise great power (Crampton, 2010). There are many theoretically rich critical cartographers, but Wood's (2010) contribution to the field is a particularly compelling analysis of maps (analogue and digital) which extends to spatial data and GIS more broadly.

Wood (2010) opens his book by describing maps as social engines that convert social energy to work and knowledge by linking things in space. The inclusion / exclusion of links across space are decided by the mapmaker and in this way, the map is seen to advance certain propositions and ideologies; "they are statements that affirm or deny the existence of something" (p.41). Using a choropleth map of the 2004 U.S. presidential elections, Wood shows how maps not only make propositions, but make arguments too.

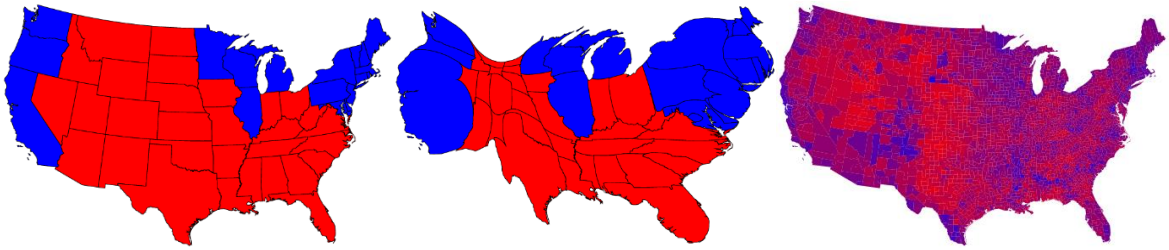


Figure 10: The US election results by state, population adjusted cartogram at state level, and then county-level return adjusted to indicate strength (%) of vote. Source: (Gastner et al., 2004.)

The map on the far left (of Figure 10) shows the results of the 2004 US election by state, and was used to assure George Bush that the country was deeply polarized, but that he was the overwhelming winner of the election and therefore had near complete control. The map was seen to be a mirror of society that was overcoming long-standing division. Of course, this wasn't actually the case; the second map which adjusts for population, and third which looks at county-level returns by strength of vote for either side show a country that didn't overwhelmingly vote for Bush and that state by state divisions weren't as stark as first thought. So, maps not only propose that *this* is *there*, but they can make arguments through stories which on the face of it, seem like neutral and accurate representations of reality (Wood, 2010).

The map's propositional logic doesn't show *the* world, but *a* world (Wood, 2010, p. 51), although it transmits supreme authority as very few are in a position to challenge its propositional logic. Wood (2010) explains this through the symbiotic relationship between cartography and the state; land isn't divided up, except in our heads and on our maps. The map constructs a state, yet simultaneously gives the state the power to say this is our land, that is yours. They both construct, and are constructed by, states. The power of maps is carried through signs and communication which ultimately affect the behaviour of people; this "discourse function" (Wood, 2010, p3) means that the way maps are decoded by people affects how they are placed into everyday conversation and wider discourse. A semiotic reading of maps as sign-functions shows the sign as saying both 'this is there' (the signifier), but also as carrying a wider meaning (the signified) which is then distributed and solidified in conversation and ongoing communication. Wood (2010) explains the map as consisting of multiple and related sign-functions:

"Maps are about relationships among which meanings circulate. In even the least ambitious maps, simple presences are absorbed in multilayer relationships integrating and disintegrating sign functions, packing and repackaging meanings according to the map's propositional logic. As a consequence, the map is a highly complex super-sign….a synthesis of signs. It's not that the map conveys meanings so much as the reader *unfolds* them through *a cycle of interpretation* in which they continually tear down and rebuild it" (p.98).

The second punch of critical cartography (Crampton, 2010) is practical action which is developed from theoretical critiques. Critical cartography has always had a strong activist and emancipatory aspect, which is seen in the practice of countermapping, the idea that hegemonic, typically state-produced maps can be challenged by alternative perspectives. There is a long history of oppressed groups producing their own maps to counter the prevailing narrative, e.g. indigenous groups in British Colombia producing maps that detailed their long history in the area to push back against plans by government and companies to begin drilling for oil and gas in their homeland (Rundstrom, 2009). Similarly, Public Participation GIS (PPGIS) which is outlined in detail concerning the work of nonprofits in section 2.4.1, aimed to democratise access to GIS, and develop tools that would be adaptable for use by regular citizens and non-specialists (Obermeyer, 1998). Feminist GIS scholars have not only changed the perception of GIS as a purely quantitative and positivist epistemic tool, but actively shaped its development and application to ensure the nonquantifiable and qualitative aspects of everyday life (and particularly those experienced by women and marginalised groups) are represented in and by spatial mapping systems (Cope and Elwood, 2009; Pavlovskaya, 2016). Mei-Po Kwan's (2002) ground-breaking contribution reclaimed GIS as a tool for feminist geographic research that reveals the gender biases of conventional qualitative methods, uses qualitative data to construct feminist cartographic narratives, and supports feminist activism.

Ultimately, the development of critical cartography has 'undisciplined' cartography and GIS: it is freed from the confines of niche academic concern and has been opened up to widespread critique but also engagement as a powerful force for emancipatory ends (Crampton and Krygier, 2006). We see this 'undiscipling' and the influence of critical

theory and critical cartography in debate by nonprofit scholars on whether civil society should be physically mapped. Never (2011) contends that if better maps of demand for civil society, and supply of civil society services existed, then there would be a more efficient market allocation of philanthropic and financial resources. Drawing on critical cartography scholars, Appe (2012; 2013) argues that we should pay attention to *who* is mapping civil society, for the ideology and priorities of who is doing the mapping will be reflected in how we define and spatially conceive of civil society. Nickel and Eikenberry (2015) develop a further critical perspective: they argue we should pay attention to *why* actors should want to map civil society, and in the case of the state, mapping civil society activity is a form of statecraft that has the potential to co-opt grassroots activity into state agendas. Similarly, Mohan and Breeze (2016) question whether macro-scale mapping exercises that seek to pass judgement about the current distribution of civil society resources have any moral basis, given that civil society activity is often an expression of individual or community preference.

2.3.3 Spatial media and changing epistemic forms

It is a banal point that the nature of mapping has changed considerably since the collation of shared perspectives into the sub-discipline of critical cartography in the 1990s and early 2000s. Under the heading of a movement to 'maps 2.0' Crampton (2009) outlines the set of changes which constitute a new era of mapping technologies and practices. The most significant of which is the development of the 'geoweb': a term used for the increase in geospatially referenced information and tools on the internet that display spatial data 'naturalistically', are interactive and can be queried, can integrate data from different sources, and ultimately move the means of production of knowledge from trained professionals into the hands of the public (Crampton, 2009). This 'rolling back' of the state from the public face of mapping has meant that the private sector and civil society have 'rolled out' their own practices and tools (Leszczynski, 2012). Google Maps and Google Earth represent significant private-sector investment in the geoweb, and free and open-source software initiatives (FOSS) such as Open Street Map and OpenLayers are civil

society are cross civil-society and private sector investments. The crowdsourcing of geospatial data is widespread, and is facilitated by platforms (such as Twitter) that geolocate individual user contributions. While traditional GIS has not been supplanted by the geoweb and 'Maps 2.0', it has led to something of a re-professionalisation where access to spatial data and cartographic tools now exists beyond the confines of academia and industry.

Having recognised a clear paradigm shift, recent scholarly thought in geography has sought to understand spatial media's epistemic affordances and mediating properties. In defining spatial media, Leszczynski (2015) (drawing on Crampton, 2009), refers to spatial media as "new technological objects (hardware, software, programming techniques, etc.) with a spatial orientation, as well as to nascent geographic information content forms produced via attendant practices with, through, and around these technologies" (p.729). Spatial media include location-enabled devices, interactive web-based mapping services, crowdsourcing platforms, spatial APIs and scopic multimedia dashboards. They do more than simply present spatial information, as they "mediate a diverse set of socio-spatial practices – communications, interactions, transactions – that extend beyond the representational practices and work of traditional maps" (Kitchin et al., 2017, p.4). Our understanding of the world through news media (Dodge, 2018), urban experiences (Kitchin and Dodge, 2011; Rose, 2017), mobilities and leisure practices (Duggan, 2020), social communication (Sutko and de Souza e Silva, 2010) and even societal norms (Elwood, 2021) are mediated by spatially orientated media. In this way, we can see spatial media as reducing the ontological stability of the map and marking a departure from the work of Wood (2010) and others, who, while recognising the agency of a map, view a map as fixed in its representations. The dynamic nature of contemporary map making means that their ontological status is never fixed, their epistemological implications are likely to change. Instead of seeing maps as representations, the advancement of spatial media and readily available of spatial data make mapping a processual, contingent, and relational practice (Kitchin and Dodge, 2007). This evolution in mapmaking is observed in a paradigm shift in how maps are made and shared. The use of service-orientated architectures which, in essence, provide mapmakers with access to decentralised geospatial data plumbing have changed the process of map-making from one of

"collecting-assembling-storing" to "reusing-assembling-sharing" (Jobst and Gartner, 2018). No longer are maps made once, instead the combination of the changing data landscape and advancement of spatial media mean maps are made and remade continually; they are processual in nature.

2.4 Existing studies of nonprofit spatial data and GIS use

Generic literature (both academic and grey literature) that outlines GIS case uses by sector has tended to ignore the nonprofit sector, instead simply outlining case uses by the public and private sectors. However, there exists a rich theoretical and empirical exposition of the role that spatial data and GIS can play in the work of nonprofit organisations. While the literature base provides ample room for development, there is not the paucity of academic nonprofit GIS literature that is often conferred (even by nonprofit GIS scholars, such as Jordan (2019)). This section of the literature review first gives historical context to the development of the main body of nonprofit GIS use literature. It particularly explains the focus on urban and neighbourhood planning. A brief meta-analysis of the studies in Table 2 is then undertaken, exploring the background, key research questions, methods, and geographic focus of the studies. Finally, a thematic analysis of pertinent findings that are unique or prominent to nonprofit organisations' use of spatial data and GIS is given.

2.4.1 Historical background to nonprofit GIS studies

The Science Wars of the 1990s, from which the sub-discipline of critical cartography emerged (see section 2.3), facilitated scholarly engagement with the nonprofit sector through a research agenda that focused on public participation and anti-elitist and democratising practice. Research Initiative 19 of the US National Centre for Geographic Information and Analysis (NCGIA) emerged in 1996 and sought to bring together GIS developers and practitioners, with (typically anti-positivist) critics and social theorists with the intention of exploring "The Social Implications of How People, Space and Environment are Represented in GIS" (NCGIA, 1996). NCGIA Research Initiative 19 encouraged inquiry into the power of spatial data availability and GIS visualisation in shaping representations

of natural resources and society, and examining inherent epistemic logics and hierarchies. It explicitly outlined a need to study situations where GIS is used as a decision-making tool, and whether those affected by its application have their knowledge, views and needs taken into account. It encouraged the study of situations where GIS has been democratised through utilisation by a broader spectrum of society. In sum, the research initiative and subsequent meetings and workshops fostered a concerted effort to develop and study the use of GIS applications that empower less privileged or marginalised groups to partake in public policy making. A stream of research emerged that was particularly concerned with community empowerment in the urban planning process through making better use of GIS (see Ramasubramanian, 2011). 'Public participation' was a phrase that scholars believed would resonate with urban planners, and thus was embedded as the umbrella term for progressing research that both involved and reported on the use of GIS by community organisations and grassroots groups to challenge and engage with state-led planning initiatives (Obermeyer, 1998., Sieber, 2006).

For scholars and practitioners seeking to study the nexus of GIS as an empowering and marginalising tool and set of practices, grassroots and community organisations in the mid-1990s provided fertile ground. At the time, the US federal government was making significant investments in sectors that would benefit from greater electronic telecommunications, laying the foundations for wider digital connectivity and access to data sources. Community-based organisations (CBOs are grassroots nonprofit organisations) were being challenged to take on greater service provision and advocacy responsibilities despite possessing limited resources. By 1995, the US Department of Housing and Development required community-based organisations to demonstrate community need in order to be eligible for grant funding (in parallel with similar changes in the UK through the Single Regeneration Budget). Consequently, community organisers began mapping census data alongside local knowledge to secure funding and develop their own narrative amidst state-planning discussions (Ramasubramanian, 2011). Philanthropic organisations and state departments encouraged the development of city-based neighbourhood indicator portals that allowed community groups to target physical interventions. Organisations became providers of local data and knowledge that was often beyond that which state bodies could supply. Community-based organisations allowed

scholars to explore how groups that were often marginalised in the planning process through omission of their perspective in the GIS and technical workings, could challenge these narratives and be empowered. Community-based organisations provided the antithesis of the positivist, state-led cartographic projects that many critical scholars at the time held great concerns over. Local knowledge and voices were being empowered through community uses of GIS and often provided more 'relatable' geographies for the local population by focusing on neighbourhoods, as opposed to arbitrary census tracts. Building on Budic's (1994) assessment of GIS use by US local governments, Sawicki and Craig (1996) turned their focus to initiatives that facilitated the use of GIS systems by CBOs to monitor local statistics and involve themselves in local planning decisions and increase the efficacy of their advocacy work. This was the first in a series of efforts to document and theorise this changing data landscape for community organisations in the US.

Date	**Author(s)**	**Geographic focus**	**Method**	**Group objectives**	**No of groups**	**Topic**
1996	Sawicki and Craig	USA	Survey and interviews	Community planning	11	GIS data intermediaries and data sharing – journal article
1998	Barndt	USA (Twin Cities)	Documentary analysis	Neighbourhood planning	1	Implementing community data systems – journal article
1998	Elwood and Leitner	USA (Twin Cities)	Interviews	Neighbourhood planning	4	Access and utility of GIS for groups – Journal article
1998	Leitner et al.	USA (Twin Cities)	Interviews	Neighbourhood planning	4	Models of community GIS

						access – conference paper
1998	Craig and Elwood	USA (Twin Cities)	Interviews	Mixed, but mostly neighbourhood planning	50	Overarching framework of use of GIS by community groups – Journal article
2000(a)	Sieber	USA (California)	Interviews and observation	Environment	4	Examining implementation of GIS – Journal article
2001	Ghose	USA (Wisconsin)	Action research	Community residents	1	Community GIS training – Journal article
2002	LISC	USA	Practice paper	Infrastructure organisation	1	Practice paper on uses of GIS
2002	Elwood	USA (Minneapolis)	Interviews	Neighbourhood planning	1	Empowerment through GIS – Journal article
2003	Elwood and Leitner	USA	Interviews	Neighbourhood planning	15	Spatial knowledge production – Journal article
2006	Elwood	USA (Chicago)	Interviews and observation	Neighbourhood planning	2	Spatial narrative production – Journal article
2007	Sieber	USA (California)	Interviews, surveys and observation	Environment	6	Access to spatial data - Journal article
2010	Watson-Bishop	USA (Missouri)	Survey and interviews	Mixed (mostly social service)	9	Non-users' reaction to potential use of

						GIS – Journal article
2011	Edwards	USA (North Carolina)	Survey	Unknown	51	Trends and barriers to adoption – MA Thesis
2012	Ward and Never	USA	Survey	Mixed	72	Adoption intention – Conference paper
2012	Al-Kodmany	USA (Chicago)	Interviews	Urban planning	8	Case study on GIS use – Journal article
2013	Roudebush et al.	USA	Web analysis	Mixed	4	Community data portals – Journal article
2013	Elwood and Leszczynski	USA	Web analysis	Mixed	5	Crowdsourced data platforms – Journal article
2016	Lin	USA (California)	Action research	Arts	1	Implementing cloud-based GIS – MA Thesis
2016	Brudney et al.	USA	Interviews	Mixed	18	Adoption of data platform – Journal article
2017	Johnson and Sieber	Canada	Action research	Environment and economic development	2	Use of geoweb tools - Journal article
2019	Jordan	USA	Lit review and practice case studies	Mixed	NA	Book chapter on use of GIS by nonprofits – practitioner perspective

Table 2: Empirical studies of nonprofit spatial data and GIS use (n=22)

2.4.2 Descriptive overview of studies

The 22 studies in Table 2 make use of empirical data to explore various uses of spatial data and geographic information systems by nonprofit organisations. They all use primary data, focusing on the use of spatial data and GIS *by* nonprofit and civil society groups and study groups that possess a coherent organisation form. The mapping review used a systematic search for alternative phrases for the nonprofit sector (such as third sector, voluntary sector, charities) alongside "spatial data" "geospatial data", "GIS", "mapping" etc. The literature was then coded for themes that run across the studies. Studies that explore GIS use by indigenous populations and groups that do not possess an organisational form and studies that explore how GIS and spatial data hypothetically could benefit nonprofit groups have not been included in this review. Scholarly work that adds a solely theoretical contribution to this field has been left out of Table 2, but where relevant is included in the thematic analysis below.

Of the 22 studies, 16 are published in peer-reviewed nonprofit, geography and planning journals and 2 are academic papers presented at geography and information management conferences. Also included is a practice paper from an infrastructure organisation and a book chapter on the use of GIS for nonprofit organisations which is authored by the Chief Executive of a United Way branch. While not normally included in literature reviews, 2 MA theses that are of high quality and relevant to this study feature in the table. In 1998 Barndt's, Elwood and Leitner's, and Craig and Elwood's empirically grounded studies were featured in a special issue in the journal 'Cartography and Geographic Information Systems', which was directly responding to the participatory turn in critical GIS studies. A variety of scholars, and in particular Sarah Elwood and Renee Sieber, have since dedicated considerable effort to developing the evidence base of nonprofit GIS use with a small but steady flow of research being produced.

It is notable that with the exception of Johnson and Sieber's (2017) study which focussed on Canadian nonprofit groups, all studies looked at the work of groups in USA, with a particular focus on the northeastern states. This is in part a product of the academic and political context discussed above, but also indicative of American companies such as

Environmental Systems Research Institute (Esri) pioneering the development of GIS software and dominant data formats such as Shapefile. There clearly remains plenty of scope for context-specific reporting of nonprofit GIS use beyond North America.

The research methods used vary according to the research question, with an even split between studies that use interviews, surveys, action research and web analysis. With the exception of Craig and Elwood (1998), the sample size for studies that use interview data is typically small, with a median sample size of 5. The papers vary in depth of interview data presented, with some giving detailed case studies of a few organisations and others drawing high-level thematic results. Surveys that were large in size tended to focus on adoption of GIS with the intention of developing an understanding of the barriers to adoption. Action research as a method provided detailed insight into the adoption and use of GIS by organisations, but could not provide comment on the post-intervention success of action research.

Until 2010, most studies concerned groups involved in urban planning, community activism, or the built or natural environment. Organisations studied operated on a local geographic scale, therefore the studies lacked application to larger organisations. Latter studies draw on a more diverse sample of organisational aims and geographic scope of operation, with Brudney et al's (2016) study of a unique data platform covering the work of four state-wide organisations, eight regional organisations and three multi-state organisations.

2.4.3 Thematic analysis of nonprofit GIS literature

Key uses of GIS

In lieu of describing every individual case use of GIS by nonprofit organisations that is in the reviewed literature, the framework provided by Craig and Elwood (1998) adequately describes many of the GIS uses listed in more contemporary papers, despite being over 20 years old. Craig and Elwood's paper draws on data from over 50 community groups in the Twin Cities of Minneapolis–Saint Paul that were interviewed regarding their use of spatial data. While organisational perspectives from social service organisations and YMCAs were

provided, most of the data and in-depth case studies focus on organisations concerned with representing the community in participatory planning processes. Craig and Elwood's four-part framework indicates that nonprofit organisations use spatial data and GIS for administrative, strategic, tactical and organising purposes:

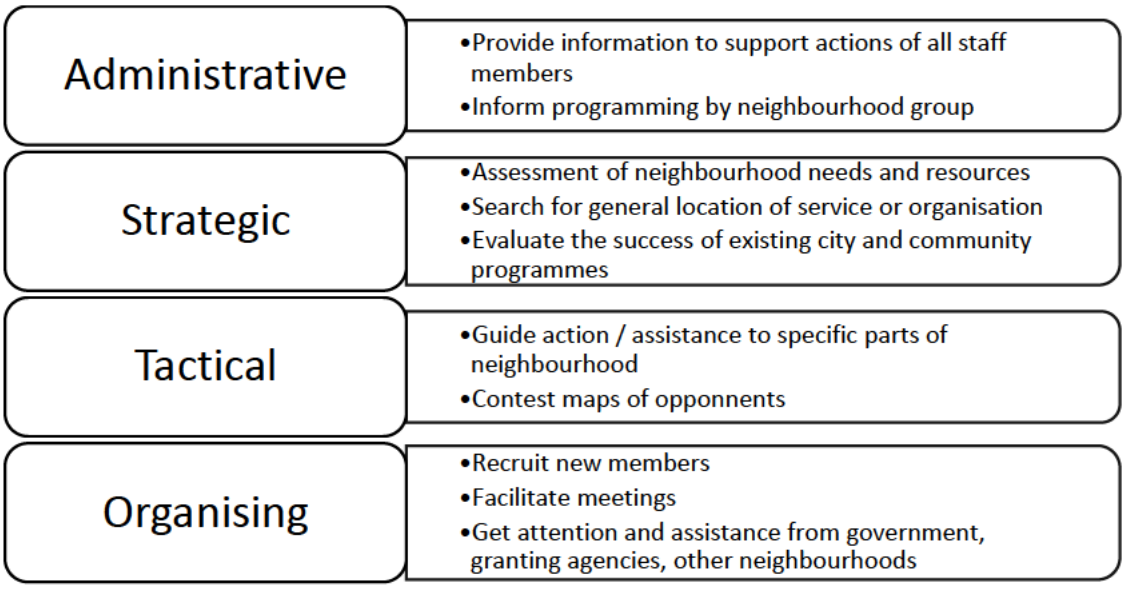


Figure 11 – Uses of maps and geographic information by community organisations, reproduced from Craig and Elwood (1998, p.101).

Craig and Elwood add depth to their framework by demonstrating how administrative staff members use maps to record details of individual properties, and show the location of grants and loans to ensure an even distribution. Strategically, groups use maps of demographic and socio-economic characteristics at the census-tract level alongside details of existing services to ensure the location of new services is adequate. Tactically, groups can contest maps that are deemed 'official' through counter-mapping exercises, or concentrate their efforts in a particular area of need. Finally, groups need to mobilise support for their work, and spatial outputs are used to inform new members about the work that is taking place and gain their support. In meetings between conflicting groups, a visual output provides a useful centre-ground and facilitates discussion about particular locations. Requirements for groups to evidence the need in their area are met in-part through presenting need alongside proposed solutions in a spatial way. By presenting the data in this way, the organisation's credibility and prestige are enhanced in the eyes of authority and new relationships can be fostered. In sum, despite being over 20 years old,

Craig and Elwood's (1998) framework still provides the most comprehensive analysis which demonstrates the utility of spatial data for nonprofit organisations in providing: administrative support through mapping key locations, strategic guidance for prioritising resource location, tactical thrust in producing competing narratives and in aiding the growth and legitimacy of the organisation as a whole. Craig and Elwood's (1998) framework is compared with the results of this study in Chapter 5.

Implementation and capacity

Scholarly debates in the 1990s around whether GIS software marginalised or empowered nonprofit groups overshadowed any consideration for how such groups implement and sustain geographic information systems, claims Sieber (2000a). Sieber showed the implementation process to be a "colourful, contradictory, evolving and highly political process" (p.26), but proposed certain organisational characteristics which make adoption more likely. The first stage in accessing a geographic information system is an organisational awareness of what resources exist and having the vision to apply the capabilities of a GIS to existing operations (Elwood and Leitner, 1998). Once this first stage is overcome, an influential characteristic is having support from upper management for the implementation and development of GIS, both for the initial outlay of software and ongoing training and workflow embedment. Having a 'GIS champion' can ensure that the project is driven forward and awareness of the 'value' of a GIS system is spread throughout the organisation (Sieber, 2000a; Lin, 2016; Brudney et al. 2016). Organisational capacity for IT development in general is an important factor in GIS adoption, with organisations that already have a sizable number of IT proficient staff having a higher propensity to adopt new technologies (Ward and Never, 2012). Scarcity of financial resources and the cost of purchasing and implementing a geographic information system are viewed as significant barriers to adoption by organisations that may otherwise benefit from a GIS. While software may be costly, nonprofit organisations with a base of dedicated volunteers can reduce staffing costs by training volunteers to have basic GIS capabilities (Sieber, 2000a). In addition, nonprofit organisations can undertake 'resource substitution' (Sieber, 2000a, p.25) in a way their for-profit counterparts cannot; they are often eligible for discounted or free products and to apply for development grants, and

they have a supportive network that doesn't foster competition and allows for technical and conceptual cooperation.

Access to data

Nonprofit organisations may use their own primary data or require secondary data from other nonprofits, public or private sector bodies. Access to secondary data is a point of empirical concern in the literature; if the data exists in the first place, gaining access to it can be impeded by technical, organisational, political, legal and economic factors (Sieber, 2007).

Technical barriers to data access may be incomplete secondary or outdated data held in an inaccessible file format. Organisations may seek granular data but instead only have access to data that has been aggregated around an irrelevant geography, such as census tracts or zip codes (Barndt, 1998). Despite the nonprofit organisations Sieber (2007) studied displaying a cavalier attitude to data, legal regulation of data varies by country and can restrict both the type of data that is shared and the way that the data can be used by organisations. Organisational and political barriers concern political sensitivity and power imbalances between groups. Inter-organisational networks facilitate data sharing, and while the majority of studies assessed pre-date the conceptualisation of the broader open-data discourse outlined in section 2.2, groups that share institutional goals and display high levels of trust widely share data (Sieber, 2007) and collectively lobby for greater data access rights (LISC, 2002). Data-sharing arrangements can display and exacerbate power differentials between groups, as in a public-nonprofit sharing arrangement, the public sector organisation may withhold data due to security concerns or because the data is politically sensitive. In private-nonprofit sharing arrangements, the nonprofit organisation must pay whatever price the private organisation stipulates for data access (Sieber, 2007). Even in nonprofit-nonprofit sharing arrangements, data access may be withheld in a bid to accrue political influence and possess knowledge capital (Elwood, 2008).

Frequently referenced in literature is the work of US think tank Urban Institute in creating the National Neighbourhood Indicators Partnership in 1995 and Community Platform in

2010. These online platforms aim to provide raw data and necessary analytical tools for nonprofit groups to make use of spatially referenced data in their work. Such 'data intermediaries' – organisations or platforms that connect data suppliers with data consumers – have a democratising effect through bridging the gap between data 'haves' and 'have nots' (Sawicki and Craig, 1996). Data intermediaries can reduce the cost of access for nonprofit groups as the cost is either shared between interested parties (Al-Kodmany, 2012) or organisations pay for discrete data access or analysis (Lin, 2016). Intermediaries, such as universities or nonprofit organisations that orient their mission towards data sharing face challenges in navigating the political and economic tensions inherent in working with nonprofit organisations and supplying a 'service' of some kind; how much assistance is given, how much assistance is given, and how much assistance is much is charged for access? (Sieber, 2007). However, data intermediaries can provide more equitable access to spatial data and encourage greater collaboration between stakeholders through shared effort and organisational priorities (Brudney et al., 2016).

The empowerment / marginalisation nexus

The narrative of GIS as both an empowering and marginalising tool that dominates the critical cartography literature found a strong application in nonprofit research literature, particularly through NCGIA research initiative 19. Elwood (2002) contends that instead of simply suggesting that GIS is empowering or disempowering, we should be assessing "in what ways does it foster empowerment and disempowerment, and for whom? What is the basis of this empowerment or disempowerment for different actors and institutions?" (p.907). Empowerment can be analysed as distributive, procedural and capacity-building at multiple spatial and temporal scales (Elwood, 2002); distributive changes occur when groups use GIS to democratise access to information and empower individuals to get involved in community action, particularly through a PPGIS action programme. Data intermediaries play a role in distributive empowerment through lowering barriers to accessing GIS and data (Ghose, 2001). Procedural change occurs when social and political processes give greater affordance to the contributions of citizens and community groups and grant their knowledge claims greater legitimacy. GIS outputs can be used to

communicate with institutions and organisations that hold power in a way that demonstrates knowledge of the issue in hand as well as possessing capability to provide a solution (Craig and Elwood, 1998). In practice, GIS outputs have resulted in groups being "taken more seriously and included in processes that were not open to them before. Using maps to communicate with decision makers allows users to illustrate a large amount of information in a relatively simple and compelling format, to convey that the users are savvy about data and technology, and that they have important information about their neighborhood." (LISC, 2000, p. 5). Finally, nonprofit groups can build individual and collective capacity through GIS training, giving greater knowledge of the analytical capacity of GIS and how it can be used to achieve organisational aims. Organisations can assess pertinent data at different scales of operation in a timely and effective manner, allowing the organisation to give input in decision-making forums that focus on differing spatial scales (from neighbourhood forums to state decision-making arenas) (Elwood, 2002).

Parallel to the 'empowerment' narrative is one of GIS as a potentially marginalising and (sometimes unwittingly) oppressive tool. Groups can be marginalised through lack of technical understanding and resource constraints that prevent the adoption of new technologies. Members of an adopting group that lack technical literacy can instantly be marginalised from discussions (Elwood, 2002). In a non-zero-sum way, one group gaining access to new technology and benefiting from increased influence with decision-makers can disproportionately disempower groups who cannot assert their knowledge in ways that command attention from decision-makers and draw on the analytical power of GIS tools. Technical GIS knowledge is highly sought after and if critical technical GIS knowledge is not distributed within the organisation, then should the staff members or volunteers who possess the skills leave the organisation, capacity is lost and the group is suddenly at a disadvantage (Elwood and Leitner, 1998; Sieber, 2000a; Sieber, 2007). In addition, groups may not always adopt GIS through complete free will; they may be required to do so to present outputs in the way requested by funding bodies, and in so doing those that lack resource are not able to resist the pressure to adopt GIS and associated outputs (Sieber, 2000b). Through service delivery contracts, organisations can be co-opted into reinforcing or exacerbating dominant spatial narratives through

reproducing state perspectives, therefore losing their capacity to resist oppressive narratives (Elwood and Leitner, 2003; Sieber, 2007).

The empowering / marginalising dichotomy is dismissed by Harris and Weiner (1998) and Elwood (2002) who contend that both processes coincide and are dependent on the social and political contexts in which organisations are embedded. Elwood's (2002) nuanced analysis attributes the complex empowerment / marginalisation nexus to the complicated and often contradictory position which nonprofit organisations occupy; "they are simultaneously striving for involvement and influence within the state-level processes in which they are embedded, while at the same time working at the community level to include and represent the needs and priorities of a diverse range of social groups. New tools and practices may alter participation and power relations differently in these multiple spheres of interaction" (2002, p.920).

Knowledge politics and hierarchies

Organisations that use digital methods to produce quantitative spatial outputs benefit from conferred legitimacy and realised empowerment as a result of epistemic hierarchies which favour the quantitative over the qualitative. Critical cartographers contend that the empiricist and positivist nature of GIS often comes at the expense of other forms of knowledge and lends itself to an instrumental and rationalist form of decision making which is popular with the state and authorities that aim to take an expert 'scientific' approach (Elwood, 2002). Nonprofit organisations make a conscious decision to position their claims as valid or true, simply by presenting quantitative data that invokes expertise and truth in a way that is recognised by fellow decision-makers (Elwood and Leitner, 2003). GIS can be deployed to transpose or situate qualitative data into or against quantitative data in a bid to legitimise narrative or experiential accounts; organisations can use community indicator dashboards to present qualitative data in a cartographic and quantitative way which gives legitimacy to community needs by demonstrating a wider spatial or temporal context (Elwood and Leszczynski, 2013).

These knowledge politics require nonprofit organisations to mediate between lay and expert knowledge and consequently make choices about what knowledge to present and how to influence or win recognition of their capability and insight. In so doing, individual accounts or other forms of knowledge can be lost or dismissed, as organisations look to "patterns over anecdotes; visual forms of evidence over non-visual forms; and objective or neutral accounts of people, place and conditions over experiential, testimonial or emotional accounts" (Elwood and Leszczynski, 2013, p. 548). This is the concern at the heart of much nonprofit GIS literature; GIS is ultimately a technology that prioritises the scientific over the anecdotal, and therefore marginalised groups that traditionally are excluded from scientific narratives find themselves excluded in the use of GIS by nonprofit organisations. In response, scholars and practitioners have sought to ensure the inclusion of marginalised groups in GIS use, particularly through a feminist perspective or 'rewiring' of GIS methods (Cope and Elwood, 2009; Kwan, 2002; Sieber, 2004).

Using GIS to build narratives

In 2006 Sarah Elwood developed and proposed an important theoretical interjection in response to the previous critical literature on nonprofit use of GIS. Drawing on ethnographic data collected from two inner-city Chicago community organisations, Elwood aims to shift the narrative away from oppositional dialects, such as organisations using GIS to resist or be co-opted into narratives, and towards nonprofits as possessing great agency and creativity in navigating complex rhetorical and technical terrains. Organisations need to navigate tense spatial, institutional and knowledge politics. Therefore, visual cartographic representations are a way of responding to these competing politics while legitimising their perspectives and casting themselves as skilled actors. Elwood (2006) demonstrates that nonprofit organisations possess sophisticated socio-spatial communication approaches that present multiple narratives to differing stakeholders. They operate in changing spatial and political contexts and use GIS and cartographic outputs to create spatial meaning and tell spatial stories at different scales and through different methods and interpretative framings. Nonprofit organisations possess the agency and intuition required to create and respond to multiple narratives

simultaneously, whether it be satisfying the demands of state funding agencies (Elwood and Leitner, 2003) building collaborative networks with fellow nonprofit organisations (Ghose, 2011) or communicating a 'story' of change to the general public (Craig and Elwood, 1998). Drawing on De Certeau's (1984) notion of a co-productive interplay existing between spatial story and spatial practice, Elwood provides empirical evidence of organisational spatial narratives affecting change within the community in a form of co-constitution. A single map can hold multiple narratives and speak to multiple narratives. Table 3 (from Elwood, 2006, p. 332) outlines the concurrent narratives of needs, assets, injustice, accomplishment, and reinterpretation that a community group may project.

Spatial Narrative	Purpose	Interpretive Examples
Needs	Show current or potential problems with neighbourhood spaces, structures, or people	Vacant lots as sites of problematic activities (drug dealing, violence, loitering).
Assets	Illustrate existing resources or opportunities for positive changes in neighbourhood space, structures, people.	Vacant lots as sites for new houses or businesses.
Injustice	Show inequalities between neighbourhood and other places/scales.	Vacant lots in multiple neighbourhoods, to show unequal conditions.
Accomplishment	Illustrate community organization successes in neighbourhood (programs, physical/material forms of development).	Vacant lots acquired for inclusion in community organizations' affordable housing land trust.
Reintepretation	Present official data through new interpretive frames, to advance neighbourhood priorities or agenda.	Lots designated as vacant in city database, but categorized by community group to differentiate community gardens from unused land.

Table 3: Spatial narratives and interpretative framing in GIS (reproduced from Elwood, 2006, p. 332)

The Geoweb and emerging forms of GIS

As identified in section 2.2, nonprofits have been operating amidst a rapidly changing data landscape over the past decade, marked by a seismic change in geospatial infrastructures, data availability and forms of analysis. Yet, extant literature does little to examine the adoption of novel methods and approaches to spatial data by nonprofit organisations.

The online availability of mapping tools and GIS platforms has changed the adoption path of GIS, as organisations can be less concerned with understanding technical procedures and forms of spatial analysis and instead simply upload their data, style it and see it on a map (Al-Kodmany, 2012). The tools of the geoweb are more intuitive and accessible, allowing groups quicker access to their visualisations. When exploring the use of Google MyMaps and the Google Maps API by two Canadian community organisations, Johnson and Sieber (2017) reasoned that organisations are still restricted by their resource capacity and organisations will use different geoweb platforms depending upon their planned time frame. Google MyMaps can be hosted by Google, is free of charge and requires little maintenance, yet using the Google Maps API requires technical knowledge, a server to hold the mapped data and willingness to sign up to a 'freemium' model. Lin's (2016) action research implemented ArcGIS Online within an arts nonprofit, observing that low barriers to access resulted in a strong take up by the organisations, yet identified challenges that are natural with spatial analysis; needing to normalise data for population sizes and lack of granularity in some datasets. The organisation would also be required to buy licencing credits beyond a certain point of access. In this sense, despite the low barriers to access, some knowledge of spatial statistics and access to ongoing financial resources are still required to fully operate a web-based GIS.

Free and open-source software (FOSS), as described in section 2.2, has significant potential to change the way nonprofits have access to and make use of GIS tools. OpenStreetMap, QGIS, OpenLayers, PostGIS, provide the infrastructure needed for organisations to map their data with no immediate financial outlay. Open-source software often comes with a strong user community around it, one which nonprofit organisations can utilise to develop their skills and begin collaborations (Vaz and Khaper, 2016). The

tool's ongoing development ensures it is kept up to date, placing it in the 'ongoing' period of implementation as described by Johnson and Sieber (2017). The development of the FOSS landscape (often by nonprofit organisations) is seen as an attempt to provide an alternative to and resist the dominance of closed, proprietary systems developed and sold by private sector organisations (Elwood, 2010). The development of the geoweb and FOSS platforms has changed how nonprofit actors engage with citizens and each other as a new 'multivocal' method of cartography has emerged (Elwood, 2010).

In extending the theoretical work on epistemic hierarchies and knowledge politics, Elwood and Leszczynski (2013) explore the new spatial media which further or enhance our ability to interact with and generate geospatial information online. Interactive mapping platforms, such as Ushahidi and others, encourage crowd-sourcing of spatially attributed information in a more interactive way than previously, meaning a shorter step from interaction to participation as citizens volunteer their knowledge and media such as photographs. This has led to a reworking of expertise and the positioning of local knowledge, as the local knowledge held by nonprofit organisations is now complemented by experiential knowledge from citizens, whose knowledge is given credibility based on peer-verification and witnessing (Elwood and Leszczynski, 2013). Geovisual epistemologies have been resituated as hypergranular and immediate information takes precedence over pre-assembled data as online mapping platforms guide an interactive experience that allows the user to understand and explore the data for themselves, in contrast with previous cartographic narratives which rely upon a "receive and believe" (p. 554) attitude to knowledge discovery. The deployment of geovisual crowdsourced information online can allow users to develop their own narratives through interacting with other posts and sharing their expertise in multiple formats. HarassMap, developed by Ushahidi, demonstrates this reworking of expertise and epistemic hierarchies by providing a platform for Egyptian citizens to document the location, time and details of sexual harassment. Experiential accounts that are reinforced by users' contributing similar stories carry more credibility than organisational or state narratives and allow for a reworking of local and national spatial narratives of sexual harassment, e.g. this bus route is particularly dangerous, or particular types of people are targeted in this area.

3. Theoretically positioning the study

This chapter situates the study at the intersection of human geography, social policy, and social studies of data by outlining their core contributions to the thesis. The second half of the chapter positions social constructionism as a thread that binds the three disciplines and provides a framework that is adopted throughout the rest of the thesis.

3.1 At the intersection of human geography, social policy, and social studies of data

3.1.1 Human Geography

Human geography's unique contribution to the social sciences and humanities is a distinct approach to understanding the world through the concepts of space and place. Prior to the spatial turn in the 1970s and 1980s, discussions of space were "dead, fixed, undialectical and immobile" (Foucault, 1980, p.177), however, geographers such as Tuan (1977), Soja (1989) and de Certeau (1984) sought to reimagine space as an active participant in human events and behaviour and move away from the historicism that had come before (Harris, 2015). Space (in comparison to place) is viewed as the movement of A->B and Soja (2009, p.2) outlines 3 critical approaches that are fundamental in helping us to think spatially:

- The ontological spatiality of being: that is that we always occupy a spatial position as well as being social and temporal in nature.
- The social production of spatiality: space can be produced through social action and be socially changed.
- The socio-spatial dialectic: just as space is socially produced, space also shapes the social. There is a co-constitution at play here.

The socio-spatial dialectic is crucial in understanding that the geographies we create and inhabit can negatively and positively affect everything we do (Soja, 2009).

Building on space is the idea of place. A place comes into existing when we ascribe a meaning to space (Tuan, 1977). John Agnew (1987) ties down three conditions for a place to exist:

- It must have a location (a sense of where)
- It must have a locale (buildings, networks, physical infrastructure)
- It must have a sense (the feelings or perceptions people have about it)

The social construction of space through the socio-spatial dialectic, and the multi-faceted and relational nature of place means space and place are always materially and socially in the process of becoming, and are never static (Massey, 2005). We see the underlying concern with space and place in the technical development of GIS, analysis of its ontologies, and critical scholarship, which calls into question GIS's capacity to represent and reproduce space and place in certain actors' interests. Human geographers have developed a substantial body of literature that looks at the epistemic promises of new spatial media for knowing space and place and their ubiquity in daily life. The theoretically rich analysis of GIS and spatial data use by community groups in the US by Sarah Elwood (and co-authors), a human geographer, is foundational for this study.

3.1.2 Social policy

The use of 'policy' in the academic subject of social policy shows an action-orientated concern for the principles, development and enactment of changes to that which is brought under the umbrella of the 'social' (Titmuss, 1974). Social policy borrows from other disciplines and concerns the role of welfare, social services, economic redistribution and equality within society. The study of nonprofit organisations and their role in contemporary society also falls within its scope. The development of theoretical and empirical work on professionalisation, hybridity, relationality, isomorphism, institutional logics, and nonprofit data use by nonprofit scholars is utilised in this thesis to add theoretical depth to the empirical analysis. While there is an active group of scholars concerned with macro spatial analysis of the nonprofit sector, work on the use of data and technology, and specifically GIS, by nonprofit scholars has been sporadic. However,

scholars have made important contributions that have adopted critical perspectives in studying the use of spatial data and GIS by NPOs but foreground the organisational characteristics of the NPOs, rather than the spatial manifestations of their work.

3.1.3 Social studies of data and technology

The third school of thought that binds this thesis together is less of a discrete discipline than human geography and social policy, instead subsuming three separate but related strands of scholarship: science and technology studies (STS), digital sociology, and critical data studies. While they borrow from each other and have many epistemic overlaps, it is helpful genealogically to separate them into disciplinary sections to appreciate their distinctive contribution.

Science and technology studies (STS)

Science and technology studies (STS) emerged in the 1960s and 70s as a confluence of disciplines that study science and technology in their social aspects. It principally rejects the view that science and technology are asocial and non-political (Webster, 1991), and instead advocates taking account of the institutions, practices, and meanings that contribute to scientific and technological development. A central tenet of STS is the co-production of science and technology, and society: just as science and technology are shaped by the social, science and technology permeate the social and material fabric of everyday life, therefore shaping "how humans experience, imagine, assemble, and order the worlds they live in" (Felt et al., 2017, p.1). An early area of theoretical and empirical focus in STS was the sociology of scientific knowledge (SSK). Drawing on Kuhn's (1970) work, the 'strong programme' of SSK (Bloor, 1976) argued that social processes shape the empirical scientific method, and that rather than simply reflecting nature, scientific knowledge is produced through the use of tools, which are themselves entangled in cultural, ideological, and institutional interests and agendas. The social constructionist agenda pursued by SSK scholars heavily influenced the future progression of STS and scholarship, such as Haraway's (1988) critique of objective scientific knowledge as failing to take account of its methods and knowledge stock as situated within communities – "positioned rationality" (p.590). The Social Construction of Technology (SCOT) approach, developed by Bijker et al. (1987), built on the SSK program to establish an influential

theory of technology as possessing interpretive flexibility; user groups will have varying interests and interpretations of what is acceptable and needed. In response to the pressures of user groups, the technological design varies and goes through various stages of contestation before an innovation is finalised.

Alongside SCOT, actor-network theory (ANT) is another significant theoretical interjection in the 'turn to technology' in the development of the STS field. While not a coherent and singular theory as such, ANT (Latour, 2005) seeks to overcome the technical / social divide, or "social determinism" (p. 84) that is present in SCOT by advocating for a flat hierarchy, in which the human and non-human are equal, and in which they gain their agency and essential attributes from their position within a wider network of actants. ANT's material-semiotic approach encourages study of both relational and material properties (Law, 2008a).

The final point of observation on this brief tour of STS is the work of Susan Leigh Star and Geoffrey Bowker. The concept of the boundary object (Star and Griesemer, 1989), describing objects which are interpreted differently across communities yet maintain structure and integrity, has been massively influential in STS and beyond. Bowker and Star's (1999) work on the social construction of classification systems shows the concept of classification practices as political and rendering certain social practices visible at the expense of others. Particularly pertinent to this study, and explored and utilised in Chapter 7, is the infrastructural inversion (Bowker, 1994) that brings into focus the formation, operation, and gaps within (often hidden) infrastructures (Star and Ruhleder, 1996), including knowledge and information infrastructures (Slota and Bowker, 2017).

Digital sociology

Digital sociology draws on a long history of sociological engagement with technology (including STS scholarship) and builds on work ranging from Marx and Weber to Haraway and Suchman. Yet, it is only really in the past decade that it has come to be a codified sub-discipline. Leading scholars have outlined the boundaries of the discipline and developed typologies (Lupton, 2015; Marres, 2017; Selwyn, 2019; Fussey and Roth, 2020),

but it is Noortje Marres' (2017) tripartite conceptualisation of the 'digital' in digital sociology as a *phenomenon*, *method*, and *platform* that I find most useful.

Digital sociologists engage with digital *phenomena* through recognising their ubiquity in contemporary life and applying, reworking, and extending existing sociological theory to make sense of both traditional phenomena of sociological concern in the digital sphere such as identity, social mobility, and gender, as well as digitally idiosyncratic issues such as networks, platforms, data, automation and algorithms (Marres, 2017; Selwyn, 2019). Selwyn (2019) remarks that much sociological engagement with the digital occurs at the interfaces of sociology with cultural and media studies, human geography, and communication and information studies, and it is much of this work that while not always labelled as digital sociology, underpins substantial themes in this thesis.

Less central to this thesis is Marres' (2017) second perspective of digital instruments or *methods* of social inquiry that offer new ways of knowing society. The increased traceability of social life provides new avenues for recording naturally recurring data on networks and social interaction, among others, while the digital environment represents something of a new arena for large scale social experiments that run in real-time. It is important to recognise a double hermeneutic at play in the use of digital methods to study society: sociologists can not only study the world differently, but consequently the way the world sees itself is transformed by digital ways of knowing society.

Thirdly, digital sociologists have new *platforms* to communicate their knowledge and engage with research participants, communities of scholars and wider publics. Research results can be published in near real-time, and the researcher-researched boundary is often much closer and intimate than previously.

Critical Data studies

Alongside STS and digital sociology, critical data studies is the third set of sociotechnical scholarship that is relevant to this thesis. Many of the claims made by critical data scholars feel familiar, for assumptions and ideologies which underpin much critical cartography / GIS, STS and digital sociology are applied to the study of data, and Big Data in particular. Kitchin and Laurialt (2014) identify this body of critical social theory as exploring how data

are "never simply neutral, objective, independent, raw representations of the world, but are situated, contingent, relational, contextual, and do active work in the world" (p5). Critical data studies takes a sociotechnical approach by placing the data assemblages that produce, circulate, share, and utilise data under examination (Table 4) (Kitchin and Laurialt, 2014; Iliadis and Russo, 2016). These complex sociotechnical systems comprise economic, technical, political, and social elements that are entwined with the shared goal of producing data.

Apparatus	**Elements**
Systems of thought	Modes of thinking, philosophies, theories, models, ideologies, rationalities, etc.
Forms of knowledge	Research texts, manuals, magazines, websites, experience, word of mouth, chat forums, etc.
Finance	Business models, investment, venture capital, grants, philanthropy, profit, etc.
Political economy	Policy, tax regimes, incentive instruments, public and political opinion, etc.
Governmentalities and legalities	Data standards, file formats, system requirements, protocols, regulations, laws, licensing, intellectual property regimes, ethical considerations, etc.
Materialities and infrastructures	Paper/pens, computers, digital devices, sensors, scanners, databases, networks, servers, buildings, etc.
Practices	Techniques, ways of doing, learned behaviours, scientific conventions, etc.
Organisations and institutions	Archives, corporations, consultants, manufacturers, retailers, government agencies, universities, conferences, clubs and societies, committees and boards, communities of practice, etc.
Subjectivities and communities	Of data producers, experts, curators, managers, analysts, scientists, politicians, users, citizens, etc.
Places	Labs, offices, field sites, data centres, server farms, business parks, etc, and their agglomerations
Marketplace	For data, its derivatives (e.g., text, tables, graphs, maps), analysts, analytic software, interpretations, etc.

Table 4: The apparatus and elements of a data assemblage (reproduced from Kitchin, 2014, p.25)

Kitchin and Laurialt (2014) use the data assemblage to show how Big Data are used to produce "pernicious social and economic relations: dataveillance and the erosion of

privacy; profiling and social sorting; anticipatory governance; and secondary uses and control creep" (Kitchin and Laurialt, 2014, p.11). boyd and Crawford's (2012) 6 claims for Big Data are a useful point to start a critically informed analysis of contemporary data assemblages and practice:

1 - Big Data changes the definition of knowledge
2 – Claims to objectivity and accuracy are misleading
3 – Bigger data are not always better data
4 – Taken out of context, Big Data loses its meaning
5 – Just because it's accessible does not make it ethical to collect data
6 – Limited access to Big Data creates new digital divides.

It seems fair to say that just as critical cartography and STS were once where scholars would turn to critically appraise spatial data and GIS, there is now a splintering taking place, where fundamental aspects of the ongoing Data Revolution are being addressed through critical perspectives. Geographic Data Science can be seen as a specialist splinter of critical thought. It looks to adopt critical theory to examine its own practices and examine how computational geography can address issues in data science more widely (Singleton and Arribas-Bel, 2021). Similarly, Critical Code Studies provides a hermeneutical reading of computer and software source code as discourse, with significant implications for society at large (Marino, 2020). The disciplines of STS, Digital Sociology, and Critical Data Studies contain identifiable traits that distinguish them, yet are often employed in conjunction. Dave Beer's (2018) analysis of the data analytics industry (previously discussed in section 2.2.2) is a pertinent example of this.

3.2 Social constructionism as a unifying conceptual framework

While this thesis takes a broad perspective and draws on the work of scholars from (at least) three disciplines, it adopts a social constructionist perspective in the analysis of empirical data to provide an epistemological tie between them. Social constructionism is a broad church, encompassing multiple perspectives which are united by a rejection of

realist approaches that take as given the fixed and 'waiting to be discovered' nature of human life. Instead, social constructionists posit that social reality, and our knowledge of it, is constructed through social action and interaction. It is important to differentiate between construct*ionism* and construct*ivism*, which are often used interchangeably. Constructivism proposes that individuals mentally construct the world of experience through cognitive processes, and therefore reality is based in the processes of the individual psyche and mind (Young and Collin, 2004; Knoblauch and Wilke, 2016). Constructivism represents a pure relativist approach, in which multiple realities are constructed by individuals, therefore undermining *any* claims of a fixed reality. Constructionism, by contrast, is less interested in the cognitive processes that accompany individual knowledge, instead portraying knowledge as ascribed to the collective social processes that construct, organise and reform social, cultural, and institutional reality. Whereas constructivism takes an individual perspective developed primarily in psychological scholarship, constructionism takes a social perspective, developed primarily by sociological scholarship.

Kenneth Gergen, who sought to clearly distinguish constructivism from constructionism, lays out some clear principles that provide a useful starting point for an introduction to social constructionist thought (Gergen, 2015, p.8-12):

- **"The ways in which we describe and explain the world are not required by "what there is""** (p.8). We have multiple choices for describing the world, and our use of language constructs the world.
- **"The ways in which we describe and explain the world are the outcomes of relationship**" (p.9). It is only by social agreement that words and descriptions of reality carry meaning, and we acquire meaning from others. However, meaning is boundaried by individual social worlds (referred to by Gergen as 'games').
- **"Constructions gain their significance from their social utility"** (p.10). Language allows us to coordinate our actions in ways that are valuable to us and reaffirm 'truth'.

- **"Values are created and sustained within forms of life – including science"** (p.12) The relationships and theories about the order of the world that we construct implicitly and explicitly carry with them value sets.

For Gergen, language and relations are central to our social construction of the world, and through language, we can deconstruct the world as well as construct it. In so doing, we provide room for imagining how we would like the world to be and challenge existing traditions, termed 'generative discourse' (Gergen, 2015). This is a common theme amongst constructionists: that we collectively are both informed by the world that is constructed and possess agency to change the construction of the world. This concept is made intelligible in Berger and Luckmann's (1966) book *The Social Construction of Reality.* Berger and Luckmann's thesis (1966) significantly impacted the development of constructionist thought in the social sciences and humanities, to the point where the field has grown so far that Berger and Luckmann's contribution is unacknowledged explicitly in subsequent novel strands of constructionist thought (Knoblauch and Wilke, 2016). Whilst much scholarship in human geography, social policy and social studies of data and technology adopt a broad social constructionist agenda, this thesis returns to foundational scholarship in the field. In so doing, it anchors analysis to the core tenets of social constructionist thought rather than providing a broad, but undefined, social constructionist position. The contribution made by returning to foundational social constructionist scholarship is discussed further in the conclusion (section 9.1.4).

Grounded in Alfred Schutz's writing on phenomenology (1972) [1932], Berger and Luckmann (1966) are concerned with the everyday sociology of knowledge: how ordinary members of society construct their world. They argue that society contains both an objective and subjective reality. Objective reality is seen as external to society, and the institutions that make up objective reality are constructed and reproduced through repeated, habitualised actions that form institutions with rules, objectives and norms. Institutions are legitimised through language and signs that give them meanings, and new generations experience these institutions as objective and external to their construction. Subjective reality is experienced though 'socialisation', in which the objective reality is internalised, so that "the socially interpreted world becomes their own world and they can

skilfully and naturally function there" (Steets, 2016, p.104). Over time, individuals recraft their own subjective world and their identity according to their experience of the externalised and objective world within the bounds of plausibility structures. This reshaping of experience becomes externalised over time, reproduced through habitual action, and 'made' objective reality.

The central point here is that there is a reality which is seen as objective (often in the form of institutions and reproduced and explained through language, culture and materials), but that through subjective reality, we have the collective power to change what is seen as objective. Therefore, the objective and externalised reality is humanly produced in a dialectical fashion: "Externalization and objectivation are moments in a continuing dialectical process, which is internalization (by which the objectivated social world is retrojected into consciousness in the course of socialization)" (Berger and Luckmann, 1966, p. 78).

Both Gergen (2015), and Berger and Luckmann (1966) stress the role of language in construction. The developments outlined previously under the auspices of the STS banner are founded on social constructionist thought that treat the role of the material as equally important as the immaterial. For many STS scholars, a broader social constructionist approach is central to explanatory theory and is not simply a philosophy, but "a core concept in sociological theory and reasoning" (Restivo and Croissant, 2008, p. 214). While theories such as the Social Construction of Technology framework are clear about their allegiance to social constructionism, the wider field is predicated on the notion that science and technology are inherently social in nature. However, what status does this give to truth and objectivity? A criticism levelled at social constructionism, and particularly social constructionism within the STS tradition (see the science wars of the 1990s), is that if everything is socially constructed, does that mean anything can be true? This would in turn debase any claims made by constructionists (as their arguments are themselves, constructed). This criticism is misplaced and assumes constructionists hold a relativist position, believing that all truths are relative to a place, time, or person. This is to ultimately confuse epistemology (how we know reality), with ontology (the nature of reality). Social constructionism makes few ontological claims, and it does not mean that

scientific facts are untrue, but rather "the ways in which a fact is produced – the choice of topic, location of research, the constraints of resources, the accumulation of empirical evidence, the transparency of methods – are part of the constitution or construction of the fact" (Roosth and Silbey, 2009, p. 461). Ultimately, social constructionism does not deny that there is an objective reality, but it is an indispensable tool in treating all knowledge forms sociologically (Weinberg, 2009). In so doing our understanding of truth is complicated, yet enhanced (Restivo and Croissant, 2008).

Criticism of social constructionism for possessing a supposed relativist outlook and ontology is largely unfounded and is in response to a false interpretation of phrases such as *construction,* and *social*, rather than the content of scholarship (Restivo and Croissant, 2008). Where it is based on specific scholarship, it is in response to purposeful distancing from scientific methods (e.g. SSK's "Strong Programme") and technological determinism (e.g. ANT) that results in the adoption of a pluralistic position to avoid the privileging of knowledge forms, methods and actors. Within STS, these approaches are debated, as Grint and Woolgar (1997) argue that ANT, by focusing on material-semiotics and agency of non-human actors, is actually not as far removed from technological determinism as its proponents claim it to be. In analysing the technological *and* the social, a concept that avoids both relativist social constructionism and realist technological determinism is *affordance.*

Affordance has been widely used to describe how objects invite certain actions and shape conditions of possibility. In critiquing Grint and Woolgar's (1997) radical constructionist perspective of technology as texts that can be reconfigured and interpreted by actors, Hutchby (2001) developed the concept of *technological affordance* to show technologies as constraining human action, as well as enabling it. This is not to return to reductionist or deterministic perspectives, instead simply recognising that the materiality, values, and rules inherent in technology play a role in the way technology comes to be used and interpreted by actors. Hutchby's (2001) explication of the affordances of technology accounts for both the social shaping of technology, and the technological shaping of society. It shows how "objects invite certain actions and shape conditions of possibility" (Fussey and Roth, 2020, p.5). As well as constraining and enabling action, technological

affordances are not universally experienced; Hutchby (2001) draws attention to the relational aspect of technologies as offering different user groups different possibilities (analogous to the SCOT perspective). A simplistic example is a basic mobile phone, where it facilitates certain actions (texting and phoning), but doesn't allow others (taking pictures or viewing emails). The buttons may be too small for people with poor eyesight, therefore being usable for some people and not others.

A perspective on Hutchby's (2001) definition of affordances is refreshed for the digital age by Nagy and Neff (2015), who extend it to include *imagined* affordances. The concept of imagined affordances takes into account how perceptions, attitudes and expectations towards digital technology and media shape how we approach and interact with them. In seeking to present a more holistic notion of affordance, Nagy and Neff (2015) draw on the concepts of materiality, mediation and affect: "Users treat tech devices as significant physical entities (materiality), they interact with them through constructed perceptions (mediated experiences), and they express strong conscious or unconscious emotions towards them (affect)" (p.7). It inserts a communicative, emotional and cognitive dimension to the concept of affordance, bridging the space between users' intentions and their acts, yet still avoiding the pitfalls of radical constructionism and technological determinism. While not named as such, Nagy and Neff's (2015) concept brings the notion of co-construction into the platform age, where users' perceptions shape how they interact with platforms, in turn driving the underpinning algorithms to shape *how* the user can and will interact with the platform and the content shown.

This study adopts a soft constructionist perspective, in line with the concept of affordances. It recognises the materiality and essential properties of technology and data but adopts Gergen's (2015) and Berger and Luckmann' (1966) fundamental social constructionist perspectives. This is to say that an objective reality exists, but the way the world is described and explained is the product of choices and relationships. These choices and relationships influence the actual construction of the world, in many cases. With regards to technology and data, social constructionism demonstrates the ability of the social to shape the technical, as well as the technical role in shaping the social. The social constructionist perspective used in this thesis is applied in three pertinent sets of

literature: social construction of data; maps, GIS, and spatial media; and the nature of organisations and institutions.

3.2.1 Social construction of data

The assertion that data are socially constructed by social studies of data and technology scholars is an underpinning tenet of this thesis. Data are not innocently discovered but are generated and produced through an assemblage of social and technical components (Gitelman, 2013; Kitchin and Laurialt, 2014). The affordances (technical and imagined) of technology and the cleaning and preparation of data shape how they are produced and interpreted (Hutchby, 2001; Nagy and Neff, 2015; Neff et al., 2017). An important intervention in social constructionist thought on the production and use of data in everyday society is found in Couldry and Hepp's (2017) update of Berger and Luckmann's (1966) thesis.

Berger and Luckmann's approach to social constructionism is built on the premise that the social world is constructed through face-to-face dialogue. This is in part a product of foundational texts on social construction and phenomenology having been developed in a world where the media played little role in constructing shared understanding, and quite possibly in part to avoid difficult discussions of multiple epistemic forms. Couldry and Hepp (2017) develop a "materialist phenomenological approach" (p.27) that no longer takes for granted that face-to-face communication is the primary method of communication. Instead, there is a recognition that technology-based communication mediates social interaction, therefore mediating our understanding and collective construction of the world. They go one step further in saying that communication is not just mediated by and through technology, but that "the very elements and building blocks from which the social is constructed" (p.7) are themselves often technologically mediated. This is referred to as mediatization: technologically mediated communication (including data), which we use to make sense of the world, is itself informed and shaped by historical waves of technological mediation. While mediation refers to communication in general (see Couldry, 2008), mediatization is something of a meta-process that describes the

increasing spread and pervasiveness of mediated communications. Couldry and Hepp (2017) develop a full social theory accounting for mediation in the social construction of reality. Two of their contributions in particular are pertinent to this thesis: the role of data in mediation, and the impact of technologically mediated communication for organisational knowledge production.

The processes of mediation and mediatization have a profound impact on our understanding of space and time, but it is the epistemological fruits of data and datafication that provide the greatest challenge to Berger and Luckmann's (1966) pre-internet constructionist thought. Couldry and Hepp (2017) stress the role of data (that is, symbolic material generated and used for particular purposes) as a precondition for knowledge of the world and our everyday life. Data production is ubiquitous, asymmetrical and, in the platform economy, undertaken by private actors with little social interest. Datafication, the process of quantifying and analysing human activity as data points, reifies the knowledge produced by data infrastructures as external to human activity. In Berger and Luckmann (1966) terms, data becomes to be seen as an objective part of our social "stock of knowledge" (p.56) from which we subjectively come to understand the world. However, we know that algorithmic classification practices that place data into databases are highly selective and abstract the data from their original place in lived and spatial reality (Bowker and Star, 1999; Couldry and Hepp, 2017; Loukissas, 2019). Data that may appear to be a true representation of social action and interaction, such as social media data collected via an API, is defined by and constructed through the classification parameters and ethical and legal concerns of the data provider (Halford et al., 2018). For organisations, the increasingly important role of data, and processes of datafication, have changed the nature of organisational knowledge production and their dependence on the wider institutional environment. Abstracted data that are mediatized (recursively mediated through layers of analysis and classification) are fed into automated processes which are seen to be central epistemic forms in contemporary organisations. Couldry and Hepp (2017) demonstrate how police authorities, schools and financial traders all rely on deeply mediatized epistemologies, often grounded in data assembled and displayed by external institutions.

Empirical examples of the mediated (and mediatized) construction of data are found in the literature on nonprofit data use. Bopp et al. (2019) show how relational database design and the need for social service NPOs to input a unique client ID results in forcing users to "operate in the image of the infrastructure and to find ways of working around that infrastructure" (p.52). The database requires a unique ID for a new service user, however, given the sensitive nature of the NPO's work, a pseudonym is often given for the name. This means that each time a user returns, the records aren't linked as a new pseudonym is given, resulting in service user data that fails to tell an accurate picture of user numbers (Bopp et al., 2019).

3.2.2 Social construction of maps, GIS and spatial media

The socially constructed nature of the map is theoretically proposed and empirically shown by critical cartographers (Crampton, 2001). Wood (2010) shows how maps are selectively curated to propose a reality, which gets turned into objective truth and eventually feeds back into spatial realities; the construction of the nation state through the map is the prime example of this. GIS, too, can be seen as a social construction, yet well-cited articles on GIS as a social construction take a slightly different perspective to that which is adopted by this thesis. They take ANT as a tool for viewing how multiple worlds come together through GIS, and datasets and relationships are likened to constructing a building (Harvey and Chrisman, 1998; Harvey, 2000; Harvey, 2001). Harvey and Chrisman (1998) adopt Star and Griesemer's (1989) concept of the boundary object in demonstrating how through shared technical standards and the layered nature of a GIS, multiple actors can both input their data and receive relevant insight despite possessing competing interests. In an 'ANT-lite' theoretical framing, Harvey (2001) positions GIS as part of a wider social network in which GIS use is constructed through socially accepted data standards and professional and disciplinary networks and allegiances.

The emergent spatial media that are discussed in section 2.3.3 are analysed in line with both Berger and Luckmann's (1966) and Couldry and Hepp's (2017) theoretical perspectives with the term 'geomediatization' capturing the way spatial media

technologies are both indispensable in many daily situations, and responsible for shaping our actions towards space and place through the ubiquity of real-time location awareness (Fast et al., 2019). Contemporary spatial data practices can themselves be described as heavily mediatized, as data and maps go through recursive formations as they are reused, assembled and shared (Jobst and Gartner, 2019).

3.2.3 Social construction of organisations and institutions

The primary unit of study in this thesis, the organisation, is argued by social constructionists to be created and held together through shared meanings. Instead of viewing organisations as machines with fixed parts, they are to be viewed as dynamic, relational processes that are rarely fixed (Corry, 2010; Gergen, 2015). Within an organisation, there are multiple narratives at play, yet the organisation is held together through a consensus around a shared meaning which comes through as a *master narrative* (Berger and Luckmann, 1966; Gergen 2015). In nonprofit organisations, the master narrative that describes an organisation's purpose and, in part, constructs their identity is typically found in straplines and mission statements (Ran and Golden, 2011; Spear, 2017). Of course, this narrative is open to contestation from counter-narratives that occur from within the organisation, or from wider institutional pressures. Practically, space for dynamic change in organisations is created by leadership when dialogue, imagination, and co-creation are all welcomed in organisational development. Through these tools, the organisation can dynamically transform in relation to internal or external pressures (Camargo-Borges and Rasera, 2013). The soft constructionist perspective of this thesis also recognises the materiality of organisations; they are not just created through shared and master narratives portrayed in mission-statements, but comprise physical components such as "people, policies and rules, desks and computers, and budgets that create realities and constraints that become the substance of socially constructed conversations" (Campbell, 2000, p.29). The concept of affordance outlined previously, and semiotics,

which is picked up again in Chapter 7, bridges this divide between the material and immaterial in the construction of organisations.

Neo-institutional theory nests the socially constructed decisions of individuals in organisations, and the "bundles of conventions about decision-making rules and other organisational routines that have congealed into structural forms" as comprising institutions (Palmer et al., 2008, p. 749). Institutions are assemblages of organisations which are unified by their logics, themselves defined as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality" (Thornton and Ocasio, 1999, p.804). As discussed in section 2.1, the increased hybridity of the nonprofit organisational form has resulted in the adoption of plural state, community, and market logics (McMullin and Skelcher, 2018). Organisations both contribute to the logics of the institutions that they inhabit and are directly affected by them. This is seen in the social construction of categories that are adopted by organisations that are part of the same wider institution (Thornton and Ocasio, 2008). For example, The Charities Statement of Recommended Practice (SORP) gives guidance on financial reporting for charities to allow the cross-comparison of organisational accounts, yet is decided by a Committee made up of cross-sector representatives.

Crucially, the legitimacy of many organisations' rests on perceived congruity between the behaviours of the individual entity, and the shared beliefs of the wider institution (Suchman, 1995). We see the tension inherent in the embedment of organisations in institutions in the way NPOs experience isomorphic pressure to adopt data-driven practices, but employ strategies that allow them to go beyond the "cooptation or resistance" of state and market narratives (Elwood, 2006). For neoinsitutional theorists, the expression of institutional logics at the organisational and institutional scales is worthy of future study (Palmer et al., 2008).

3.3 Research gap and research questions

3.3.1 Outlining a research gap

Having reviewed relevant literature (chapter 2) and developed a broad theoretical framework (chapter 3), the justifications for undertaking a social constructionist study of contemporary spatial data use by nonprofit organisations in the UK can be explained as spatial and contextual, temporal, and theoretical and disciplinary.

Spatial and contextual

Current research on nonprofit GIS use (and nonprofit data use more generally) is overwhelmingly based on the US context. This is a product of the US once being international leaders in GIS technical development and fostering a strong culture of critical cartography scholarship. However, it could be argued that a product of the 'undisciplining' (Crampton, 2001) of cartography and GIS is that the US is no longer the only significant site of GIS use. While the UK and US nonprofit sectors are comparable and operate under similar political economies, there are still considerable differences in the regulatory and operational nonprofit environments.

Secondly, the contexts in which NPO spatial data use is examined is largely uniform: in response to the 'Science Wars' of the 1990s, scholars sought to understand the current and potential uses of GIS for small, grassroots organisations that were typically formed to influence neighbourhood planning decisions. Whilst more recent studies have studied a slightly more diverse range of organisational missions, Table 2 shows a lack of knowledge of sizeable nonprofit subsectors such as social service, religious, and grantmaking organisations. Section 2.1 outlines the professionalisation of the nonprofit sector in the UK, yet, again there is little empirical work that assesses the use of GIS by medium-large nonprofit organisations. This could explain the widespread omission of the nonprofit sector from geospatial policy developments in the UK. Finally, most qualitative studies are both small in sample size, and tend to focus on one type of organisational mission (such as urban planning). Therefore, there is a significant gap to be filled by a study that assess a wide range of organisational sizes and missions.

Temporal

The literature review clearly documents a shift in the production and use of spatial data and GIS tools over the past decade. The rapid pace of technological development and adoption of data-informed practice means that while many studies still hold great value, they do not accurately reflect contemporary working practices. For example, Craig and Elwood's (1998) framework is still often cited, but it is based on data that is over 20 years old. Examples of contemporary developments that we know little about in the nonprofit context include the use of open-source technologies and programming languages, the development of sectoral-specific data ecosystems and data sharing practices, the adoption of spatial media, the use of spatial data analytics, and organisational cultures towards data use.

Theoretical and disciplinary

The final justification for a fresh study of NPO GIS use is to overcome firm disciplinary divides and take stock of and apply work from emerging disciplines. The fields of geography and nonprofit studies have much to offer each other yet academic silos prevent fruitful theoretical partnership. For example, Sarah Elwood and Agnieszka Leszczynski's scholarship is often omitted by nonprofit scholars as the studies are found in Geography journals, yet they offer great theoretical contribution to discussion of nonprofit organisational epistemologies and agency amidst professionalisation and isomorphic pressures. Elwood's (2006) work on 'cooptation or resistance' is a fine example of nonprofits decoupling their work from wider institutional pressures, yet the theoretical connection has not been made. Similarly, a Latourian approach to social constructionism is the orthodox starting point for sociotechnical analysis in STS, yet a broader social constructionist framework that adopts Berger and Luckmann's (1966) (and more recently Couldry and Hepp's (2017)) perspectives may offer novel insights. It is a strength of STS that the researcher can position themselves in a way where technology can be read through multiple and various social theoretical perspectives (Elwood et al., 2011). Emerging critical perspectives on data, such as Sadowski's (2020) characterisation of data as a form of capital are important to understanding the broader political-economic framework under which NPOs adopt data-driven practices. The three disciplinary fields outlined above of human geography, nonprofit studies, and social studies of data and

technology share concerns with knowledge hierarchies, data ontologies and epistemologies, relationality, semiotics, and institutional pressures and practices. Through adopting an overarching soft social constructionist framework that unifies these fields, productive theoretical connections can be applied in an empirical study of nonprofit spatial data use.

3.3.2 Guiding research questions

Considering the research gap identified and the adoption of a soft social constructionist framework, this study centres around three guiding research questions:

RQ1: How is spatial data used by UK nonprofit organisations to construct and represent reality? (organisational)

This question starts from the premise that an objective reality exists but that the way the world is described and explained is the product of choices and relationships. It seeks to explore the extent to which spatial data are both constructed within a wider data assemblage (Kitchin and Laurialt, 2014), and used in organisational settings to collectively understand and act in the world. In line with critical cartography scholarship, the question recognises that spatial data visualisations represent *a* reality that is subject to change but that spatial data are put to work to affect real-world change (Wood, 2010). The question is pitched at the analytical scale of the organisation and is primarily answered by Chapters 6 and 7. Chapter 6 explores the epistemic practices behind NPO knowledge construction regarding gaining knowledge of people (e.g. volunteers, donors, service users), and place (e.g. a defined geographic area or spatial narrative). Chapter 7 undertakes a semiotic analysis to explore the constructed representations of phenomenological reality and organisational narratives.

RQ2: How is spatial data used by UK nonprofit organisations to position themselves within and across sectors? (Organisational and institutional)

This question recognises that NPOs possess the agency to use spatial data for their advantage, to tell spatial stories at different scales (Elwood and Leitner, 2003). It builds on nonprofit literature that theorises NPOs as occupying a hybrid space between the market, community and public sector (Evers and Laville, 2004) to examine how spatial data are used to build relations and communicate across boundaries. It uses the term sector to refer to both a group of organisations that display similar characteristics and associate with each other (also called a field), as well as macro institutional sectors, such as the market and the state. It is answered largely by Chapter 7, which looks at spatial data as semiotic devices that perform relational work across boundaries, and by Chapter 8, which shows how NPOs use spatial data to position themselves within the wider field and deal with issues of output and normative legitimacy arising from the adoption of institutional logics.

RQ3: How can nonprofit spatial data use be theorised using frameworks drawn from the fields of human geography, nonprofit research, and social studies of data? (theoretical)

This third question gives space for the adoption of multiple theoretical perspectives from several disciplines. The adopted theoretical perspectives follow a social constructionist approach but contribute empirically and theoretically to several academic fields. This study sits at the intersection of three (albeit broad) disciplines: human geography, which is concerned with the construction of space and place, and the social and technical aspects of GIS and spatial data visualisation and a critical analysis of them; nonprofit studies and the allied discipline of social policy illuminates, theorises and critically examines the work of nonprofit organisations; and social studies of data scholarship, which encompasses the subfields of science and technology studies (STS), digital sociology, and critical data studies.

This research question could lead the thesis to become siloed in accordance with disciplinary divides, yet the question does not presume an innate distinction between fields that cannot be overcome, but rather a set of approaches that can be put to work to form a productive synergy. This thesis does not adopt a Latourian approach, yet Latour's (2005) encouragement to look beyond the disciplinary atomisation of the social and towards the linkages and associations between fields is upheld. This final research question is answered throughout the thesis.

4. Methodology

4.1 Introduction

This chapter details the methodology used in the collection and analysis of data for this thesis. Research, and especially qualitative research, which follows the interpretivist tradition, is rarely smooth and linear. This chapter documents the methodological approach taken to show how the analysis in Chapters 5-8 came to be. It takes inspiration from Gekker's (2016) thesis, which provides a reflexive and honest narrative account of the evolution of his research and describes the decisions taken in guiding epistemic and ontological assumptions. The chapter starts by explaining the motivation for the study and the disciplinary background that underpinned the initial research questions. Section 4.3 outlines the recruitment rationale and an overview of the 35 nonprofit organisations studied, before describing research data sources and methods.

Working chronologically through the research process, the chapter discusses the relationship between theory, practice and research in light of a reflective period in which the underpinning ontology and epistemology (and thus research questions) were aligned with social constructionist thought. The role of theory in a largely deductive analysis (with some inductive elements) is described alongside the practicalities of coding, synthesising and presenting the data. The chapter ends with an evaluation of the methodological approach by assessing the thesis against Tracy's (2010) eight criteria for ensuring qualitative research provides a distinct contribution to knowledge.

4.2 Background to the study and early research design

In 2014 the Centre for Social Justice, an influential centre-right think tank, produced a report that recommended that the Cabinet Office develop an online map of the UK's social sector, showing where charities and nonprofit organisations work. It was founded on claims that there were significant 'charity deserts' in the UK: areas where the population was underserved by charitable effort, and that by mapping the scope of social action, gaps could be filled. I took up the Centre for Social Justice's suggestion in my BA Geography undergraduate dissertation topic and interviewed a range of nonprofit staff

and volunteers about the potential use cases for such a map, alongside a light exploration into the technical options for doing so. The dissertation drew on two bodies of literature. The first was critical cartography scholarship which documented emerging tools and approaches but fundamentally challenged positivist cartographers to see the social dimensions of their work and examine its potential to exacerbate inequality by rendering places visible and invisible. This dovetailed with the work of voluntary sector scholars and geographers who sought to not only map and understand the spatial distribution of the voluntary sector but examine the challenges and potential fallacies in doing so.

The eventual application for the ESRC PhD scholarship was concerned with the spatial distribution of charitable resources, but (in line with the work of Sarah Elwood and others), sought to assess how NPOs themselves used GIS to allocate resources. This was a field characterised by a clear omission of nonprofit examples and voice in leading GIS textbooks and in emerging policy developments. I proposed to document NPO engagement with spatial data and develop a framework and typology that detailed how spatial data can be used by NPOs to allocate resources and draw out good practice to improve NPO operational efficiency and resource allocation.

These pragmatic aims were captured in the first two initial research questions:
RQ1: Which organisational aims necessitate the use of geospatial data for their delivery?

RQ2: What technical and analytical capacity exists for further use of geospatial data to meet organisational aims?

The third research question was influenced by critical cartographers, and in particular, the work of Sarah Elwood, which sought to explore NPO spatial data use as resting on organisational values, and not simply instrumental utility:

RQ3: How does geospatial data use reflect the value-led approach of the third sector?

Guided by my research questions and a desire to unearth and document the use of spatial data and GIS across a range of NPOs, I adopted a multi-case study research approach. A case study is a not research method in and of itself, instead it provides a framework for studying a contained subject through an analytical frame (Thomas, 2011). The contained

subject should be boundaried in some way and observable as a distinct unit of analysis. The boundaries could be loosely defined, such as an event or a community, or quite well defined, such as the nonprofit organisation which is the unit of analysis in this thesis. The topic of analysis is guided by the research questions, in this thesis the topic is the use of spatial data and GIS. Case studies can be used for replicable and generalisable research, although they are most useful for providing rich, contextualised understanding (Stake, 2005; Thomas, 2011). As an aim of the thesis was to provide a framework and typology of differing uses of spatial data by NPOs, I adopted a multi-case approach, meaning individual cases could be situated in their own unique context, but the topic of interest (spatial data use) could be analysed comparatively and thematically across the cases. While not being generalisable, the research design assumed a fairly objectivist ontology and epistemology and drew on Eisenhardt's (1989) guidance for building empirically valid theory from case study research. Onsrud et al's (1992) proposals for undertaking qualitative research of GIS use in organisations were also influential and advocated for case study research that adopted a replicable approach to pursue broad theory development.

4.3 Data collection

4.3.1 Recruitment

As the study was, in part, motivated by a near-complete omission of contemporary understanding of nonprofit spatial data use, I was keen to ensure a cross-section of the UK's nonprofit sector was represented. Whilst aware that a qualitative approach wouldn't provide a generalisable sample, I felt it was important to assess the breadth of work undertaken and any differences by organisational mission or size. In addition, conversations with academics and practitioners had revealed a scepticism over whether NPOs were using spatial data at all; when hearing of my research topic, a senior voluntary sector academic remarked, "You won't find many organisations using spatial data". I therefore decided it was important to cast a wide net, but still undertake a purposive sampling strategy so the multifaceted aims of the sector could be represented. The criteria for candidate organisations included:

- An organisation that meets Kendall and Knapp's (1993) definition of nonprofit organisations (see section 2.1.1). Note that this doesn't necessarily require the organisation to be registered with a regulatory body (such as the Charity Commission for England and Wales).
- Operated primarily in the UK. There is quite a stark theoretical and empirical disciplinary divide between the study of domestically focussed, western NPOs and internationally focussed organisations (that are typically studied by international development scholars). Therefore, this study focused primarily on organisations which are based in and primarily operate in the UK.
- Uses spatial data to some extent. This could range from occasional light analysis of service user postcodes to advanced use of GIS and a knowledge of spatial statistics.

The review of literature revealed a lack of contemporary studies on the use of spatial data by NPOs, and very few studies of medium-large organisations, or organisations working in sizeable subsectors such as social service, religious, and grantmaking organisations. The typology of International Classification for Non-profit Organisations (ICNPO) by Salamon and Anheier (1996) was adapted[2] to fit the context of this study, allowing the researcher to purposively seek out cases by organisational mission.

The approach taken to sampling can be referred to as 'generic purposive' sampling. In contrast to theoretical sampling, where categories and cases sought are determined by emerging theory, generic purposive sampling is led by a priori categories (in this case the ICNPO) and the research questions at play (Bryman, 2016). The first selection of cases were recruited from relevant practitioner events I had attended or presented at, where staff from NPOs had demonstrated some form of spatial data use or offered to be included in the study upon hearing of my research topic. In addition, I was fortunate to have the support of several freelance analysts, NPO 'knowledge brokers' and data visualisation providers who acted as gatekeepers by recommending potential case organisations to me and passing on (with consent) contact details. At the end of each

[2] changes include split of ICNPO group 8 into grantmakers and umbrella bodies, and removal of "international" and "business and professional associations and unions"

research interview, I would ask if the interviewee was aware of any other NPOs that use geospatial data, which led to small number of organisations being suggested through this snowball sampling approach. The final recruitment approach was the most purposive; I sought to fill gaps in my typology by conducting an internet search for relevant cases. This included looking at staff job titles on LinkedIn and getting in contact to ask if they use spatial data, looking at conference programmes to see who has presented, searching for case studies or marketing materials which showed NPO spatial data use (such as on Esri's website), or simply using a keyword search. For example, Case 2 was found by searching "animal charity AND spatial OR map OR data OR GIS". Across all recruitment methods, I requested interviews with staff from 63 nonprofit organisations.

4.3.2 Cases recruited

The recruitment efforts yielded interviews with staff from 35 nonprofit organisations (outlined in detail in Appendix 1). The 35 organisations represented a range of missions, social service NPOs, grantmaking NPOs, and environmentally focussed NPOs being the best represented (Figure 12).

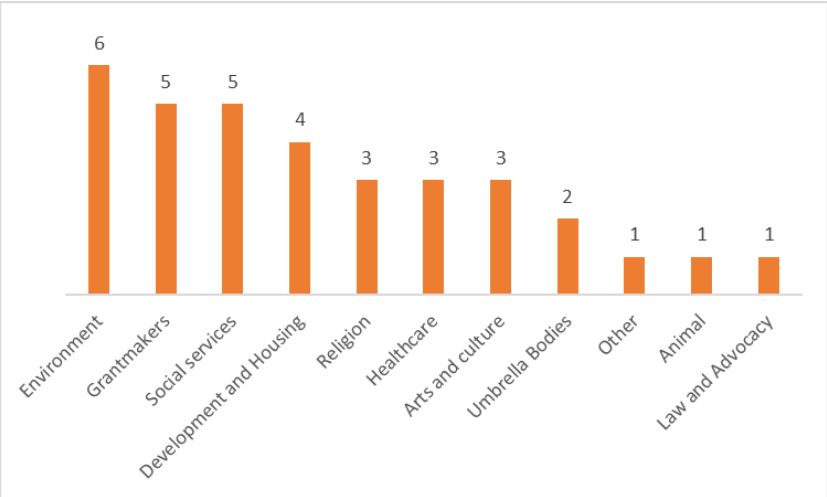


Figure 12: Breakdown of 35 cases by ICNPO classification (adapted).

Figure 13 displays the 35 case study TSOs by ICNPO classification and amount spent in the financial year 2017/18. Spending totals give a more accurate reflection of organisational impact than income, as some organisations, particularly grantmakers, will

often give more than they generated in income, due to differing annual returns on investments and endowments. The total figures are drawn from the NPO's 2017/18 accounts. In order to maintain anonymity of cases, annual spending category is capped at £50m, as several organisations are expenditure outliers in their category. The distribution of organisations is good, as 80% of UK voluntary sector spending is done by organisations with income greater than £1m p.a. (NCVO, 2020). Whilst grassroots organisations (less than £100k) are the best represented in extant literature on nonprofit GIS use, it is still a limitation of this study that most cases have an expenditure of over a £1m per year, as organisations with an income of £100,000 or less make up 81% of the registered sector (NCVO, 2020).



Figure 13: spending categories for the 35 case organisations (for 2017/18)

Finally, Figure 14 gives an overview of the cases by both ICNPO category and annual spend. It shows that all of the environmentally focussed organisations studied spend over £5m per year, and that the smaller organisations studied work in the fields of social services, development and housing, religion and as umbrella bodies.

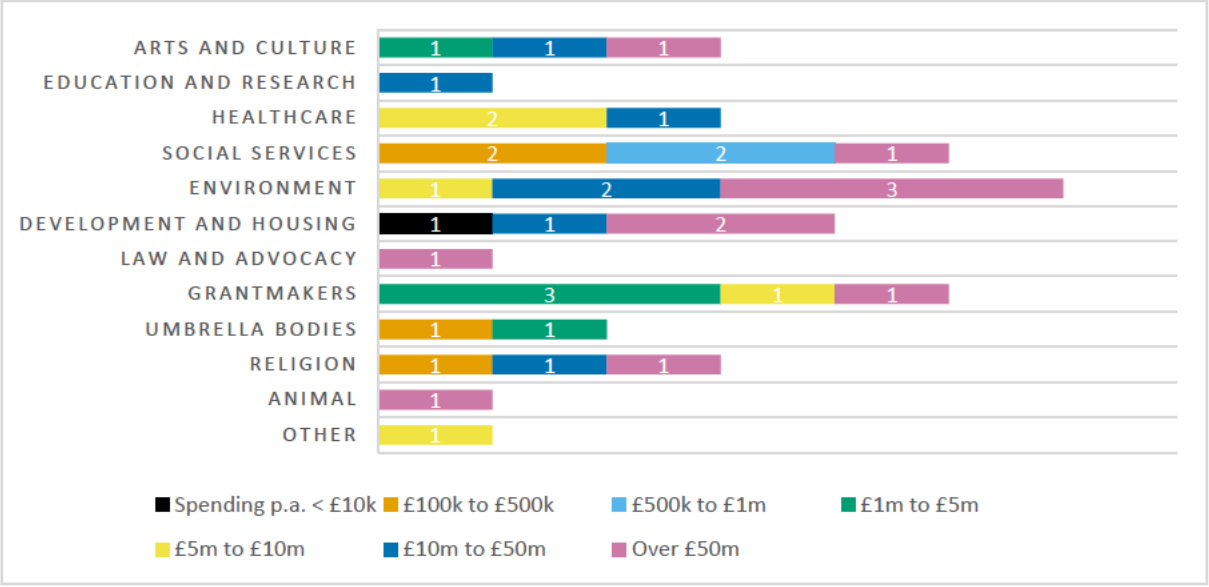


Figure 14: Overview of 35 cases by classification and annual spend (2017/18).

4.3.3 Documentary and visual sources

The primary data source (interviews with staff, discussed next), was informed and supplemented by analysis of documentary and visual sources. Annual reports comprised an important documentary source: they outline core mission statements and values; give context to the organisation's operating environment in that year; describe the financial and human capacity of the organisation; and outline the specific work undertaken by the organisation. Annual reports would sometimes reference the organisation's long-term strategy, but most NPOs studied made an articulated and granular strategy or theory of change publicly available as a separate document. Impact reports, case studies and published interviews provided an insight into discrete pieces of work undertaken by the organisation, with many detailing uses of spatial data and GIS. For example, Case 24 features in several in-depth promotional case studies and interviews for a leading GIS software provider. These documents were frequently referenced in the interviews and meant that the line of questioning was well-informed through prior knowledge of organisational activities and spatial data use.

As the thesis concerns spatial data and GIS, it is not surprising that maps and data visualisations were an important material source. In some cases, these were available prior

to the interview, e.g. publicly available asset maps, but in most cases either interactive or static visualisations were shared during or following the interview. The information and consent form (Appendix 2) which participants were required to sign included the clause: "I consent for publicly available and disclosed documents to be used anonymously in the research outputs".

Maps and spatial outputs provided a visual component that would inform and reinforce data gathered in interviews and be used in semiotic analysis (discussed further in section 4.5) and contain important metadata. An interactive map may display metadata describing the partners which contributed to its production or provided data sources, or details of the person or team responsible for maintaining it. It may show when the map was made or how frequently it is updated. In a multi-case study, the research topic may stay the same, but it is important to understand the contextual situation that each case operates in and which informs action and relations (Stake, 2005). The annual reports, strategies, case studies, maps and visualisations, and their metadata, are not only themselves a source of research data, but provide the necessary context for an informed interview process, and for full analysis and presentation of the final research outputs.

4.3.4 Interviews

The primary data source for this thesis is the interviews with staff from the 35 NPOs. One interview per NPO was conducted between September 2018 and December 2019. with each interview lasting between 50 minutes and 2 hours. Most interviews took place at the interviewees' site of work, although some interviews took place via telephone or Skype. 32 of the interviews were with one staff member, three were with two to four people. The overarching research questions required interviews with a staff member who had good technical knowledge of spatial data and GIS use and purview of wider strategic and cultural matters. This meant that interviewee job titles varied (see Appendix 1 for full list), but would typically be associated with a senior or managerial position; staff titles included 'Head of Data', 'GIS Manager', 'Evaluation Manager'. Staff with job titles such as 'support worker', 'CEO', or 'Pastor' wouldn't ordinarily be expected to use spatial data, however, in smaller NPOs staff roles are often necessarily expansive and cover a broad remit and

require a range of skills. All interviewees were paid staff members, with the exception of a volunteer placement student at Case 20.

The interviews were semi-structured in nature and worked through a set list of questions (Appendix 3) that were the same across all cases, but responses were followed up with context specific questions and leaving space for new topics of discussion to emerge. Semi-structured interviews are particularly useful for multi-case study research, as the interview guide means cross-case themes and comparisons can be drawn, yet there is room for individual case-specific details to be explored in depth. The central questions which guided discussion encompassed seven main subjects: (1) overview of participant, organisation and their position in the organisation, (2) the 'state' of current geospatial data use in the organisation, (3) particular use cases of spatial data and organisational aims that are met by use of geospatial data, (4) the broader link between the organisation's strategy/aims and spatial data use, (5) the extent to which the data used reflects service users or society, (6) the organisational culture towards data use, (7) future plans for geospatial data use. To elicit the most detailed and exact response and stimulate discussion, documentary material would often be used or quoted when asking a question. For example, a question may be:

"Looking at your objective as an organisation: "giving everyone in [region] a good quality of life", is the phrase, how well do you think your current data use and particularly spatial data use fits with and supports this aim?" *Interview question from transcript.*

In general, most interviewees were forthcoming and open, with some reporting that the interview process was cathartic or provided clarity, a process Macmillan (2015) terms 'mutual sense-making' as staff reflect on their own progress and ways of working. All interviews were recorded and took place under the agreed conditions set out by the University of Birmingham's Ethical Review Committee (number 18-0596).

4.4 Data analysis

4.4.1 Initial coding

The data collection period lasted just over a year, during which time was spent recruiting cases, preparing for and undertaking interviews and then transcribing them. As is suggested with multi-case study research (Yin, 2014), a case study database was populated as the data collection progressed. The database captured descriptive characteristics, relevant material data sources and quotes, and immediate thoughts regarding potential themes emerging from the interviews. During this time the first round of coding began, with common themes that were developing being highlighted in the case study database, referencing points in the interview or material sources as source material. After collecting data on the 25th case, it became apparent that some solid themes were beginning to emerge and data saturation was beginning to be reached. Qualitative research is rarely seeking to provide a sample from which accurate generalisations can be made, yet as an aim of the thesis was to produce a typology, it was important to attain conclusive findings. There is no set sample size needed to reach data saturation, instead it is reached when significant new themes are not emerging in data collection (Francis et al., 2010). Whilst the last 5-10 cases added important depth to the existing themes and important domain-specific examples of spatial data and GIS use, it was clear that data saturation had been reached.

Once the data collection had ended, all interview transcripts were checked for accuracy and notes and memos from the case study database were added as appendices to the transcript. The final transcripts were uploaded into NVivo and the coding process began in earnest. The interviews were transcribed verbatim, although rarely included non-speech markers beyond: [pause] to identify a pause. The first round of coding looked mainly at the use of spatial data or GIS in the domain application, i.e. the data sources, techniques and context surrounding its use. Grouped under the primary code 'descriptives' were secondary codes on: primary use cases, capacity, culture, data sources, software and techniques, organisational aims, organisational type, interviewee job title. This thematic analysis informed the description in Chapter 5: *Description of cases and case uses.* While descriptive analysis is sometimes viewed as a minor, preceding part of more important

theoretical or causal analysis, it should stand alone as an important contribution to knowledge in its own right. Descriptive analysis provides a broad documentation of empirical observations, not a narrow description that serves a theoretical or hypo-deductive purpose. It both provides an important contextual grounding and asks questions of *what*, rather than *why*, but also provides space for a normative reflection of what is important to the individuals studied, and what do they view as right and worthy of attention (Gerring, 2012). Chapter 5 is therefore not to be seen as solely a preamble to Chapters 6-8, but rather an independent description of current NPO uses of spatial data, organisational culture and capacity, and data sources and tools. It shows what is important to NPOs that use spatial data, the work that spatial data supports, and compares both previous (albeit dated) literature on NPO spatial data use and contemporary uses.

4.4.2 A dialogue between theory, practice, and research

In contrast with Chapter 5, Chapters 6-8 extensively use theory to explain and position spatial data use by NPOs. Researchers often assume that case study research involves a tricky relationship with theory: is it specifics of the singular case, or the cross-case comparison and thematic analysis, which is of theoretical interest? Is theory built from the case(s) inductively, or is theory to be applied deductively? This tension is falsely assumed, as in practice, almost all researchers come to the case with a preliminary theory or prior ontological and epistemological stance (Yin, 2014). The research process for this thesis was founded on a dialogue between theory, practice, and research. A dialogical approach to case study research recognises that through creativity, critical discernment and sensitivity to local contexts, there can be a mutual formation and generative tension between theory and research (Rule and John, 2015). Theory may not necessarily be solely inductively constructed, or deductively applied; case study research provides the perfect empirical richness for theory to both explain and be developed by the case (Rule and John, 2015).

The second round of coding and data analysis (after the descriptive one) was not only informed by the initial research questions, but a fairly objective ontological perspective,

which viewed spatial data as being of utility to NPOs. It was largely guided by the critical cartographer Denis Wood's (2010) assertion that the way in which maps 'do work' for people and things should be examined. Chapter 6 sought to deductively apply theory from nonprofit literature on nonprofit expertise to explore how spatial data are used to gain expertise, albeit recognising that spatial data are mediated and mediatized and therefore do not offer a true reflection of an ontologically fixed world. The use of spatial data by NPOs to gather and apply knowledge was a theme that emerged quite early on in the research process, when early themes were being documented in the case study database. Similarly, it was clear that extant literature had very little to say about the role of spatial data, and notably their visualisations, in building relations within and across cases. Star and Griesemer's (1989) concept of the boundary object seemed apt for positioning spatial data as a boundary object that performed relational work across communities (Chapter 7). Finally, Chapter 8 was the most deductive of all, in that it took Weber's ideal types of social action and sought to identify them in the work of NPOs, with the aim of aligning value sets and social action that was underpinned by spatial data use. Identified in the literature was a tension between the use of data (typically in monitoring and evaluation practices) and nonprofit values. The use of Weber's ideal types of social action as a yardstick seemed an objective way of aligning action with value propositions.

4.4.3 A theoretical shift

A dialogical approach to theory understands that theorisation is not static but liable to reformation and re-examination. Having undertaken the second round of coding and written up the findings using the theoretical lenses discussed above, the chapters were submitted to my supervisors as standalone chapters, and to journals, in the hope that they offered a substantive contribution to knowledge. The feedback from the supervisory team and peer reviewers was that whilst the data and research topic was of importance and interesting, there was clearly much more at play than could be elucidated through the theoretical approaches used at the time.

Similarly, the stage of analysis and interpretation of data might draw [the researcher] back to theory—reading more around grounded theory, perhaps, or formulating theory by writing notes about concepts emerging from the data. A dialogical model suggests that theory and research are not as easy to separate as linear theory research or research theory models indicate. (Rule and John, 2015, p.8)

Dialogical and reflexive case study research takes account of and responds to critique from within a community of scholarship (Rule and John, 2015). Particularly influential was a peer reviewer comment which, in effect, encouraged me to avoid a "timid analysis" and commit fully to social constructionism as a binding concept. I, therefore, began a process of deep engagement with social constructionist scholarship, particularly within STS, critical data studies and institutional theory scholarship (see section 3.2)). The purpose of theory is to help interpret and explain phenomena, move across a range of phenomena, aid critical reflection, and (often) be of use to practitioners (Rule and John, 2015). The fruits of a tight fit between theory and data were realised in shifting from a largely descriptive analysis which took a utilitarian, instrumental perspective and varied theoretical approach, to a more theoretically informed and consistent one (see Table 5). The process of reflection regarding the role of theory in my research, and an emerging ontological and epistemological shift to viewing and studying the world as socially constructed, led to the reformulation of my final research questions:

1. How do nonprofit organisations in the UK construct and represent reality through spatial data and GIS?
2. How is spatial data used by organisations to position themselves within and across sectors?
3. How can nonprofit spatial data use be theorised using frameworks drawn from the fields of human geography, nonprofit research, and social studies of data?

(1) Instrumental analysis (theory)	Instrumental analysis (key theorists)	(2) Social constructionist analysis (theory)	Social constructionist analysis (key theorists)
Knowledge of place and people. Role of mediatized knowledge in gaining expertise.	Elwood and Leszczynski (2013), Macmillan, (2013), Couldry and Hepp (2017)	Construction of knowledge through an organisational epistemology framework	Tsoukas and Vladimirou (2001), Seirafi (2012)
Spatial data as a boundary object connecting within and across NPOs	Star and Griesemer (1989), Craig and Elwood (1998)	Spatial data as a socially constructed relational semiotic device	Liu and Li (2015), Stamper (2001)
Exploring congruence between values and use of spatial data and consequences for claims of legitimacy	Weber (1978), Nevile (2010)	The interplay between socially constructed institutional logics and conferred legitimacy and NPO spatial data use	Thornton and Ocasio (2008), Nevile (2010)

Table 5: Movement from an instrumental analysis to a social constructionist analysis

With new research questions to guide the study and a refreshed theoretical toolbox, I began the third round of coding. Research question 3 encourages a broad theoretical exploration, seeing how NPO spatial data use can be theorised in keeping with multiple academic canons. Maintaining a social constructionist 'thread' running throughout the thesis reduced the risk of it becoming a disjointed theoretical smorgasbord, as was the case following the first analysis (Table 5). Elwood et al., (2011) describe qualitative GIS research as being conducted through multiple theoretical readings when undertaken by scholars that sit within the STS tradition. To examine which theoretical readings held the most explanatory power and fulfilled Rule and John's (2015) criteria of theory, I began a third round of coding the data afresh. A strong theoretical framework can enrich the data

and the case's uniqueness, whilst also showing what is of more general relevance and interest. Qualitative case study research can contain a rich and thick description, but without a strong theoretical framework, "the details may devolve into a story that is difficult to transfer to other settings" (Collins and Stockton, 2018, p.6). In addition, much social constructionist analysis can become overly descriptive and lack a strong theoretical hook (Alvesson and Sköldberg, 2017).

All three theoretically informed empirical Chapters (6-8) are built around strong theoretical frameworks which were used to analyse the data from the interviews and material sources deductively. The constituent parts of the frameworks were first deductively applied to data from each case (both interview data and material sources) with NVivo codes/tags to assess the fit between the theory and the case. There were instances where a singular theory alone couldn't fully account for the observed action, or an alternative angle could be explored. Therefore, in an example of the case-theory dialogic, the primary theory would be expanded or accompanied by an allied theory. In Chapter 6, the organisational epistemological framework is amended to account for the process of mediation. In Chapter 7, the organisational semiotic framework is paired with STS theory on infrastructure. In Chapter 8, neo-institutional theory on institutional logics is paired with an inductive building of a distinct 'logic'. It was important to verify findings and codes through a process of triangulation between sources. Triangulation between sources decreases the chance of misinterpretation and deepens the scope of the study (Tracy, 2010); when undertaking a semiotic reading of the cases, and assessing the pragmatic intentions behind the sign use, both the sign (the map), the interview data, and the organisation's annual or impact report would be examined and compared to ensure an accurate semiotic assessment is being made.

Having coded the data in NVivo and analysed each case study, I was presented with a classic dilemma faced in case study research: is the individual case the point of interest, or the thematic analysis across cases (Thomas, 2011)? I decided to try and combine both by using several case studies to demonstrate cross-case thematic findings. STS scholarship has a long tradition of using case studies to make arguments and develop theory (Law, 2008b), and scholarship on qualitative GIS (Elwood et al., 2011) and analysis of GIS in

operational settings (Onsrud et al., 1992) advocate for their use in analysis. Chapter 8 differs from this in that it presents a wholly cross-case analysis. The purpose of this is not only to offer a broad analysis but also to place the 'testing' of ideal types of institutional logics as the central feature of the chapter, rather than context-specific analysis.

4.5 Evaluation and reflection

Reflective research draws "attention to the complex relationships between processes of knowledge production and the various contexts of such processes, as well as the involvement of the knowledge producer" (Alvesson and Skoldberg, 2017, p.10). It's about the "interpretation of interpretation" (ibid, p.11) and reflecting on the quality and process of research. To not conduct reflective social constructionist research would be negligent, as the researcher examines the choices involved in describing the world, and therefore must examine their own. Tracy's (2010) *Eight "Big-Tent" Criteria for Excellent Qualitative Research* provides a useful heuristic for reflection (highlighted in italics).

The research was conducted with *rich rigour* through its use of well-established theoretical constructs, in-depth and comparable interviews with knowledgeable staff, and the investigation of a broad sample of organisations, many of which filled significant gaps in extant studies of nonprofit data use (such as grantmaking organisations). To improve the rigour of the study, a representative range of organisational sizes should be studied. While 81% of 'general charities' are organisations that have an income of less than £100k p.a (NCVO, 2020), they are less likely to use data and technology due to resource constraints, (McNutt et al., 2018) and have staff dedicated to data-based roles (Basker, 2017). Consequently, they are less likely to use spatial data and have less external visibility when they do (data work is subsumed within other roles). It is, therefore, a limitation of this study that the majority of the 35 organisations in the wider study have an income of over £1m p.a. (2018/19) and smaller organisations are not well represented. However, many of the cases are dominant organisations in their sub-sector and display extensive and innovative uses of geospatial data. Many can be classed as early-adopters due to organisational cultures that promote innovation, prioritising job roles that allow for spatial media exploration and the resources required to trial and develop novel methods. If

technological diffusion and isomorphic pressures result in the adoption of similar uses of spatial data use by smaller organisations, then it is important to study the work of early-adopters.

Tracy (2010) encourages the researcher to examine the *credibility* of their research. Does it give a thick description, provide concrete detail, triangulate data and offer multivocality? This thesis presents a detailed description of the work of nonprofit organisations and draws on a range of data sources to do so. However, it eschews some common theoretical and methodological approaches for this type of work. A study that seeks to uncover and theorise the social construction of data in an organisational setting may choose to undertake an ethnography in a few organisations, which this thesis does not do. Should the opportunity to conduct such a study come again, an ethnographic approach could be beneficial. An ethnographic approach would have yielded a deep, multivocal and holistic understanding of a few cases. It would increase the *rigour* of the study by studying a diversity of opinions within the organisation; in several cases, staff members mentioned data use occurring in other parts of the organisation but didn't know enough to discuss it in depth. In addition, Maxwell et al. (2016) demonstrate the wide intra-organisational variation in data literacy and culture, something a deep engagement with an individual case would capture. However, an ethnographic approach would have lost the breadth of understanding across varied organisational missions that this study presents. Given the study's founding aims were to document a process that was currently undocumented (and as far as some were concerned, wasn't taking place) and develop a typology, the multi-case study approach was the correct way forward and has proved fruitful for offering both breadth and depth.

The thesis gives a *sincere* portrayal of the research process; the disciplinary background and motivations which informed the study and the theoretical shifts which occurred post data collection are discussed openly. *Ethically*, the study design met the required standard set by the University's Ethical Review Committee, although I was keen to ensure I also did the right thing by the research participants. This meant representing the interviewees and their work in a fair and accurate light and making project outputs publicly available for wider use. Whilst it may be impossible to objectively assess the *worthiness of the topic*

and whether a *significant contribution* has been made, I believe the topic is timely, relevant and interesting. Nonprofit organisations are not isolated from the pervasive datafication of organisational and social life and studies thus far have primarily focussed on small scale or prefabricated data platform use (Sieber, 2007; Roudebush et al., 2013; Brudney et al., 2016), have been focussed on implementation rather than organisational aims (Sieber, 2000; Bishop 2010), or sought to build the evidence base for a concept particular to emerging GIS scholarship, such as VGI or PPGIS (Sieber, 2006; Elwood et al., 2012). The study analyses each organisation in-depth, but a holistic view of the cases allows for common themes to be tied to broader policy and theoretical concerns. The use of the ICNPO classification moves the study away from 'sub-sector' specific stories, to one that is relatable to organisations from across the sector. It navigates from the particular to the general in a way that organisations can apply to their own operations. A qualitative perspective on (frequently) quantitative actions within an organisation brings geospatial data use away from a functionalist, utilitarian perspective to one that provides an analysis of geospatial data use without losing qualitative perspectives on how organisations deliver their objectives.

I have been keen to ensure that research conducted makes a *significant contribution* to nonprofit practice, with it *resonating* through transferrable findings. The research has been presented at several well-attended practitioner events and conferences, emphasising how organisations can use their own spatial data in their day-to-day work. It has been written up for several blogs which are well-read by the nonprofit community, with one being based on the summary table of key drivers of spatial data use (Table 6). This blog and my advisory input formed part of the evidence base which contributed to funding being made available to develop a bespoke mapping tool for charities.

The final criteria that Tracy (2010) puts forward is *meaningful coherence*. I.e. does the study achieve what it purports to do, and does it meaningfully connect literature, research questions, findings and interpretations. I believe that the study is meaningfully coherent, however, it is logical to respond to this criterion in the conclusion of the thesis.

4.6 Conclusion

This chapter has presented the methodological approach taken in collecting, analysing, and presenting the data used in this thesis. The thesis takes a qualitative assessment of typically quantitative spatial data use. Interview data forms the primary data source, but it is triangulated against material sources. The chapter reflects on the theoretical shift that occurred post data collection and moved the research questions away from an instrumental, theory-lite perspective to research questions and an ontology and epistemology that were theoretically consistent and interrogated the data more deeply. Finally, an assessment of the research against Tracy's (2010) criteria for high-quality qualitative research demonstrates a methodologically sound study that provides theoretical and practical contributions. Despite this, there are areas where the study could be improved, breadth of opinion within the organisation and reliance on a single perspective being the most obvious.

5. Description of cases and case uses

5.1 Introduction

This first chapter[3] provides a descriptive overview of the 35 cases included in the study (shown in Appendix 1). It contextualises the more detailed and theoretical exploration of the cases in the proceeding chapters by outlining: the primary drivers of GIS and spatial data use, data types and sources, use of software and analytical tools, organisational capacity, and organisational culture towards spatial data use and data use more generally. It is important to gain a broad apprehension of the factors (technical, cultural, financial etc.) which facilitate or impede NPO use of spatial data and GIS, both to serve as a guide for sector practitioners and as a benchmarking exercise of for scholars who are concerned with the use of data by nonprofit organisations and spatial data and GIS use and adoption more generally.

5.2 Primary drivers of spatial data and GIS use

Despite the heterogeneity of size and missions of the organisations studied, nonprofit use of spatial data and GIS can be ascribed to four main motivations: to display a map of assets, inform current and future service delivery, inform policy and advocacy, and engage stakeholders. As NPOs use the same visualisations or sets of spatial data for multiple purposes, the four themes described are not mutually exclusive, but go some way to distilling the numerous ways that nonprofit organisations use spatial data.

[3] NB: A summary of Chapter 5 has been written up as a blog. It contains a similar structure, phrasing and direct quotes from the interviews. *Bowles, J. (2021) "How charities use geospatial data: research findings from a study of UK organisations", Catalyst. Blog post. https://www.thecatalyst.org.uk/resource-articles/how-charities-use-geospatial-data-research-findings-from-a-study-of-uk-organisations#*

Map assets and administrative boundaries

At their most fundamental, maps possess a propositional logic which says this is there (Wood, 2010). For nonprofit organisations, the object of reference can be the location of key assets, members, other organisations, boundaries, grants, or volunteers. For the umbrella organisations (Cases 5 and 6), maintaining directories of local voluntary sector members and activities that can be filtered by activity type is useful for internal and external knowledge of what is happening where and works to fulfil their mission of raising the profile of the local voluntary sector (Figure 15). Local voluntary sector listings held by infrastructure and umbrella bodies contain information on grassroots groups that are not registered with the charity commission (Mohan, 2012), serving as an important and more comprehensive guide to local voluntary sector activity than charity commission data alone.

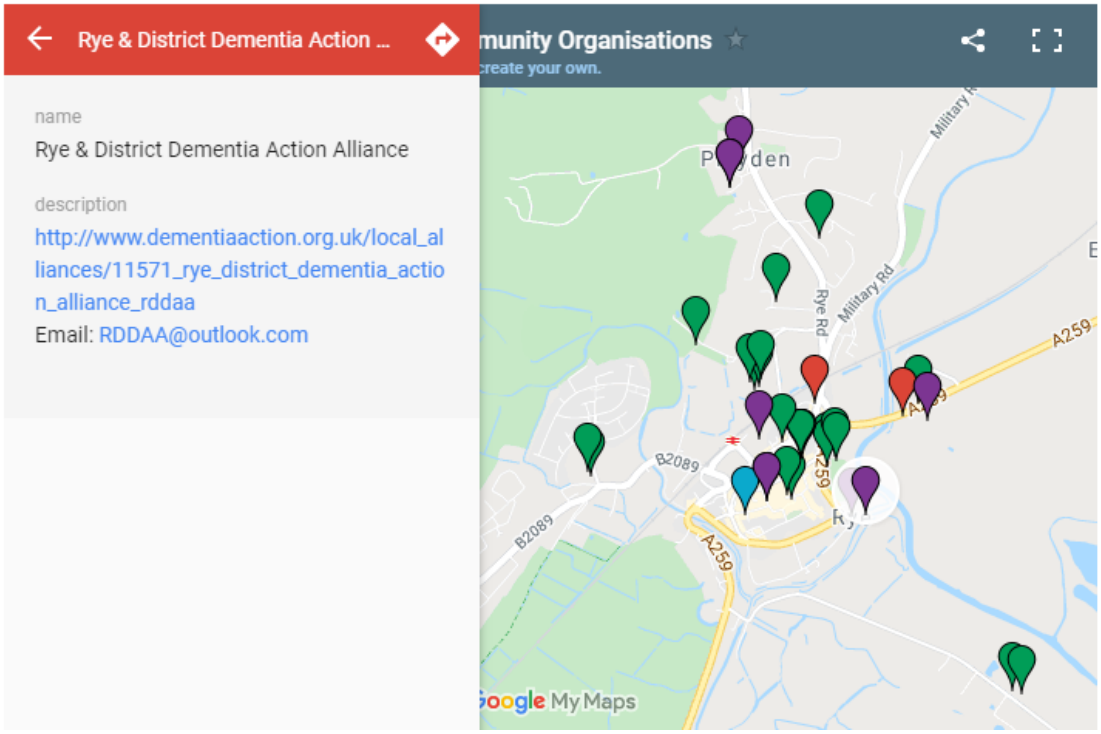


Figure 15: Case 5 asset map (Source: case 5)

Asset maps require a significant investment of time and finance to ensure their accuracy, and therefore there are few examples of comprehensive asset maps that have been routinely updated and maintained. One longstanding example is an asset map that is coordinated and hosted by a regional religious nonprofit (Case 8). The map is custom built

and gathers data on events that are happening in the region through manual submissions and automatic feeds from partner organisations. Data added to the map is automatically shared via a feed with relevant partners. It has been running for over five years and displays a wide range of activities that are organised by religious and non-religious groups. As a result of being maintained by a regional body, and not at the level of individual churches, the resources exist to commit to minimal but ongoing web-development costs and staffing costs to ensure it is accurate and successfully marketed across the region. The precise location of activities and public nature of the map means discretion must be applied to the display of activities; displaying the location of work tackling modern slavery hotspots could compromise safety and project efficacy.

For national organisations, administrative maps are used to maintain uniformity of standards and spatial understanding across various stakeholders, including local religious NPOs. Figure 16 shows the public ArcGIS Online map of administrative boundaries and jurisdictions, alongside individual churches, for Case 9, a national religious nonprofit organisation. As the organisation's boundaries are not contiguous with government (ONS) statistical boundaries, maintaining and publicly sharing boundaries and the corresponding location of churches is an important function of the national nonprofit organisation.

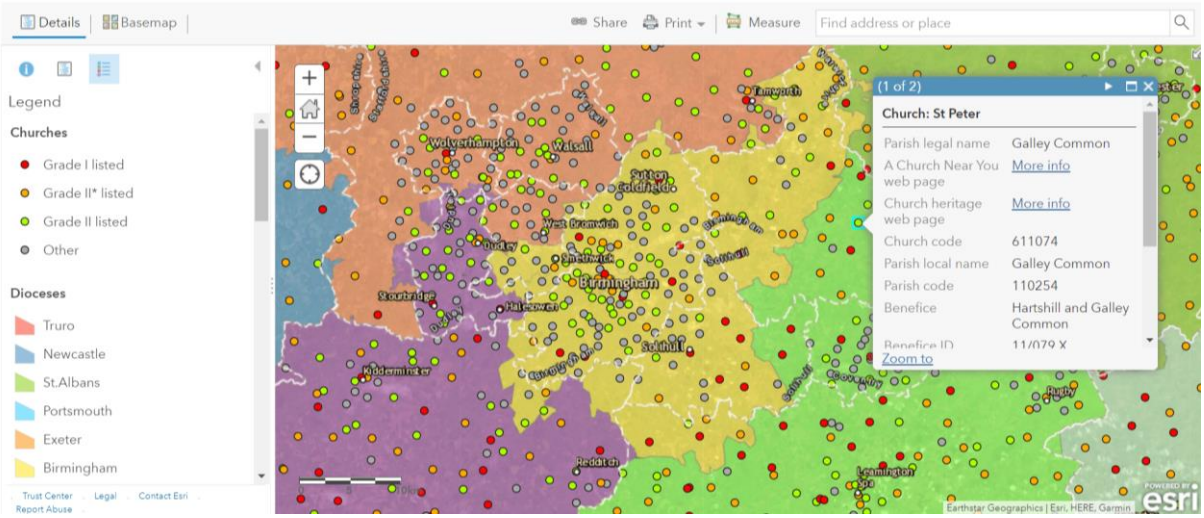


Figure 16 : Administrative map of boundaries and churches (source: Case 9)

Case 24's live asset map displays the location of its emergency rescue equipment and personnel, giving its central command office an immediate understanding of where

resources can be dispatched from in response to an emergency. This "*bread and butter work*" (*GIS Advisor, Case 24)*, is accompanied by maps that display the outcome of each rescue around the country. Volunteers are also 'assets' that are mapped. Case 31, a national environmental nonprofit, maintains a map of volunteers and their roles/skills on the organisation's intranet GIS system.

"As part of our internet GIS that data is visualised, we have volunteers and volunteer role types in there, so we have volunteer photographers, walk leaders, anything and everything. So again that allows people to say I want a photographer in that area…yes I can use the CRM and look at a list of names…but the map allows us to see where people can travel to."

GIS Manager, Case 31, Environmental Nonprofit.

Directly inform service delivery

Despite the significant heterogeneity of missions in the organisations studied, the most widely observed use of spatial data and GIS by NPOs was to inform current or future service delivery. Service delivery describes the activities undertaken which serve a public or group as defined in their organisational aims and mission.

It is not surprising that the work of environmental organisations (Cases 30-35) is well captured by the study sample; environmental management training and techniques are often centred around the ability of GIS to spatially represent geographic features and interrogate them alongside a multitude of datasets. The spatial data and GIS use cases presented by environmental organisations are manifold and span the breadth of extremely large organisations as staff and volunteers directly rely on internal GIS systems for service delivery. Use cases include rangers marking out areas of animal habitat or managed estates that require monitoring or intervention, volunteers documenting the location of damaged or missing signage along pathways, or GIS practitioners assessing the accessibility of cycle infrastructure for different user groups and amending it accordingly.

Social service, healthcare and development/housing organisations concerned with spatially observable issues also constitute a significant user-group. Cases 18 and 19 are large NPOs that address homelessness but utilise spatial data for service delivery in different ways. Case 18 maintains a city-wide multi-agency database that allocates a unique identifier to each rough sleeper that outreach workers interact with. Data on demographics, circumstances, individual needs, support provided, and the location of where the person has been seen rough sleeping is collected, giving outreach workers a comprehensive understanding of personal history and where the person is likely to be found. In addition, members of the public can refer rough sleepers to outreach teams via a referral form that offers exact geolocation (placement of pin on a map) or description (e.g. "behind bins") of the rough sleeper. The data held by Case 18 is aggregated to a hierarchy of spatial scales (consequently anonymising records) for long-term monitoring of locality- or policy-based interventions. Case 19 uses aggregated data (at local authority level) to assess the national allocation of its resources against demand. At the time of interview (November 2018), they were beginning an exercise which ensured the location of their advice centres reflected current and not historic demand for their services in cities and local authorities.

Adequate resource allocation is similarly a concern for Cases 13 and 23, which deliver cancer treatment and support (Case 13) and youth counselling and support (Case 23). By collecting the postcodes of service users, Case 13 could ensure equity of service provision in response to need, and relocate fixed and mobile counselling services to other parts of their area of jurisdiction in order to respond to unmet need and remove barriers to access. Case 13 operates three mobile support units across Wales, allowing rural or elderly patients to receive treatment without travelling far and entering a hospital. Through partnering with a local university, they have developed an open-source tool that takes both supply (availability of buses) and demand (travel time, cancer incidence rates) constraints into consideration, allowing the nonprofit to locate the treatment units in optimal locations.

For organisations with a defined membership or regular body of visitors, maintaining longitudinal datasets with a spatial attribute allows service provision to be tailored to

specific needs. Case 7 is a small church in the suburbs of a UK city, that has collected a variety of data on its members (<100) over the past 10 years. Once a year, a volunteer analyses the data to assess trends, building up a long-term picture of age, demographics and location. Figure 17 shows the distribution of church members in 2008, and Figure 18 in 2018. From visualising the spatial distribution of members, the church decided to deliver events in multiple locations, so members were able to invite their neighbours or work colleagues to events that were in or near their locality.

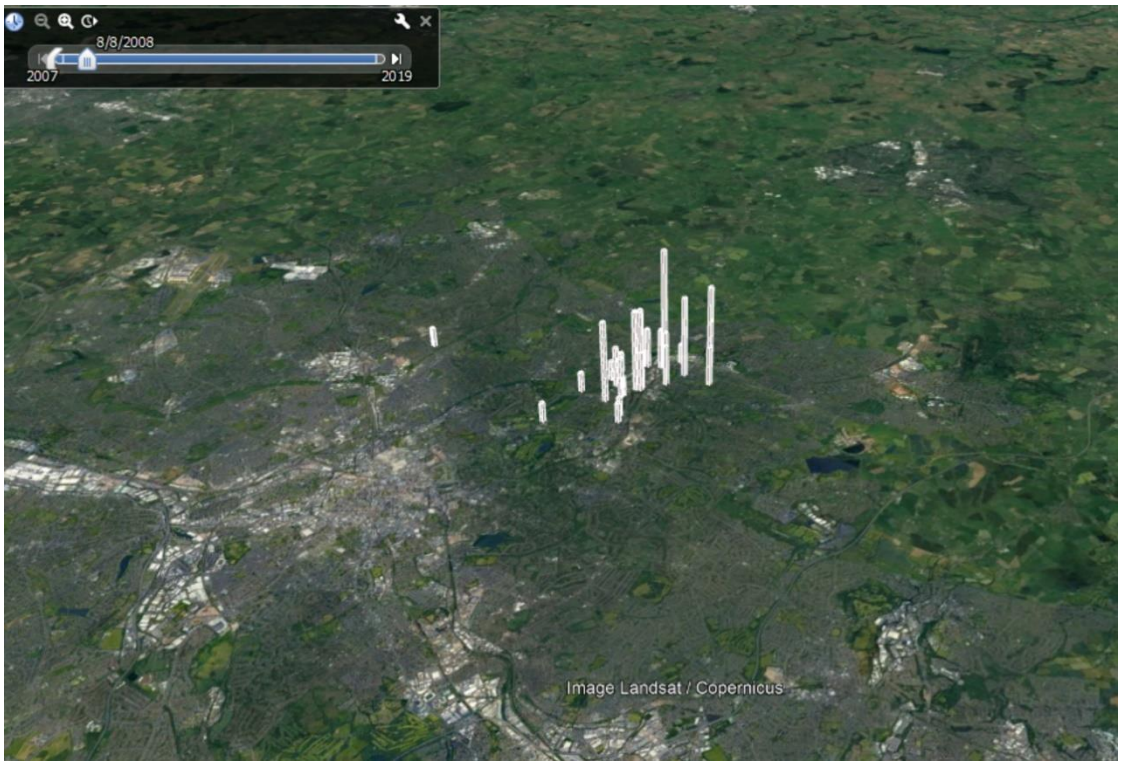


Figure 17: Case 7 member distribution in 2008 (Source: Case 7)

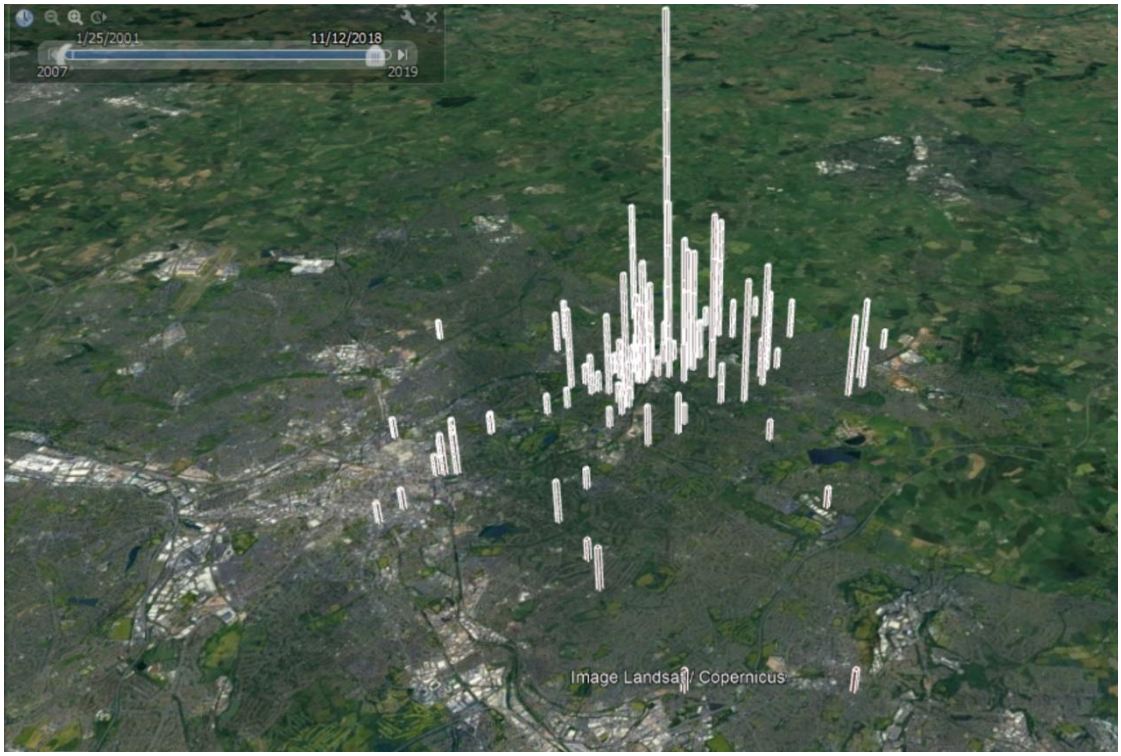


Figure 18: Case 7 member distribution in 2018 (Source: Case 7)

Case 11, a large arts and culture NPO, collects postcode data on ticket purchases for events and exhibitions and data on members. This data is used to tailor the event and exhibition programme to the tastes and interests of members and ensure that necessary ancillary services are in place. For example, if heat maps of historic ticketing data show that a particular exhibition subject draws an audience from a wide geography, then more cloakroom space should be made available as visitors will have more luggage, and staff should be prepared for greater visitor numbers outside of peak train travel times.

While not directly engaging with individual service users in the way many aforementioned organisations do, grantmaking organisations nonetheless deliver a service to their grantees, who in turn will often directly engage service users. The work of grantmaking organisations, a sub-sector that is understudied in previous GIS nonprofit literature (Brudney and Prentice, 2018), is well covered in this study (Cases 25-29). All 5 grantmaking organisations use spatial data to varying degrees as they seek to respond to the greatest need and equitably distribute funding. Cases 26-28 are community foundations that make use of quantitative (such as the Indices of Multiple Deprivation (IMD)) and qualitative (such as local focus groups) data to frame their priority areas or guide the decisions of donors. The varied use of evidence and donor relations amongst the community foundations is explored further in section 7.3.1. The use of spatial data to define eligibility criteria is seen in multiple cases, but most prominently in 27, a national grantmaker, and 21, a small social service organisation. Both use the IMD to define 'deprived' areas (e.g. most 20% most deprived) that are eligible for grants or services.

Finally, NPOs use spatial data to anticipate future demand for their services. By analysing a combination of postcode and demographic data collected in emergency rescues, Case 24 can identify the groups most likely to require the services of the emergency rescue organisation. The educational outreach team then proactively works in geographic areas where 'at risk' groups make up a high percentage of the population to reduce the number of future incidences. The only organisation included in the study that falls under the 'education and research' classification is Case 3, a large organisation that delivers educational training courses around the UK. It uses longitudinal data on birth rates by

Middle Super Output Area (MSOA) to encourage practitioners to deliver courses in areas where there will be ongoing and future demand for their services.

Inform policy and advocacy efforts

Nonprofit organisations serve an important expressive function as they draw attention to issues that have been neglected in public discourse, challenge policy and propose alternatives, and influence local and national priorities (Frumkin, 2005). Data, including spatial data, often provide the evidential basis for nonprofit organisations to begin advocacy efforts and contest and propose policy. Case 4 is a national law and advocacy organisation that works for the benefit of over 300 federated autonomous branches. It aggregates data collected in person and online on the queries and advice people seek, broken down by geographic area. A near real-time perspective on the challenges facing people permits the organisation to act as an expert voice when informing MPs of the challenges in their constituency, or policymakers of the challenges affecting their area of focus.

"We held an event in Parliament and we had about 100 MPs turn up to see their local area data on the map. I think the campaign was quite successful, there were changes to legislation and it all contributed to that."
Head of Data, Case 4, Law and Advocacy NPO.

Similar case uses include a national development and housing NPO (Case 19) which visualises spatial data on the prevalence of homelessness in national campaigns.

"From a campaigning point of view those sorts of visualisations are hugely compelling things that are often picked up effectively via social media."
Senior Analyst, Case 19, Development and Housing NPO.

Having internal capacity to interrogate spatial data allows organisations to intervene in live political debate; Case 31, a large environmental NPO, took advantage of the release of the proposed High Speed 2 railway route to visualise the impact it would have on the

environment, and on ancient woodland in particular, to make the public and transport policy executives aware of potential environmental damage.

Service delivery for Case 2, an animal welfare organisation, involves the rehabilitation, care and rehoming of animals. To prevent animals from falling into their care, the organisation undertakes various campaigns to inform the public and influence policy and legal agendas. An ongoing project for the organisations concerns estimating the size and spatial distribution of the UK's dog population. Spatially referenced data is collected from insurance companies, welfare centres and online advertisements amongst other sources. By gaining a spatial understanding of the distribution and movement of dogs, the organisation can campaign for policy and legal changes to be enacted that would prevent and disrupt the sale of dogs by illegal breeders.

Stakeholder engagement

Finally, nonprofit organisations use spatial data and GIS to engage a variety of stakeholders for both financial and non-financial purposes. Financial purposes include targeting current and prospective donors and using spatial data and GIS to support and enhance grant applications. Case 17, a large development and housing NPO, engages past and current donors by ensuring updates and campaign appeals are relevant to the city or area in which the donor lives and demographic characteristics (such as ensuring marathon publicity is age appropriate). NPOs engage donors by presenting the impact of their contribution in a visually engaging way; Case 31, a large environmental NPO, provides a bi-annual update for long-term corporate donors and map the location of the work which was funded by their donation. For the donor, a map is generated for each retail store, allowing the donor to display the localised impact of their donations within the vicinity of each store. Spatial data are used to engage prospective donors in several ways. Selective targeting of appeals or fundraising requests is frequently underpinned by socio-economic or geodemographic classifications that segregate areas at multiple spatial scales. Cause-specific data are used to elicit a greater emotional response from donors; in the case of a medium sized healthcare charity (Case 14) that works to support a particular hospital, data

was obtained from the local NHS trust which showed the aggregated distribution of recent births by the top level postcode area. While previous mailing campaigns were conducted in uniform or uninformed manner, the birth data allowed the NPO to target areas with higher recent birth rates and therefore engage people who have recently used the hospital's services. The mixed funding base of many NPOs can include grant funds, for which spatial data can underpin evidence of need or successful service provision. Case 22, a small social services organisation that provides support for carers, used postcode data on the current location of the young carers it supports to demonstrate to a grantmaking body that many young carers were not accessing their services due to a lack of transport access, and that a grant for minibus provision would solve the issue. The organisation was able to demonstrate the grant's utility in a 'before' and 'after' visualisation of the reach of their service in a final report for the funding body.

Spatial data and GIS can play a pivotal function in efforts to engage stakeholders for non-financial motives. Asset maps held by infrastructure organisations, such as Case 6, can be used to provide a 'birds eye' perspective on service delivery within a defined area, and be used to initiate and facilitate discussions with partner organisations about cooperating with filling gaps in service delivery. While the final spatial visualisation is often itself a part of an organisation's service delivery offering (such as the publicly available asset maps), the contribution of data to the visualisation offers an opportunity for wider stakeholder engagement and relationships to be forged. Case 12 encourages public assistance in spatially locating the site of historic film footage, while Case 31 encourages contributions on the location of ancient trees. For both organisations, while the primary driver is knowledge contribution, public interaction builds brand and cause awareness, leading to long-term support.

Similarly, data sharing across organisations and sectors serves the purpose of greater knowledge, but is often the catalyst for closer working relationships. Case 8 (discussed in detail in section 7.4.2) is a large religious NPO that maintains a publicly available map of community activities and events within their area of jurisdiction. Partner organisations from the public and third sectors contribute their own events data via a feed, which is mapped.

Establishing and comparing frameworks

The almost complete omission of the nonprofit sector and civil society from literature that gives an overview of GIS uses by sector was a contributory factor for wanting to undertake this study. While an original aim of the study was to provide a detailed typology of cases uses by organisational type (see section 4.4.3 in Methodology), Table 6 is a more succinct tool which facilitates cross-sector comparison whilst still describing the underpinning drivers behind spatial data use. Table 6 compares the case uses of GIS and spatial data found in this study alongside Craig and Elwood's (1998) overview of grassroots community organisations. The four motivations for NPOs to use spatial data and GIS do, to some extent, overlap with Craig and Elwood's (1998) framework of administrative, strategic, tactical and organising uses for maps and geographic information. 'Administrative' purposes encapsulates the desire for asset maps, while 'strategic' and 'tactical' purposes could describe spatial data's use in service delivery and influence and advocacy efforts. Similarly, 'organising' purposes would loosely describe stakeholder engagement efforts. While there is overlap and the uses being described are similar, the terminology used by Craig and Elwood (1998) reflects a study of small, grassroots organisations, for which terms such as 'tactical' and 'organising' would be apt. This thesis features a broad range of organisations, which are on the whole larger and more professionalised than those studied by Craig and Elwood (1998). The terminology used to describe the four motivations reflects contemporary vocabulary used to describe the operations of large, formalised organisations.

Table 6 also draws comparisons with GIS and spatial data case uses in the public and private sectors. For each primary driver identified in this study, comparative case uses are found in consultancy reports and academic publications. For example, when using spatial data to inform service delivery, the organisations may all undertake geodemographic analysis or combine spatial data sets to allocate resources. Longley et al. (2015) list the profit motive, brand awareness, asset accumulation, risk control and business generation as key drivers for private sector organisations. For the public sector, fulfilling manifesto promises, providing value for money, protecting citizens and responding to their needs, and acting equitably are significant drivers of GIS use. The nonprofit sector may use GIS in

similar ways (such as the targeting of resources based on socio-spatial indicators) but are responding to different drivers. The drivers for the nonprofit sector are underpinned by their values and desire for social change, and manifest through using spatial data to map assets and administrative boundaries, inform service delivery, inform policy and advocacy, and engage stakeholders.

Primary drivers identified in this study	Expanded description from this study	Comparison with Craig and Elwood's framework (1998)	Public sector example (from Open Data Institute (2019a) and Geospatial Commission (2020))	Private sector example (from Azaz (2011) and Frontier Economics (2020))
Map assets and administrative boundaries	• Display location of assets for internal and external (community) uses • Maintain uniformity of spatial understanding across large organisations	*Administrative* • Maps showing existing programs • Records of property information • Maps showing loans given	• Create map of the UKs underground pipe and cable network by bringing infrastructure datasets together • Develop open-source map of local authority services and community groups	• Real-time facilities management • Map supply chain components • Map footfall in shopping centres using mobile phone data
Directly inform service delivery	• Deliver services, ensure adequate spatial provision of services • Combine past service user data with geodemographic data to anticipate future service demand	*Strategic* • General assessment of neighbourhood needs • Evaluate the success of existing city and community programs	• Using satellite imagery to identify suitable housing locations and monitor the housing construction • During COVID-19, public health bodies spatially assessed and optimally reallocated key resources such as ventilators	• Use geodemographic profiling to optimally locate new stores • Optimise transport delivery routes • Estimate risk for insurance policies (flooding etc.)
Inform policy and advocacy efforts	• Use spatial data as the evidential basis for campaigns and policy proposals • Aggregate real-time data on common social concerns by area and present constituency level analysis to MPs	*Tactical* • Contest maps of opponents and show misrepresentations	• Develop a cycle route audit tool with stakeholders that crowdsources issues with cycle infrastructure to use in policy campaigns	• Use geospatial data to lobby government for sector specific changes to legislation
Stakeholder engagement (financial and non-financial)	• Use postcode data on service users to demonstrate need in grant applications • Use maps of service delivery to build relationships with partners and gain wider buy-in	*Organizing* • Recruit new members • Facilitate meetings • Get attention and financial assistance from government, granting agencies and other neighbourhoods	• Use crowdsourced GIS collection as a way of engaging with the public and getting across key messages	• Demonstrate past mapping successes to win new contracts

Table 6: Primary drivers of spatial data and GIS use (identified in this study and comparison)

5.3 Data forms used by nonprofit organisations

The variety of spatial data subjects and formats that NPOs use was a striking finding during the research process. A subsection of literature (see section 2.2) and received wisdom imply that nonprofit organisations are unsophisticated in their choice of data. This research demonstrates a more nuanced reality, where a continuum of complexity runs from using secondary data as part of a software as a service (SaaS) package, to gathering real-time primary data on service users. This section assesses primary and secondary spatial data used (as seen in Appendix 1) and addresses the topics of data intermediaries and sharing.

Primary data

Spatial data can be visualised in either raster or vector forms (see section 2.3.1). Environmental organisations (Cases 31-35) formed the only group that displayed the use of raster data layers they had generated. Drones are used by staff at Case 34's conservation areas to provide aerial imagery of habitat conditions which are then 'stitched' together and loaded as a raster layer in the organisation's internal GIS. The drone imagery is available on-demand with a much higher spatial resolution than commercially available aerial imagery. The other use of raster imagery is when it is included as an attribute of a feature, such as a point feature representing a piece of infrastructure. Both Cases 33 and 35 use Esri's Collector app to allow staff members and volunteers to record the condition of signs, footpaths and other key assets and infrastructure. Staff and volunteers can include a picture as an attribute for the feature, allowing the condition of infrastructure to be monitored over time.

With the exception of the cases listed above, all other spatial data were either analysed statistically or visualised as vector data. Widely analysed and visualised by the organisations studied was internal data on the location of their service delivery. This data could be held as a postcode, which in many cases was geocoded to a latitude/longitude to allow it to be mapped, or aggregated by geography (using the corresponding administrative code). Grant data in particular was often visualised according to the scale of interest, as mapping the location of the grant beneficiaries can be misleading, as the value of the grant will be

distributed over a wide area. Data on members, service users, donors and visitors constitute the other significant primary data resource. Customer Relationship Management (CRM) systems hold varying multiple scales of geographic identifier (such as full address, postcode, ward, CCG, etc). Alongside a variety of other attributes / variables, such as socio-economic or demographic data, the spatial data allows organisations to apprehend a spatial understanding of donors, members, volunteers and service users. As with data on service delivery, data aggregation was often necessary to a) ensure anonymity and b) make the analysis or visualisation meaningful to particular research questions and concerns.

Environmental organisations (particularly Cases 31-35) all use a wide variety of primary data, from recording reserve and habitat boundaries to the location of individual trees that require monitoring. Similarly, organisations that operate their own geographic boundaries (i.e. not administered by the GSS/ONS) update changes to polygons in multiple file formats (e.g. Shapefile, GeoJSON). GPS data has given organisations granular detail on people's movements (with consent), and footfall infrastructure user counts give real-time user count / capacity updates. Web-scraping tools and the HTML5 Geolocation API have allowed online activity to be spatially located (Cases 2 and 4). Finally, there are multiple instances of qualitative data being given a spatial attribute, such as survey data, or geolocation being extracted from narrative description such as a grant report, case note or object metadata.

Secondary data

A more limited range of secondary data is used by the cases studied, and often to contextualise and enrich primary data or make a loose inference about stakeholders / geographic areas. Widely used is the English Indices of Multiple Deprivation (IMD), a composite index that gives an approximation of deprivation at Lower Super Output Area (LSOA, $\bar{x}$ 1500 people or 650 households). The IMD was used at varying spatial scales, and individual sub-domains, average rank, average score and % of LSOAs in an area (such as Local Authority) were all used by organisations. In some cases, (such as Case 9), the IMD was rescaled to fit custom boundaries. Publicly available data gathered by public health teams, the previous census or government(s) was frequently used to provide information at relevant spatial scales that gave insight into the demographic composition of areas, or pertinent

health concerns that need addressing. Geodemographic classifications, such as the Output Area Classification (despite being nearly a decade old) and Experian's Mosaic were used to infer interests and behaviours of donors and stakeholders. There was one instance of voluntarily gaining data from private sector providers (Case 2) and limited evidence of NPOs purchasing specific data sets from private sector providers, with the exception of individual projects that require bespoke insight (such as the purchase of consumer spending data from Kantar, in Case 15). The only secondary data pertaining specifically to the nonprofit sector was data accessed from 360Giving's GrantNav, on the grants given and received by the sector. Notably, none of the 35 cases referenced work involving the Charity Commission's register of charities. Finally, secondary data in the form of boundary files / postcode and GSS/ONS administrative look-up tables proved vital for organisations to easily map their own data and add spatial attributes to postcode data.

Access to data

While access to data was not a central theme of the research and data collection process, it is worth noting several observations that occurred across multiple cases. The ONS Open Geography Portal was widely praised for its comprehensive repository of look-up tables and provision of boundary files in multiple formats. Despite the promises of the Geospatial Commission, interviewees were largely sceptical about its capacity for change and widening access via licensing agreements. Data access depended significantly on the issue that the organisation was concerned with; it is much easier to gather data on the spatial distribution of grants given to youth organisations than on the prevalence of homelessness in a city, for which data is typically provided at the Local Authority level. Where organisational missions aligned, there was evidence of inter- and intra-sectoral data sharing agreements. Case 14 has a close working relationship with the NHS trust for which it raises ancillary funds, and therefore benefitted from access to anonymised data on the spatial distribution of recent births. Three of the five environmental organisations studied are members of the National Biodiversity Network, an independently run membership organisation that collates standardised biodiversity data for individuals, public, private and nonprofit organisations,

and acts as a data intermediary.

5.4 Software and training

As observed in Appendix 1, the majority of organisations studied use a combination of tools to analyse and visualise their data. Tools used range from those that are designed with spatial applications in mind, to generic data visualisation and analysis languages and packages. This section gives an overview of the tools and software used, and training initiatives employed by NPOs.

GIS and spatial tools

Esri is the market leader in GIS software, web applications and data management. It provides desktop GIS software ArcGIS, ArcGIS Server, ArcGIS Online, and a range of mobile capture tools (such as ArcGIS Collector and Survey123). Despite Esri offering a significant discount for nonprofit organisations and tiered enterprise agreements, the cost of access makes it prohibitive for small and medium sized organisations; all organisations studied that used Esri products spent over £10m p.a.. Esri enterprise agreements allow large organisations to ensure formats, storage and analysis are unified and speak to a 'single source of truth' aspiration (see section 6.4.1), and are not fragmented within server or file format silos. In addition, interviewees had high praise for the support and training offered by Esri as part of holding an enterprise agreement with them.

While 8 of the cases studied use Esri products, 9 cases (including several that use Esri tools) use QGIS, a free and open source (FOSS) desktop GIS that integrates with a range of 'community built' GIS plugin packages and applications. Users are reliant on external consultancy and online user support (such as GIS Stack Exchange), however, its powerful analytical and visualisation capacity, wide range of plugins (such as OpenLayers, QGIS2Web, and Traveltime) and low financial and technical barriers to entry make it a popular option for nonprofit organisations. However, a limited number of interviewees displayed some concern over the security of internal data when using open-source software and 'community' developed packages. Several interviewees referred to the ideological appeal of using free

and open source software and languages (QGIS, PostGIS, R, Python), even if they are not the preferred organisational tools.

Several environmental organisations run internal GIS web browsers that either use a proprietary programme (such as Earthlight), or as with Case 34, use a custom-designed internal browser to meet the organisation's needs. Case 34's browser is used by ~800 staff and volunteers to maintain habitat records, provide advice to landowners, support illegal wildlife crime investigations and feed into planning development consultations. Staff and volunteers are supported by a dedicated GIS trainer, who delivers remote internal training on ArcGIS and the organisation's internal GIS browser.

When organisations lack the technical or financial capacity to use the above tools, or where spatial data is used to serve the needs of discrete pieces of work and not as part of routine service delivery, applications such as Google My Maps and Batchgeo take tabular data that contain a postcode or coordinate and create a 'pin cushion' map, such as Figure 15 (map at top of section). Google My Maps in particular is a useful tool for customisable point / line / polygon maps that can be widely shared and easily updated. However, My Maps' limit of 10 layers with a maximum of 10,000 data points is frustrating for organisations that wish to use My Maps for large-scale projects. As Johnson and Sieber (2017) note, more advanced users that have ongoing mapping needs will likely use the Google Maps API for increased capacity and flexibility. Notable for its low technical barriers is OCSI's Local Insight platform, used by three of the grantmakers studied (26-28) to gain access to secondary data on a variety of socio-economic and demographic indicators, and overlay their own point data or polygons.

Data visualisation tools

Of course, the use and analysis of spatial data doesn't necessarily entail the use of GIS or spatial visualisation at all. In many cases, NPOs use Excel to sort, aggregate and visualise members or grant applicants by postcode area. Despite not being visualised geospatially, this is still spatial analysis as the measured variable is spatial distribution. Organisations that solely used Excel tended to be smaller in size or early on in their data maturity journey. For several organisations, business intelligence / data analysis and visualisation tools that aren't intended solely for visualising spatial data, but have capacity to do so, meet operational

needs. Tableau, Microsoft's PowerBI and Alteryx were all used to analyse and visualise data. The three organisations that use Tableau (Cases 4, 15 and 29) spoke highly of its intuitive user interface, capacity for presenting multiple interactive visualisations in a dashboard and smooth handling of a variety of spatial data. For Cases 4 and 29, dashboards that give staff (and for Case 4, external stakeholders) a live picture of operations are run on multiple Tableau dashboards that combine spatial visualisation with other forms of visualisation. For organisations that use Tableau, and have considered it, the cost of individual licences is considerable and can prove prohibitive. However, the business case for purchasing licences for Tableau may be stronger than for an Esri product, as Tableau can serve a wider variety of visualisation needs for staff that work across campaigns, research, fundraising etc.

Languages

The programming languages SQL, R and Python (and associated GUIs / IDEs) are used for a variety of functions across many of the cases studied. SQL is used for querying data, and in relational database servers. R and Python are primarily used for cleaning and analysing large scale structured and unstructured datasets, and not typically used for generating spatial visualisation outputs. There was a sense that the demand for R skills in particular is growing within organisations that use it, as a wide variety of R packages exist for undertaking reproducible data analysis in R Studio. Case 2, a large animal welfare NPO, has launched an internal R training course to encourage a wider body of staff to use R in day-to-day operations.

Fragmentation

The wide variety of software and tools discussed in this section and named in Appendix 1 surpasses that which would be expected following a reading of the literature discussed in chapter 2. In many cases, organisations use tools for individual purposes, leading to fragmented data storage and formats. To overcome some of this fragmentation, the software Feature Manipulation Engine (FME) can be used. FME provides a platform for translating and transforming spatial data between formats, including between geometric and digital formats. It also allows users to consolidate a wide range of data types from diverse sources.

5.5 Organisational capacity

Interviewees were asked about their role and position within the organisation, and existing capacity for spatial data use. Job titles varied significantly, although most roles involved either oversight of impact and information functions or management and responsibility for GIS functions. Unsurprisingly, capacity varied depending upon whether GIS and spatial data are routinely used or used for individual projects / case uses. In smaller organisations, or organisations where spatial data use is infrequent, one person was typically responsible for providing spatial data and GIS input or support. In some cases, interviewees' defined roles did not include space for data-based activities, and therefore work is not prioritised, despite strong organisational support. This was the situation with Case 5, a small umbrella body that uses spatial data in project work, but also maintains a public asset map of organisations and activities:

"They're [CEO and trustees] very on board, the CEO likes it, the trustees are always happy with it, funders like to have a look at the kind of activity that's happening as well. We just have a capacity issue, as I said we're 9 people, I'm the only one who actively works ever on the map and that's not actually part of my role in any paid capacity so it's just when everything else is done and I can"

Active Communities Connector, Case 5, Umbrella Body.

External support from volunteers, academics and consultants is sought when organisations lack internal capacity. Case 7's annual update of the location of church members (see Figures 17 and 18) is voluntarily undertaken by a member who is a risk analyst for an insurance firm. The voluntary role fulfils part of the volunteer's CPD record and their work is presented at the church's annual strategy day. Academic support is provided to the research team in Case 13, a large healthcare charity, through a longstanding partnership between the NPO and local universities. In the case studied, a full-time PhD project developed an open-source 'floating catchment area' tool that the NPO could use ongoing. Private consultancy from a nonprofit data analyst was sought by Case 3 to undertake primary and secondary data analysis, and work with staff members to build long-term capacity.

While NPOs increased skills and capacity by developing internal training schemes and engaging with external training schemes and support, there were several instances of staff using valuable skills learnt in previous roles. The Senior Data Analyst from Case 17, a large homelessness NPO, transferred to the organisation from an analyst role at a large supermarket chain, therefore possessing a geospatial analysis skillset. The specific role didn't exist prior to their employment at the NPO, and the transfer of knowledge and skills has been fundamental in changing operations and organisational culture towards data use. Similarly, the research officer from Case 2, an animal welfare NPO, was employed in part due to the skills in R, GIS and spatial epidemiology learnt during their PhD research.

Finally, it is notable that capacity for GIS and spatial data use is greatest in organisations that operate an internal consultancy type service, where GIS is integral to the work of multiple departments across a large organisation. Cases 4, 9, 25 and the large environmental NPOs (cases 31-35) have between 2 and 16 full-time staff who predominantly use GIS in their work for the benefit of the whole organisation. They tend to sit within wider analytical or information support teams. For example, Case 4, a law and advocacy NPO, employs two full-time GIS specialists, who sit within a wider team of 18 researchers who undertake a wide range of mixed data analysis.

5.6 Organisational culture

The existence of an organisational culture towards data use can be a deciding factor in whether a nonprofit organisation uses data to underpin their work (Reynolds et al., 2019). Fostering a culture of data use could range from starting to routinely use data to better understand beneficiaries to adopting data use as an organisation-wide value (Kline and Dolamore, 2019; Data Orchard, 2019). In the cases studied, organisational culture towards data and analytics heavily impacted the complexity and breadth of data analysis. Interviewees were asked about the organisational data culture, and support from trustees and senior management. Organisational data culture refers beyond whether data use is encouraged or discouraged, but whether data use underpins day-to-day decisions, or is used ad-hoc. Are there visible 'data champions' within the senior management team that lead by example, or is data use restricted to individuals who are curious? It also includes attitudes

towards intra- and inter-organisational data sharing, and the freedom staff and volunteers have to innovate and progress data use.

Commitment by trustees and senior management to data use in general, and in some circumstances specifically spatial data use, varied across the cases. Support from trustees often comes when they themselves work or have worked in a sector or role that relies on the use of data and digital technologies. In turn, they expect similar technological progression and case uses in the NPO. Case 6, an umbrella body, operates a trustee pairing programme, where individual trustees are paired with a team to find out about what they do, observe their effectiveness and offer support. Senior leadership support ranged from situations where senior leaders were directly driving progression, to those that required a proof of concept to understand and buy-in to further developments:

Interviewer: "And is this well supported by the leadership team, is it being driven from the top or is it fairly organic?"

Senior Head of Information, Case 29, large Grantmaking NPO: "What can I say about this... yes to an extent, I think we needed to demonstrate the value of it, but once we did then yes we did get the support we wanted, but it needed to be shown rather than talked about, they needed to see some of the stuff in action."

Interviewer: "You had to show the dashboard up on the screen?"

Senior Head of Information, Case 29, large Grantmaking NPO: "Yes a very clunky function version of that and say we have access to this data because of the technologies we're putting in; both tableau and NLP and we've got a new reporting database as well to allow us to do the 'mapping' in a thematic way, so yeah we needed to go through the process of why this is a good thing, even though it's very low cost."

In some cases, such as Case 31, a large environmental organisation, GIS and spatial data use is driven from the bottom up and fragmented across departments. It has lacked the explicit support of the management team as they have not necessarily been aware of its pivotal role. This issue was identified in a recent external review of GIS use, where further senior

management support was listed as an action point in order for GIS use to be championed at management level and for spatial data use to be joined up across quite separate operations.

Organisational culture towards data use, and GIS and spatial data specifically, seems to be strong in organisational structures that position data functions as a separate internal service, in the same way that HR, communications and finance are distinct functions. In the cases that operate an internal consultancy style, GIS is seen as pivotal to the wider organisational operation and not just individual project use cases. Environmental organisations are an example of this, where GIS is seen as pivotal to the work of multiple departments:

> *"The head of our department is very good at making the business case for GIS and data management and so I think our role as a GIS and data department is seen as being pretty essential by the management board. The model is that we're a service department and we provide services to these other departments in the organisation, so we're a key service just like IT or HR you could say"*
>
> *Senior GIS Analyst. Case 34, Environmental NGO.*

A strong indicator of growing organisational support for data use is interest in developing a data strategy or hiring under job titles that explicitly mark data out as a key priority. A good example of this is Case 17, a homelessness NPO that is committing to hiring a Head of Data Strategy to lead the development of a data warehouse and organisational strategy that brings disparate data uses together. Demand is from the bottom up, as staff get frustrated with data silos and poor access and also top down, as senior leadership increasingly request more detailed information about organisational progress.

Finally, several exogenous forces influence an organisation's culture towards data. The first is the arrival of GDPR in 2018, which meant all organisations had to ensure they knew what data they held and where it was. This led to organisations streamlining data processes and storage and developing internal policies which encouraged awareness of data and its role in the organisation. The second key exogenous force is demand from funders, and isomorphic pressures more generally, to better demonstrate impact, become data-driven and ultimately adopt business-like attitudes and data practices. Isomorphic pressures are discussed further

in Chapter 7.

5.7 Conclusion

This chapter has given a descriptive overview of the primary drivers of spatial data and GIS use by the NPOs studied, the data sources and types used, relevant uses of software and related training, organisational capacity, and the organisational culture within which interviewees operate. The nonprofit organisations studied use spatial data and GIS to map assets and administrative boundaries, directly inform service delivery, inform policy and advocacy efforts, and engage stakeholders for financial and non-financial motives. When compared with the 'business drivers' listed by Longley et al. (2015), nonprofit organisations display a distinct set of drivers to both the public and private sectors. Organisations use a variety of primary and secondary data and gather them from a wide range of sources. Primary data includes point data on the location of members and distribution of grants, as well as vector polygon boundaries of an organisation's geographic remit. Secondary data, such as the Indices of Multiple Deprivation and Experian's Mosaic classification are used to gain context and infer interests and behaviours of donors and stakeholders. The organisations studied use a surprisingly wide range of GIS software, tools and languages, with many using a mix of tools for individual needs. Esri's tools, the market leader in GIS software, were most prevalent in large organisations for whom an enterprise agreement with Esri makes sense. Organisational capacity and culture significantly impact the frequency and depth of GIS and spatial data use. In particular, it was striking the extent to which organisations relied on the skills of one or two people, or organisational culture towards data use was driven by a senior leader or trustee.

6. Exploring an epistemological approach to nonprofit spatial data use: constructing knowledge of people and place

6.1 Introduction

This chapter is the first of three empirical chapters (Chapters 6,7,8) that theoretically analyse the use of spatial data by nonprofit organisations. Whilst the whole thesis is concerned with organisations in one way or another (as a consequence of data having been collected at the organisational level), this chapter explicitly analyses the construction of spatial data and its role in organisational epistemology and action. It asks how organisations know, what they know, and how does knowledge help them to act in the world? It primarily responds to research question 1: *How is spatial data used by UK nonprofit organisations to construct and represent reality?*

The soft constructionist perspective adopted by this thesis recognises that there is an ontologically fixed world (thus avoiding a relativist outlook), but that the way the world is described and explained is socially constructed through choices and relationships. This chapter is interested in how nonprofit organisations' knowledge claims are constructed through and by spatial data and spatial media. It asks questions such as: how do NPOs use spatial data and spatial media to build claims about their world? What are the technological and epistemic affordances of spatial data and spatial media for NPOs? In line with the critical assessments of Denis Wood (2010) and other scholars, what 'work' and action do the knowledge claims result in?

These are important questions for theory and practice. From a social constructionist perspective, organisations are held together through shared meanings. For nonprofit organisations, this is evidenced in working towards a shared pursuit, which is underpinned by an objectified stock of knowledge on the issue of concern. Organisational epistemology examines the nature and origins of that stock of knowledge as well as its application. Attending to the epistemic practices of organisations goes beneath the readily accessible exterior to look not just at working practices, but how actors in an organisation make sense of and interpret the world. This sense-making is contingent upon organisational priorities,

narratives, values, and financial constraints and technological and material affordances. With the exception of a few studies that are informed by Human-Computer Interaction or critical theory (e.g. Elwood and Leszczynski., 2013; Bopp et al., 2019) empirical literature on the use of data by NPOs, and specifically spatial data, attends primarily to knowledge *use* and not knowledge *production*. This chapter seeks to unpack organisational epistemic practices by employing established theory on the social construction of knowledge and organisational epistemologies, alongside contemporary theory on mediated (and mediatized) knowledge production, with a specific focus on spatial data and media.

The UK nonprofit sector is in part populated by organisations that have gained their legitimacy and status through a long-term commitment to expert knowledge of a singular issue (e.g. campaigning and single-issue organisations, and not membership organisations). Issue-specific expertise gives them authority to act and influence policy decisions while gaining support (of all kinds) from individuals and organisations who share their values and mission (Hilton et al., 2013; Avner, 2016); ultimately underpinning the public benefit that registered charities are required to deliver. Nonprofit expert knowledge is a key source of distinction from both the public and private sectors (Macmillan, 2013). It is an asset to be exploited by public sector bodies when looking to outsource public service contracts (Macmillan, 2010) or form a partnership with NPOs (Gazley and Brudney, 2007). Therefore, it is important that the bases of knowledge claims which underpin claims of legitimacy are brought into focus and examined as situated knowledge that emerges from what Haraway (1988) refers to as a place of "positioned rationality" (p.590).

The 35 organisations studied in this thesis reflect the diversity of organisational missions found in the UK nonprofit sector. This chapter explores 4 cases in detail by examining the cross-cutting themes of 'people' and 'place'. The four key drivers in Table 6 of nonprofit use of spatial data (mapping assets, directly informing service delivery, informing policy and advocacy, and stakeholder engagement) are underpinned by knowledge of or relations with people and stakeholders. While Chapter 7 looks at the relational work of spatial data and their infrastructures, this chapter demonstrates the importance of knowledge of people to the operations of nonprofit organisations, their ability to command wider authority and deliver public benefit. Secondly, many nonprofit organisations have a strong affinity to a

place; charitable objectives stipulate that an organisation should work for the benefit of a particular geographic community or seek to address an issue that has manifested spatially. Place-based approaches to service delivery are in vogue amongst UK nonprofit organisations, so this chapter explores how expert knowledge of place, and service delivery in place, is constructed and shaped through and by spatial data and spatial media. Organisational resources are finite, and many issues of concern manifest spatially, therefore spatial data are used to prioritise which people and places organisations engage with and invest resources in.

6.2 Theoretical overview

6.2.1 Knowledge Management in the nonprofit sector

The professionalisation of the nonprofit sector is marked by the incorporation of expert knowledge into the everyday operations of NPOs (Hwang and Powell, 2009). This is partly driven by the sector's wider position in the UK's knowledge-based economy, where legitimacy is gained by demonstrating expertise in a particular field or sub-field. This is evident in section 2.2.2, where we see how NPOs are required to demonstrate knowledge both before and after service delivery and intervention. While nonprofit expert knowledge is what distinguishes nonprofits from the for-profit and public sectors (Macmillan, 2013) competitive contracting practices require NPOs to prove their expertise in the face of intense competition. There are also normative pressures for organisations to use their knowledge to pursue best practice and efficient service delivery; networks of professionals (such as the Data Champions programme mentioned in section 2.2.2) foster shared practice benchmarks and an imperative that service delivery must be informed by evidence.

The centrality of specialist knowledge to the operations of contemporary NPOs is evidenced and articulated through the practice and theoretical discipline of Knowledge Management (KM). KM perspectives equip scholars and practitioners to reflect on organisations as socially constructed interconnected systems composed of numerous knowledge forms and applications (Alavi and Leidner, 2001; Tsoukas and Vladimirou, 2001). Knowledge Management scholars typically identify four sets of socially enacted and interconnected knowledge processes: "1) creation (also referred to as construction), 2) storage / retrieval, 3)

transfer, and 4) application" (Alavi and Leidner, 2001, p. 115). Organisational knowledge infrastructures typically rely on Knowledge Management Systems: purpose-built data and IT systems that support and enhance the four organisational processes.

Research on KM practices in nonprofit organisations is less empirically and theoretically developed than for the public and private sector organisations, but still gives a good insight into: awareness and use of KM practices (Turner, 2014); potential KM strategies employed by organisations of different sizes, for whom KM will look very different (Hume and Hume, 2008); and how volunteers share knowledge within an organisational setting (Ragsdell et al., 2014). A significant contribution to nonprofit KM literature is found in Rathi et al.'s (2015) analysis of a survey of 2,700 Canadian and 1,356 Australian NPOs, which provides a comprehensive overview of the type of knowledge held by NPOs. Rathi et al. give five essential categories of knowledge that are held by NPOs (pp. 30-31):

- Knowledge about management and organisational practices within the NPO
- Knowledge about financial, physical, human and intellectual resources
- Knowledge about the community of individuals that represent the NPO, as members, volunteers, donors, stakeholders and any served by the NPO.
- Knowledge about the sector within which the NPO operates, including any domain or specialist knowledge required to achieve organisational goals
- "Situated" or context-based knowledge originating externally (i.e. outside the organisation, community and sector) has the potential to impact organisational operations.

The five categories of organisational knowledge held by NPOs provide scholars and practitioners with the foundation for analyses informed by Knowledge Management practice. However, the type of data (spatial data) discussed in this thesis will be more prevalent in some categories of knowledge than others. Therefore, the analysis in this chapter will use the cross-cutting themes of *people* and *place* to guide the discussion.

6.2.2 Turning to organisational epistemology

Of the four components of KM, it is knowledge creation and application (and less so storage and transfer) that are the concern of this chapter. It is possibly a feature of KM's orientation towards practice, not theory, that means organisational knowledge creation is rarely discussed in terms of epistemology (Seirafi, 2012) – i.e. how organisations come to know, what they know, and how do they construct their knowledge? Again, this does not deny the existence of an independent and material reality (ontology), but it looks to understand how organisations come to construct their knowledge of reality (epistemology). This chapter draws on the work of organisational theorists Haridimos Tsoukas (1996, 2001, 2005) and Kasra Seirafi (2012) to develop an epistemological model (Figure 19) of organisational knowledge that accounts for the socially constructed and mediated nature of organisational knowledge, its entanglement with real-world application and situated judgement, and the role of feedback loops in destabilising and reshaping knowledge.

The possession of organisational knowledge is the third point on a continuum of understanding, with 'data' and 'information' being the first two points. Data is the "ordered sequence of any given items of events" (Tsoukas and Vladimirou, 2001, p. 976), such as the index of a book, or a data frame with ordered rows. The data is turned into information when there is a context to it and the reader can interpret it. For example, the data frame relates to the work of an organisation and there is a relation between data points. Finally, knowledge is when meaning is linked to the use of information, so the reader can exercise judgement in applying the information in a particular context (Tsoukas and Vladimirou, 2001). This thesis adopts Tsoukas and Vladimirou's definition of organisational knowledge:

"*Knowledge is the individual ability to draw distinctions within a collective domain of action, based on an appreciation of context or theory, or both" (2001, p.979)*

Figure 19 provides a schematic representation of this definition which accounts for mediating and contextual factors in the construction (section 1) and application (section 2) of organisational knowledge. It is adapted from Seirafi's (2012) schematic model to account not only for dynamic feedback loops in organisational learning but the mediating role of data

and technology (labelled (1) affordances). The schematic represents organisational epistemology as comprising 5 interrelated parts:

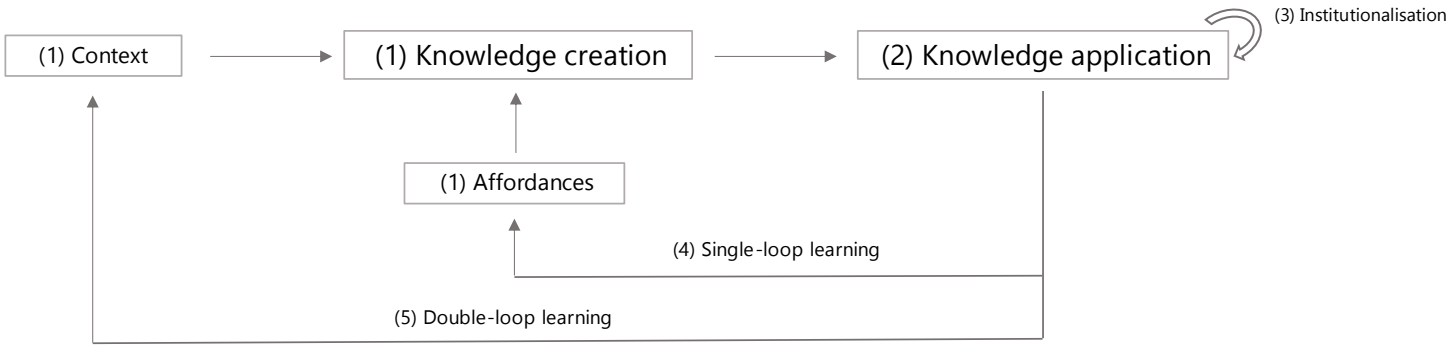


Figure 19: Schematic diagram of organisational epistemology (adapted from Seirafi, 2012)

Knowledge creation (stage 1): the data and information gathered by organisations are contingent upon and shaped by context and affordances. Appreciation of context and affordance in knowledge creation helps us see past individual data points and recognise the wider data assemblages that bring them into being. The context surrounding knowledge creation includes (among other things) the assumptions, ideologies, master narratives, politics, and material organisational constraints which hinder and enable the production of data. Appreciation of context moves us from looking at data sets to data settings and acknowledging the local technical and social settings in which data are made (Loukissas, 2019). Affordances refer to both the affordances of technology and media as interfaces and tools, as well as the mediated and mediatized nature of data and its display and access. In the following chapter we see how spatial data and spatial media afford ways of knowing by privileging one view over another, often as a product of the imagined affordances that affect how users come to interact with spatial dashboards and interactive platforms (Nagy and Neff, 2015). Without returning to either technological determinism or a full Latourian view, the concept of affordances acknowledges the agency of the non-human in constraining or enabling action.

Knowledge application (stage 2): knowledge creation and application are two sides of the same coin. Information becomes knowledge when it is applied in a setting, with an appreciation of the particular context. The definitions of knowledge used in this thesis, and organisational knowledge specifically, emphasise the application of information to draw distinctions as central to its definition (Berger and Luckmann, 1969; Tsoukas and Vladimirou, 2001; Gergen, 2015). In practice, this means using data and information to split the world into *this* and *that* and refine our understanding of the constituent parts of the phenomenon of interest. Knowledge is applied in a local setting (both geospatially and thematically), and its application is shaped by and contingent upon awareness of the local circumstances, as well as deeply situated ideologies and master narratives. Therefore, between stages 1 and 2, we can see discretion in how and where knowledge is applied.

Knowledge institutionalisation (stage 3): the repeated application of knowledge leads to it becoming institutionalised, or in Berger and Luckmann's (1966) framing, made part of objective reality. As with our society and institutions, organisations draw from a 'stock of knowledge' which take the form of generalised responses to certain situations, or knowledge that is deep-seated and rarely questioned. The loop in Figure 19 represents the application of knowledge that is drawn from the collective stock and not constructed afresh every time. In so doing, this reinforces the assumed 'truth' of knowledge.

Single-loop learning (stage 4): Seirafi (2012) draws on Argyris's (1976) single- and double-loop theories of action to demonstrate the iterative learning process that occurs following knowledge application. Single-loop learning occurs when constructed knowledge fails to adequately explain or allow an organisation to act in the world. Therefore, an iterative feedback process occurs where small changes are made to the variables of interest, albeit within the affordances of technology and media which communicate the (un)successful application of knowledge.

Double-loop learning (stage 5): Whereas in single-loop learning, knowledge creation is changed in incremental steps in response to its application, in double-loop learning the underlying assumptions, paradigms, and perspectives are shifted. For example, an organisation may orient itself towards a new issue of concern or change its value set. Single-

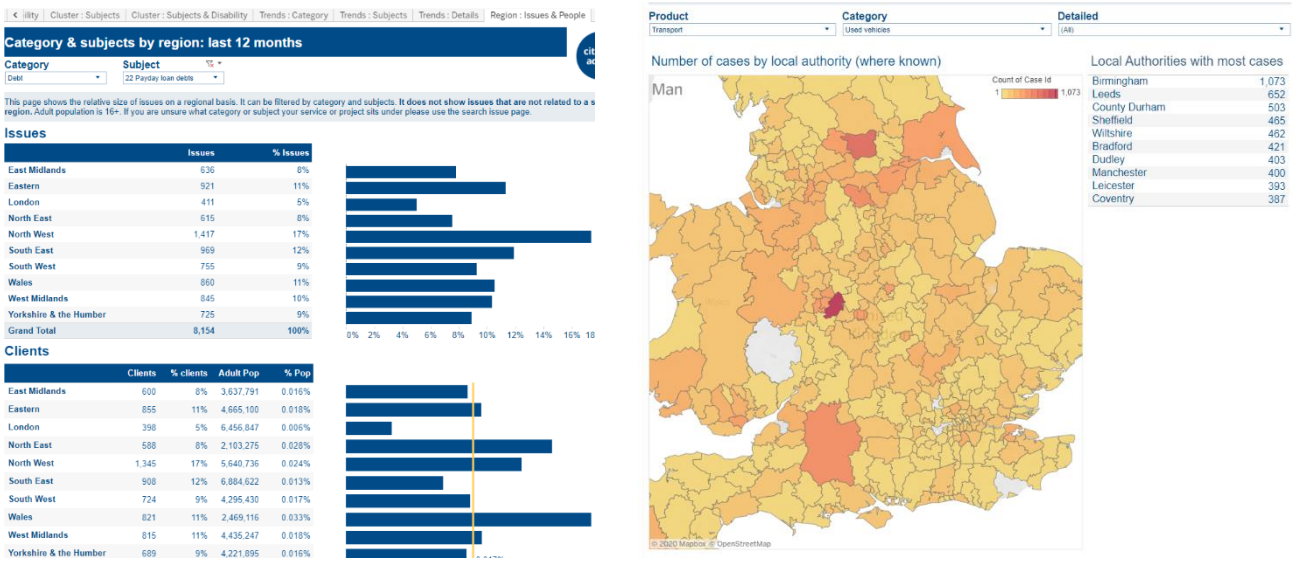
and double-loop learning indicate that the construction of knowledge is contingent on underlying assumptions and that there is no universally valid organisational knowledge, but contextualised knowledge that is not static and is open-ended (Sierafi, 2012).

In the next sections of this chapter, the organisational epistemology schematic is used to show how organisations construct knowledge of people (6.3) and place (6.4) and prioritise the application of knowledge (the movement from stage 1 to stage 2). The interdependence between epistemology and ontology in organisations means that "knowledge then not only is something that can be found in the organization but something that constitutes the organization. This relevance of knowledge can be revealed, if we show how knowledge is not only the mere representation (of an objective world) but is inherently connected to meaning and action" (Sierafi, 2012, pp.72-73).

6.3 Constructing knowledge of people

6.3.1 National law and advocacy organisation geolocating web queries (Case 4)

Case 4 is a national law and advocacy organisation that works through a large number of federated autonomous branches. Ascertaining data on service users and the queries they present with at the local branches is fundamental to ensuring their services are relevant and resources are adequately distributed. All local branches use a universal case management system, which visualises data on both the issues that service users present with and details about their service users, such as where they come from. This data is gathered by the national organisations and then aggregated to fit geographies beyond the scale of the individual branches. The data is compiled and fed back to individual branches to show the wider geographies and national trends and policymakers through dashboards showing the types of queries presented in an area. Holding a centralised database facilitates reports and dashboards concerning higher-level geographies such as Parliamentary constituencies (an average population of 72,200 people in England), which are then presented to MPs to demonstrate real-time concerns in their area. Publicly, the data is dynamically displayed using Tableau dashboards, for example showing the prevalence of payday loan concerns by region (Figure 20) and queries regarding used vehicles by Local Authority (Figure 21).



Figures 20 and 21 : Prevalence of payday loans by region and queries regarding used vehicles by LA

We can use the constituent parts of the organisational epistemology framework above (Figure 19) to identify the socially constructed nature of Case 4's use and application of data.

The data and information gathered by staff are contingent upon and shaped by context and affordances (stage 1 of Figure 19). **Contextual** factors include (among other things) ideologies, master narratives, politics, and material and organisational constraints. At the time of interviewing, Case 4's strategy and master narrative centred around a mission of "helping people find a way forward" and a culture of being "inventive, responsible and generous", to overall become one seamless service (source: Case 4, 2015-2020 strategy document). The cultural values of being inventive and generous are evident in Case 4's desire to develop data pipelines that "give back" to individual branches. We see significant material and organisational constraints when the physical infrastructure of the individual branches is examined, and a reminder to look beyond the data set and towards the data setting and the localised production of data (Loukissas, 2019). Data are only collected where a local branch exists with staff and technological infrastructure to capture the data. Therefore, the appearance of 'demand' for particular services or queries is widely impacted by supply:

"If you know Slough just outside London, we don't have a [local branch] in Slough so if you looked at the map and saw that Slough had very low numbers of debt problems it is because we don't have an office in Slough."

Head of Data, Case 4, Law and Advocacy NPO.

The location of local branches is often shaped by historical and contemporary funding patterns (themselves, a social construction), and while there is national coverage of local branches, individual branches serve varying numbers of people due to their location being rural or urban, or there being more than one branch in an area. A further supply-side consideration that shapes the collection of data is the subject of advice offered; local branches offer a range of specialist advice but do not offer advice on healthcare matters, therefore data would not capture health-based concerns. Finally, there are situations where data is collected, but material constraints and localised priorities mean that staff do not have the time to undertake detailed data analysis to gather knowledge on their geographic area of concern.

Alongside context, the **affordances** of technology and media shape the construction of data (stage 1 of Figure 19). The term 'affordances' is used to describe how technology and media

"invite certain actions and shape conditions of possibility" (Fussey and Roth, 2020, p.5). Case 4 uses a custom recording system that records details about the individual client and combines standardised classifications and free text about the issue and advice given. Classificatory databases are often required to reduce the world into an intelligible order but divide up the world into predetermined categories (Bowker and Star, 1999), that may result in either forcing users to "operate in the image of the infrastructure" (Bopp, 2019, p.52) or new residual categories being formed.

As with any proprietary software, Tableau, the business intelligence software which allows staff and volunteers to visualise and interrogate data on the issues clients present with, is limited in function by the capabilities baked into its design:

"We had to change Tableau quite substantially to get it to work… we've pushed Tableau's mapping capabilities quite far in order to do this."
Head of Data, Case 4, Law and Advocacy NPO.

The movement from data to information (before its application as knowledge), relies on staff and volunteers engaging with the data and interrogating it in Tableau. There exists significant variation in the extent to which local branches make use of the data, largely due to the attitudes of the local Chief Executive towards data use, and the skills of volunteers. For Case 4 at the national level, there is a strong organisational culture of data use that encourages engagement with Tableau and data analysis.

The definition of organisational knowledge used in this chapter places the **application** of insight at its centre, alongside "the individual ability to draw distinctions within a collective domain of action…" (Tsoukas and Vladimirou, 2001, p. 979). Case 4 demonstrates the application of knowledge through using its ability to aggregate data from local branches to the geographies of individual parliamentary constituencies:

"So we did a big campaign about universal credit and we wrote to MPs to say in your constituency [Case 4] have helped x thousand people with universal credit in the last 12 months, and that's not something that anybody could do locally because in a constituency there might be more than 1 [local branch] operating which might operate across two or

three constituencies, so we are able to aggregates [the data] up and then shift or cut it slightly differently, which you can't do locally."
Head of Data, Case 4, Law and Advocacy NPO.

Knowledge is selectively utilised for individual or specific campaigns that may challenge government narrative or policy, and the unique insight at the national level gives Case 4 authority and legitimacy to speak on behalf of the individual local branches. As Case 4 acts as a support organisation to the individual branches, (constructed) knowledge of the types of queries facing local branches is used to deploy finite support resources to the areas that are facing the greatest demand or lack capacity.

Stage 3 of the organisational epistemology (Figure 19) is the **institutionalisation of knowledge** that occurs when it is repeatedly applied and comes to form the stock of knowledge that becomes deep-seated and rarely questioned. The interview with the Head of Data at Case 4 demonstrated how the long-term construction and application of knowledge has led to widely-held institutional truisms such as:

"We see a greater proportion of people from poorer areas [than the average], we see slightly more women than men, we see more disabled people than the national average, that sort of thing.."

Q (JB): "What difference does that make to you as an organization, knowing that people from a poorer background come to you for example?

A: "To be honest that's pretty well established, everyone who works in the organisation knows that, but I guess [having the data means] we can prove it, it makes the case."

The construction and application of knowledge is a dynamic and iterative process, with **single-loop learning** (Stage 4, Figure 19) occurring where current knowledge construction processes do not adequately facilitate organisational action. There are two notable examples of Case 4 undertaking single-loop learning. The first is the sampling of IP addresses to identify the latitude and longitude of the user. The HTML5 geolocation API gives the location of the user, combined with the time of day and the areas of the website visited, offering a

powerful real-time picture of the queries that people need answering. This novel epistemic practice is in response to a significant increase in visitor numbers to the website (12 times as many people receive advice via the website as opposed to in-person (source: Head of Data, Case 4). In addition, it gives an aspatial service a spatial positioning to help supplement the gaps in the data previously noted due to the uneven provision of local branches. In the long run, this information will be applied to the provision of physical vs online services, as Case 4 looks to allocate resources optimally.

Figure 19 shows single-loop learning as being subject to the affordances of technology and media. In this case, the HTML5 geolocation API requires users to give their permission for data to be collected, which they may deny. To maintain trust and complete confidentiality, Case 4 will also not collect data on sensitive topics (such as immigration matters, ending a relationship, and gender-based violence).

The second instance of single-loop learning is found in the development of Natural Language Processing (NLP) capabilities to interrogate the textual data found in individual case notes. This work could identify emerging issues that need to be added to the classification system, or areas that should be a policy focus for the organisation.

Finally, **double-loop learning** (Stage 5, Figure 19), refers to a shift in underlying assumptions, paradigms, and institutional perspectives. The interview with the Head of Data of Case 4 took place in 2018, whilst Case 4 worked towards its 2015-2020 strategy. The strategy contained a strong epistemic focus; improving the evidence and insight basis at national and local levels, delivering continual improvement to services offered, and measuring real-time outcome data as routine. The Head of Data spoke of a desire to increase the use of data by staff and volunteers, and this is reflected in the updated 2019-2022 strategy, which places the importance of data and technology to the organisation's service delivery in a way that is not seen in the previous strategy. This double-loop shift will in turn impact the context, such as the values and priorities, under which knowledge is constructed through and by spatial data and media.

6.3.2 Arts and culture organisations and mediatized knowledge of audiences (Case 10)

Arts organisations routinely make use of audience data for marketing purposes by 'segmenting' it: "separating a group of customers belonging to the market into smaller groups of customers with commonalities such as similar needs, wants and behaviours normally defined within the boundaries of geography / location, socio-demographic profiling, and certain customer behaviours" (Kottasz and Prestini, 2020, p.245). Case 10 is an arts and culture organisation that fulfils a unique role in the UK's arts data ecosystem. It is commissioned by a non-departmental public body (NDPB) for arts and culture to deliver an audience segmentation tool that brings together a range of data, allowing the culture and arts sector to understand their audiences fully. Over 800 arts organisations contribute two types of data to Case 10: automated feed of ticket data, including information on the art form, category of ticket and address (inc. postcode) of the customer. They also undertake surveys, capturing data on age, ethnicity, sex, satisfaction, and motivations amongst other variables.

This data is aggregated by Case 10 to gain a nationwide understanding of arts audiences. The ticket sales data is combined with wider cultural survey data, proximity to cultural provision data, and Experian's Mosaic geodemographic segmentation to develop a specialist audience segmentation classification. Based on ticket sales address data, arts organisations can analyse their data according to the 10 audience segments, and contrast their audience data with wider trends for particular art forms and geographic areas. Organisations are encouraged to use the data to engage with groups beyond their normal audience members. If they are charities, they can deliver public benefit by opening up their offering to deprived and culturally underserved communities. Case 10 is a charitable company and operates a trading subsidiary that undertakes bespoke audience and segmentation analysis for arts organisations.

The use of audience segmentation has received critical attention, (e.g. Ashton and Gowland-Pryde, 2019), yet stops short of fully deconstructing epistemic practice and revealing the heavily mediatized nature of audience segmentation in the way possible with the organisational epistemological framework.

The **context** (stage 1 of figure 19) that informs **knowledge creation** in Case 10 includes an organisational mission to "*transform the relationship between the arts and audiences, for the health of the arts sector and the public good".* It aims to achieve this by enabling "*cultural organisations to use our national data to increase their relevance, reach and resilience"* (source: Case 10 annual report 2018). The process of knowledge creation, which leads to greater insight for arts organisations is therefore central to the mission and public benefit of Case 10. It is an unusual example in that data and a spatial understanding form the backbone of their work and public offer.

While Case 10 is an organisation that is legally and operationally independent of other arts organisations and displays a diverse income portfolio, it operates within an organisational field that it is both shaped by, and plays a role in shaping. It receives substantial support from Arts Council England as a designated 'Sector Support Organisation' and views this designation as a "*significant vote of confidence in the [audience segmentation tool] and [Case 10] more broadly*" (source: Case 10 annual report 2018). In addition, two trustees of Case 10 sit on Arts Council England boards, and while there is no suggestion of undue influence (Case 10 takes great care to ensure this doesn't occur), there is substantial evidence that board interlocking results in the spread of best practice, better governance, and a greater likelihood of receiving larger grants (Bloch et al., 2020; Paarlberg et al., 2020). It is, therefore, a reasonable assumption that Case 10 will be influenced by the values and priorities of organisations with which it shares board members and are found in close proximity within the arts and culture institutional sphere (an institutional approach is developed further in Chapter 8 of this thesis).

Context also features organisational constraints which prohibit knowledge construction. Case 10 collects both survey data from arts audiences, and box office data, but does not read across them or link them due to GDPR constraints. This may be because permission has not been sought by the data subjects to link the data, or doing so would be deemed too intrusive. However, by not being able to read across the two data sources an extra dimension of the audience base is lost.

The organisational epistemological framework takes account of the **affordances** at play in shaping the construction of data. The primary affordance at play in Case 10's knowledge

construction process is that offered by the mediatized data which underpins their arts-specific audience segmentation categories. While Case 10 uses a wide range of primary and secondary arts data to develop a bespoke segmentation tool, Experian's Mosaic geodemographic classifications provide the basis for the categories and the geocoding.

Experian's Mosaic is a UK wide geodemographic classification system that distils over 450 input variables drawn from over 850m source records relating to ~50m adults in the UK down to 15 'groups' of people, with 66 sub-types. For example, classification B "*Prestige Positions"* is broken down into five subgroups, such as "*Alpha Families - High-achieving families living fast-track lives, advancing careers, finances and their school-age kids' development"* (Experian, 2019). These groups and subgroups will be geocoded, so a single postcode can be tied to a classification. The 450+ input variables include credit referencing and other financial data that is 'brokered', a range of socio-economic variables, property information, and survey data such as the British Household Panel Survey and survey data on consumption and media engagement trends. Experian's Mosaic represents what Couldry and Hepp (2017) term a process of mediatization, where phenomena are datafied and then recursively mediated through layers of analysis and classification before being presented as objective truth.

A critical reading of segmentation as a classificatory practice would reveal further affordances. Ashton and Gowland-Price (2019) present audience segmentation practices as imbued with the politics of their originating body and capable of reinforcing negative stereotypes. In addition, classificatory practices necessarily define boundaries around people and thus exclude some but include others. They also do not account for transitions or changes in tastes and movement between classifications and segments that occur outside the time frame of the core data sets being updated.

The audience segmentation dataset and platforms are **applied** by both Case 10 when undertaking research and bespoke consultation and the wider arts community. Figure 22 shows an example of a web application developed by Case 10 that uses segmentation. It shows the distribution of the 'Commuterland Culturebuffs' audience segment around Bath, an affluent group that make up 11% of English households and are keen consumers of culture, but with leanings towards heritage and more traditional art forms.

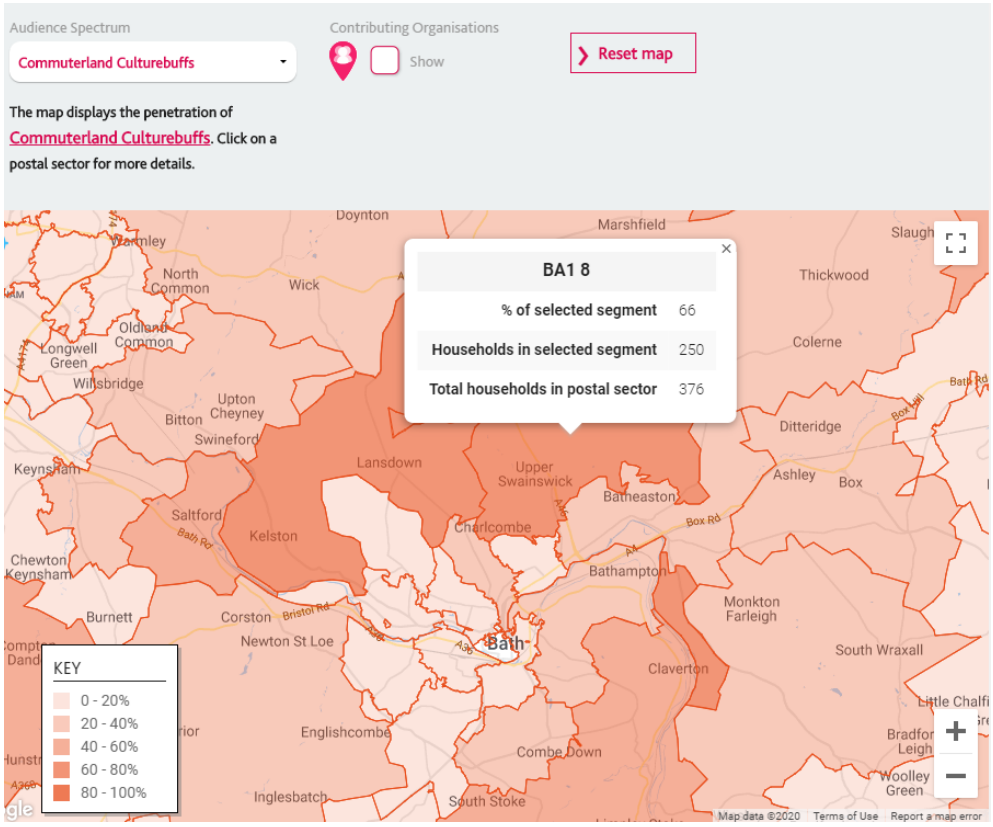


Figure 22: Distribution of audience segmentation class (Source: Case 10)

The impact of affordances and mediatization doesn't necessarily render the audience segmentation tool untruthful and without utility, but it should instead be recognised as socially constructed. Geodemographic classifications gain their nomothetic utility from making truthful explanatory and predictive claims about people based on their location. Proponents of geodemographic classification, such as Webber and Burrows (2018) claim that the type of neighbourhood a person lives in is often as good a predictor of their behaviour than any single demographic variable, and individual postcodes within the same taxonomic category tend to be more uniform than individuals grouped based on a one-dimensional measurement such as age, gender or occupational status. For arts organisations, knowing where their audiences come from and consequently, their inferred interests and tastes, allows them to ensure their content is in line with their audience's interests. In addition, the aggregation and classification of audience data according to population level data means small arts venues can overcome challenges of data privacy and spatial scale and understand their current and potential audience through spatial interpolation.

Case 10 uses the data to advise arts organisations regarding their current offer to audiences and develop strategies to reach different audience groups. Case 10 recognises that the arts are heavily socially stratified, and therefore act in line with their stated public benefit and advise organisations on how to engage the currently disengaged. However, there is a slight financially-driven paradox with the public benefit requirements of many organisations that Case 10 works with, and therefore Case 10 by extension. Arts organisations use geodemographic data to refine their offer to drive ticket sales from their regular audiences. In addition, many receive public funding which comes with the requirement to drive engagement from 'hard to reach' groups that typically wouldn't engage with the arts. Consequently, the application of the geodemographic insights is often not applied to 'middle Britain':

"There's a real paradox around it: we often find ourselves talking to people saying there's a middle of the population that you are missing. You realise you need to go and reach the hard to reach and obviously you are bringing in the regulars because they make you lots of money, but what about middle Britain who might go to the theatre once a year or less and who are persuadable, but you have to go to them to give them a reason to come."
Research Director, Case 10, Arts and Culture NPO

It is the heavy socially-stratified nature of the arts that represents the most heavily **institutionalised** knowledge in Case 10. It was frequently referenced in the interview and organisational documents and therefore clearly forms part of the 'stock of knowledge' which guides the ongoing application of knowledge and approaches to knowledge construction. There were other truisms or rules of thumb that guide understanding, such as:

"So typically 80% of an arts audience tends to come from within a 30-minute drive time generally speaking, unless there's something weird going on."
Research Director, Case 10, Arts and Culture NPO

The identification of **single-loop learning** in the organisational epistemological model is especially clear in cases of recursivity amid deep mediatization. Individual arts organisations use the audience segmentation classification developed by Case 10 to classify their data and

develop their offering. Data is then captured on the audiences that attend, it is classified and fed back into the redevelopment and refinement of the segmentations over time. There is, therefore, a recursive nature to the data used, which Hepp (2019) places as a core feature of mediatized knowledge construction, whereby data processing algorithms are "reapplied to the social phenomena they collect data on and through these recursive loops they are themselves an influential factor in the transformation of social phenomena" (p.11).

Finally, we can observe the process of **double-loop learning** at two scales in Case 10. An organisational level of learning is outlined in Case 10's 2018 annual report, where the strategic decision to change the activities of its trading subsidiary was taken to ensure better alignment with the aims and objectives of the charity. This involved moving away from distributing marketing materials, and towards using data-driven decision making to strengthen the cultural sector. The trading subsidiary also developed a new financial model which meant it would be better able to financially support the charity.

The second level is at the institutional level (discussed further in Chapter 8). Case 10 occupies a unique position in operating as a form of quasi-infrastructure organisation for arts organisations. Its mission is to not only be a "trusted custodian of shared data" (source: interview with Research Director, Case 10) but to encourage a widespread shift in institutional values and priorities in the arts sector, where data-driven knowledge construction is seen as central to the activities of arts organisations. A widespread shift in epistemic and operational practice would change the arts sector to a degree where the construction of Case 10's knowledge would be situated amongst a radically different context (Stage 1 of Figure 19) and therefore shift its own epistemic practice. For example, as arts the organisations that Case 10 work with become more innovative in their use of data, the demands placed on Case 10 for more advanced analytical outputs will lead to deeper insight.

6.4 Constructing knowledge of place

6.4.1 Knowing place through spatial dashboards (Case 29)

Interest in 'place' amongst UK grantmakers has grown following recognition of unequal distribution of resources and impact of government austerity, combined with a renewed emphasis on localism in policy discourse (Taylor and Buckly, 2017). For Case 29, a national grantmaking NPO with a strong emphasis on delivering at the community level (>80% of grants were for £10k or less), delivering impactful grants requires an expert understanding of not only community need but the location of their approximately 18,000 live projects and their thematic areas. Historically, local funding officers would have no consistent way of assessing the current spatial extent of grantmaking in their designated geographic area and would rely on static updates from the central information team. To overcome the piecemeal approach and create a "single source of truth" (source: interview with Senior Head of Information, Case 29) for the whole organisation, a live Tableau dashboard was created (Figure 23), giving staff access to mapped aggregate and point-level data on current, historic and rejected grant applications, displayed at Local Authority and community spatial scales.



Figure 23: Case 29 Tableau dashboard (Source: Case 29)

Case 29 is a large organisation with a wide range of epistemic practices that could be studied. The analysis of Case 29's epistemic practices in this chapter focuses on the use of spatial data in the dashboard and future developments of it, which itself is regarded as a

transformational development in the organisation's knowledge construction and application practices.

Significant contextual factors have influenced the development of the spatial dashboard and the insights it produces. At the time of the interview, Case 29 had a strategy that aimed to put 'people in the lead' (source: Case 29 2017/18 strategic framework); in practice, this meant not creating bureaucratic barriers to accessing grants. This meant the dashboard needed to utilise existing data, and not increase the scope of data demanded in grant applications and project reports.

The volume, variety, and velocity of data collected by Case 29 meets the standard for Big Data. As such, it was a significant technical operation in pulling together disparate data sources and developing the IT and data architecture to provide a whole-organisation view on the data. In addition, organisational buy-in was limited at first, with mixed support from the senior management team. Consequently, a prototype was required to be developed before the full-scale implementation of the project was given the green light.

The Information Team which developed the dashboard operate as part of a 'functional family' within the wider organisation where they work across different directorates and have a whole-organisation overview. This is significant, as it meant they could work beyond siloed departments in developing the dashboard. The Team is also tasked with "*pushing forward*" (source: interview with Senior Head of Information, Case 29) and being reactive and progressive:

> *"Our job is mainly to do as much development as we can pushing boundaries in terms of how much we can extract from the data we've got, what use we can make of it, how we integrate other external datasets, how we create insight using the data we've got"*
> *Senior Head of Information, Case 29, Grantmaking NPO*

The **affordances** of the business intelligence software used to develop and host the dashboard (Tableau) were considered before its use. Tableau was chosen over a competitor tool as it offers a superior mapping function, has an intuitive user interface (UI), easily pulls in multiple variables, and is readily scalable across the organisation. The supportive online user community help negate difficulties with some of the quirks from a software developers'

perspective. Case 29 is taking the development of the dashboard slowly, in part due to the significant cost of Tableau licences which allow developers access to change the dashboard (viewing-only licences are less expensive).

The dashboard is presented at two spatial scales (see Figure 23): the Local Authority level and 'community' level. The 'community' view breaks down areas into the first part of the postcode, plus the next letter. This was chosen over Lower Super Output Areas (LSOAs) as staff on the ground understand postcode areas, and it was believed that they represent a good proxy for demarcating spatial communities. It was also decided early on in the dashboard development that it would aggregate data points (in a choropleth map), rather than just display individual pin-points on the map, as the volume of data would have made it incomprehensible.

The development of the spatial dashboard represents a wholesale epistemological change from previous knowledge construction processes. The desire to present a "*single source of truth*" (source: interview with Senior Head of Information, Case 29) emerged in response to data being given out in response to individual requests, and therefore the scope and depth of insight presented were heavily shaped by the question asked in the data access request. By using an organisational dashboard, everyone in the organisation has the same opportunity to gain insight consistently by accessing a uniform knowledge base.

The spatial dashboard has facilitated a significant epistemological shift in the way **knowledge is applied** and distinctions are drawn between where and how new resources should be deployed. The ability to filter by theme, organisation, and beneficiary type gives funding officers a live and interactive spatial awareness of what is occurring where at the community level:

"We can ask, thematically have we funded something along these lines and in this geographic area before, and at what scale, did it work, is it still going, and do we, therefore, want to fund this? It might be that we actually say look, if you just go 2 miles down the road, you've already got this happening. Previously, funding officers would need to go into the database, find a piece of data and come out, then go in, find a piece of data etc…and they had no oversight or aerial view. Even at its most basic level, it's [the live dashboard] been

transformational. People for the first time are getting a feel for what it is that we're funding, where it is and without having to try and find the needle in the haystack." Head of Information, Case 29, Grantmaking NPO

At the time of the interview, the spatial dashboard had only been in place for five months, and so it was too early to ascertain whether it had led to the **institutionalisation** of knowledge. Despite the recent implementation, there were plans to develop the dashboard's epistemic utility that represented **single-loop learning.** A significant affordance and constraint of the data used in the dashboard is that it displays the address of where the grantee is registered, not where the grant is distributed. Therefore, despite the dashboard's epistemological appeal as a "single source of truth" (source: interview with Senior Head of Information, Case 29) and objective presentation of the world and place, it is hampered by the well-documented headquarter effect (see Mohan and Breeze, 2016).

To negate the headquarters effect, Case 29 is trialling the use of natural language processing (NLP) with Python to integrate each grant's project descriptions and analyse the thematic areas and communities on which the project will be focussed. The same process is applied to geographic areas, so the accountable organisation may be registered in a city centre, but the project description explains that the organisation will work in areas A, B and C. By making use of innovative coding capabilities and tools, not only is the HQ effect negated, but funding officers' mediated knowledge of the spatial representation and place characteristics is more accurate, and the spatial distribution of the grant is better represented. The parsing of project descriptions is unobtrusive and doesn't create a further bureaucratic burden on grant holders.

Following the successful use of NLP to establish where grants are distributed, Case 29 anticipates another period of single-loop learning taking place, where they respond to the data by shifting their grant allocation process to ensure they "*reach the people they want to reach*" (source: interview with Senior Head of Information, Case 29) and that their work is aligned with their core values.

Finally, clear **double-loop learning** is absent in Case 29. This may be a limitation of the data captured in that it focused on a fixed point in time and the implementation of one specific

tool. However, it could also be a product of Case 29's unique sectoral position, where whilst independent from government, it receives strategic direction from it, therefore limiting the opportunity for double-loop learning to occur.

6.4.2 Bridging place history with geovisual media (Case 12)

Nonprofit organisations seeking to work in place must grapple with its various multiplicities and the "thrown-togetherness" (Massey, 2005, p. 141) of its constitution; a place is composed of historically and temporally situated spatial narratives and configurations that intertwine human experience and movement in space. We can identify the socially constructed nature of place (as opposed to space) in this second case study, which shows how digital representations of place come to be constructed through tradition, memories, common experiences, stories and visual representations (as outlined by Knoblauch and Löw, 2017). It reminds us that data are often indexes to local knowledge (Loukissas, 2019).

Case 12, a large arts and culture NPO, launched a project to digitise 10,000 films from archives around the UK to preserve them and make them accessible and viewable to a wider audience. A significant output following the digitisation process has been the development of an interactive map that geolocates the film footage so users can search by location, in addition to theme and date produced. Alongside the interactive map, Case 12 developed a crowdsourcing platform, where users can view geolocated footage, and tag the contemporary location of individual scenes and align the shot with Google Streetview footage to generate a contrast between previous and contemporary scenes. The process of locating the section of the film is shown in Figure 24, showing the film of Southwold High Street from 1963 in the top right, the location in the top left and then the contemporary view from Google Street View in the bottom left. Users can also add comments, describing the scene and any personal connections they may have.

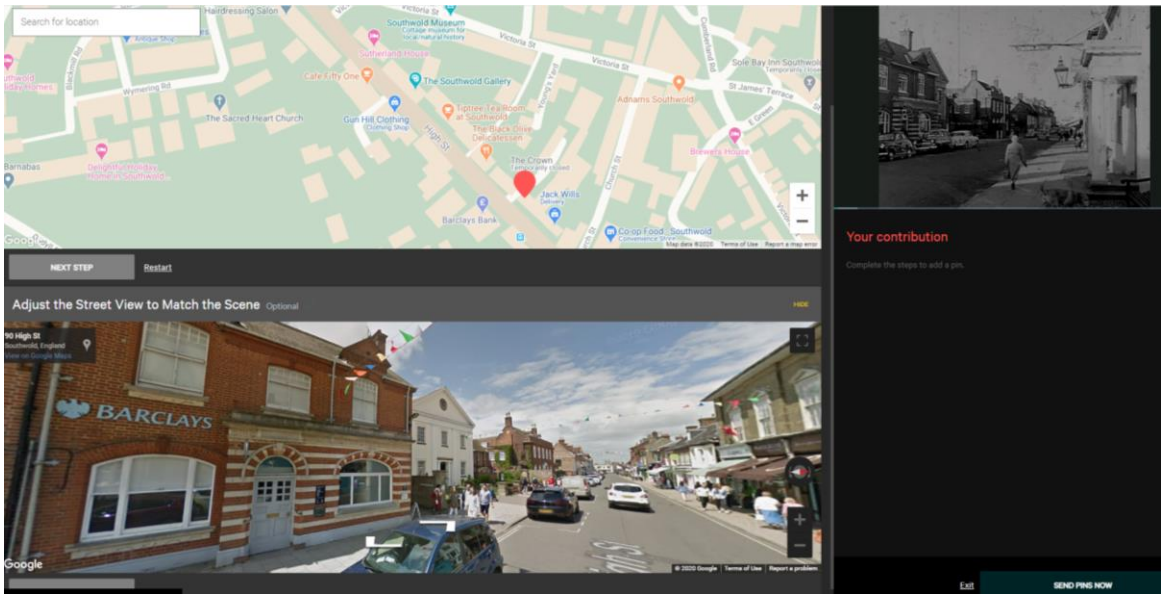


Figure 24: Locating a scene of Southwold High Street, Suffolk from 1963 footage. (source: Case 12)

The knowledge constructed by Case 12 (and that which is crowdsourced) is curated through and centred on engagement with place. It ultimately gives an aspatial digital file a spatial grounding that is tied to the experience of place. A **contextual** factor contributing to the platform's development and accrual of spatial data through geocoding is Case 12's spatial duality: the organisation operates at the national level, yet draws on regional archival collections (which are intrinsically rooted in place) to populate their wider digital platform. One of Case 12's key aims and public benefit offer is to give everyone in the UK the opportunity to enjoy and learn from past, present and future films. As people exist within a place and have a deep attachment to it, place as an engagement tool and visual driver was seen as an obvious way of fulfilling the dual-spatiality that exists in the public benefit statement.

The digitisation and geocoding components both received strong whole-organisational support and subsequently significant resources were allocated to the project. The geocoding of films is extremely resource-intensive, as while the underlying data spine was in place, the identification of film location and theme is a manual process. The films that have been digitised and ultimately were uploaded to the platform represent a very small sample of the total films available (estimated to be <1% of the total), and films were selected to be geocoded based upon their geography and topic to ensure a good spatial and thematic spread. Therefore, while the map looks well populated, the videos shown have been selected

to ensure even distribution. A further limiting contextual factor is that Case 12 does not own the rights to certain film collections, and therefore cannot publish them online.

The ability to gain insight is enabled and constrained by the technical and imagined **affordances** of the platform, dataset, and underlying geocoding capability. Two notable technical affordances facilitate the crowdsourcing process. The first is the development of Pybossa, a free and open-source crowdsourcing framework built using Python with the source code accessible on Github. Pybossa provides the web application's underlying framework, which allows users to geolocate film scenes against Google Streetview (Figure 24). Despite the digitisation and mapping project commanding significant organisational resource, the development of a new crowdsourcing platform was outside the budget's scope. Therefore, access to a free and open-source platform meant the crowdsourcing data could be more granular and comparable to the modern day.

The second technical affordance is found in the crowdsourcing mapping platform itself. For a pinned location to be seen publicly on the map, it has to be pinned ten times by different users, from which the final pin is centrally aggregated. Therefore, the ten-pin rule corrects for human error and misjudgement as well as intentional vandalism. This is a good example of how errors in the construction of knowledge are accounted for and trust is maintained while elevating local knowledge to an expert or truthful status.

In addition to technical affordances, Case 12's mapping platforms rely on imagined affordances. The concept of imagined affordances considers how perceptions, attitudes and expectations towards digital technology and media shape how we approach and interact with them (Nagy and Neff, 2015). Digital maps, particularly Google Maps, which the platform uses, are so ubiquitous and embedded in people's lives that they are comfortable scrolling around or 'pinching in' to move the map around and search for a particular location. People come to the map with the experience and confidence to interrogate it. Interestingly, the design agency that Case 12 worked with in developing the map initially believed that maps were 'old hat' and weren't engaging and therefore favoured a different approach. The counterargument was put forward by Case 12, who believed that the imagined affordances of mapping technologies meant a mapping platform would be enticing and engaging.

The knowledge accrued from the mapping platform has lead to both primary and secondary **applications**. The use of spatial media to explore historical experiences of place engage us in ways many other media cannot; to see moving footage of a place and people that links to our life story is powerful and evocative:

"It's really satisfying to turn a dry dataset into a visually and navigationally engaging experience and I think it chimes with people and impacts upon them, we are turning data into emotion and that is a very powerful thing to do, and I think place does that. You take latitude and longitude which are just dry coordinates and before you know it you have built an interface where people can trace their life story, they can go on the map and say here is a film from the town that I was born in, here is a film from the town I went to university in, here is a film from the town where I met my wife, here is a film for the town where I have lived with my family for 10 years. It all comes from data, and human cataloguing of course, and I find that very satisfying and quite interesting"

Head of Data and Visual Preservation, Case 12, Arts and Culture NPO

Therefore, localised geographical knowledge is used to develop a detailed archive of digitised geolocated film footage and engage users in an emotive and highly interactive experience with place through digital means. Place is used as an entry into a geovisual experience that positions localised crowdsourced knowledge, and by extension, Case 12 as an expert authority on the film's location, and enhances our construction and experience of place. These representations of place confirm McQuire's (2017) contention that rather than 'place' being lost amidst the development of 'aspatial' technological development, new media open up places spatially and temporally as they are "reframed by new potentials for archiving, analysing and retrieving various streams of information" (p.20).

A secondary application is widening engagement beyond London and the South East, which is a long-term KPI. Case 12's 2018/19 annual report states that 78% of engagement occurs outside of London and the South East. The digital nature of the platform means it reaches into communities that typically aren't engaged in Case 12's work:

"Outside the M25 awareness of our mission and our purpose has always been lower, so one of the most satisfying things about the project was when we surveyed uses of the application

it reached people in Aberdeenshire, Belfast, Hull and Cornwall in a way that no other project has ever really done, to be totally honest"
Head of Data and Visual Preservation, Case 12, Arts and Culture NPO

Historical footage of place is given renewed spatial significance, but crowdsourced spatially referenced data engages a wide audience and generates a significant record of peer-verified local history. Crucially, the platform facilitates the delivery of Case 12's stated public benefit, promoting access to British and world cinema to audiences across the UK. It presents a novel way of engaging a geographically dispersed audience through the prism of place in a way that would not be possible without the platform.

The interview with the Head of Data and Visual Preservation at Case 12 revealed **institutionalised** knowledge and truisms, such as "*outside the M25 our engagement has always been lower*" (source: interview with Head of Data and Visual Preservation, Case 12), however, the clearest case of subjective knowledge turning into objective, institutionalised knowledge is found in the mapping platforms verification practices. As Elwood and Leszczynski (2013) state, verification practices bolster the validity of local knowledge as cartographic norms are broken down and crowdsourced and peer-verified knowledge is legitimised and given the same truth value as 'professional' or 'expert' cartography. We see this in the verification practices of Case 12, where a section of the film must be located in the same place by ten different users for it to be added to the map, negating the need for organisational verification yet ensuring it becomes part of the unquestioned, objective stock of knowledge.

The mapping platform is itself a product of **single-loop learning**, as it underwent rigorous user-experience research and design testing before its launch. The single-loop learning that is poised to take place following the development of the geocoded film dataset involves a better understanding of historic film practices. Once the dataset is complete (following crowdsourcing geocoding), Case 12 can begin a data-driven analysis of the types of subjects people were interested in at different points in time, and where and who historically filmed.

"You can tell stories and speculate, but once you have a corpus of data you can crunch it and do computational analysis and unlock things that you could never have imagined knowing"
Head of visual data and preservation, Case 12, Arts and Culture NPO

Finally, the development of the technical infrastructure for digitising and geocoding archived film footage contributes to a **double-loop** shift in priorities for Case 12. As part of their strategy at the time of interview, digitising over 100,000 videotapes before their degradation (which are now obsolete) was a significant priority. The 2019/20 annual report states that it is important to digitise them while "*we still have availability of equipment, skilled and experienced staff, and the means to digitise en masse*" (source: 2019/20 annual report, Case 12). It was suggested in interview that having the geocoding infrastructure in place could lead to longer-term engagement with place through increased geocoding of films.

6.5 Conclusion and contribution of the chapter

Steve MacLaughlin, VP of Data and Analytics at Blackbaud concludes his book *Data driven nonprofits* (2016) by observing that *"Data driven nonprofits accelerate change in the world by using data to influence strategy and inform decisions to produce value and impact. Data is their raw material, and they convert it into information and insights that create value" (p. 219).*

The organisational epistemological framework used in this chapter shows that on the one hand, MacLaughlin is right in that NPOs do indeed use data to influence strategy and inform decisions. However, on the other hand, the case studies show data to not be 'raw' or independent of the organisation but wrapped up in the choices, contexts, affordances, materialities, and priorities of NPOs. This chapter demonstrates the socially constructed nature of spatial data and the way insight is mediated and shaped. In particular, it demonstrates how spatial data and media are constructed and applied amid efforts to better know and work in and with people and place.

The organisational epistemology (adapted from Seirafi, 2012) reveals all stages in the construction and application of data-informed knowledge in NPOs. It shows the contextual factors that inform the construction of knowledge, such as: organisational missions and value sets, position within the wider institutional field, and material and legal constraints. We see this in Case 4, where a desire to become "*one seamless service*" (source: Case 2015-2020 strategy) has led to the development of data infrastructure which prioritises immediate access to service-wide data. Knowledge creation is shaped by the affordances of technology and media, such as Tableau's spatial media capacity, which presents all staff in Case 29 with a uniform insight. Information becomes knowledge when applied in a setting, and knowledge application in the cases presented ultimately assists the organisations in delivering public benefit and working towards their mission. In all four cases, spatial media acts as an epistemic tool (Figures 20 – 24), giving nonprofit organisations access to knowledge of people and place that is novel, frequently updated or real-time, captures multiple spatial scales, and contributes towards actionable insight that positions the nonprofit organisations as experts in their domain.

The transfer of knowledge from a subjective position to an objective one where it is institutionalised and routinely accessed and applied is seen in the expression of truisms that guide organisational priorities and work, such as Case 10's assertion that "*80% of an arts audience tends to come from within a 30-minute drive time*" (source: interview with Director of Policy Research, Case 10). When the constructed knowledge fails to provide utility, or change to its construction occurs, the concept of single-loop learning teases this process apart from wider epistemic practices. Case 4's sampling of IP addresses to provide aspatial service delivery with a spatial positioning is an apt example of single-loop learning. Double-loop learning demonstrates a wider shift in organisational practice or values, such as Case 10's decision to realign the activities of its trading subsidiary with the ongoing data-driven work of the charity to work towards the same end-goal. Single- and double-loop learning show organisational knowledge as being continuously reworked and a product of ever-changing practice, priorities, and values. It moves away from the static and instrumentalist perspectives of data use that are typically portrayed.

This chapter has presented spatial data and media as not only constructed but also contributing to organisational knowledge construction and application through the perspective of an organisational epistemology framework. The next chapter builds on this to show how spatial data and media, when analysed from a semiotic and relational perspective, are seen to build connections and convey meaning across and between organisational and sectoral boundaries.

7. Exploring a relational approach to nonprofit spatial data use: working between and within organisations

7.1 Introduction

Just as spatial data are seen to be *mediated* and to *mediate* knowledge production (Chapter 6), this chapter demonstrates how spatial data are used as *media* to build connections and convey meaning. It deconstructs spatial data and their graphical visualisation in spatial media to show them as relational devices that work across organisational and sectoral boundaries. Whereas Chapter 6 examined organisational epistemic and knowledge practices, Chapter 7 examines the role of spatial data and media in organisational communicative practices. This chapter responds to both research questions 1 and 2.

Research question 1: *How is spatial data used by UK nonprofit organisations to construct and represent reality?* is addressed through an emphasis on the material and visual construction of reality. The chapter uses a semiotic framework which shows: spatial data visualisations as a socially constructed product of sign choices, design, and composition; the intended and received meanings that are drawn from interpretations of signs; and the resultant real-world changes.

Research question 2: *How is spatial data used by UK nonprofit organisations to position themselves within and across sectors?* is addressed through viewing spatial data as a semiotic device that performs relational work. Through four case studies (that differ from those presented in Chapter 6) we see how spatial data build connections and convey meaning across large and disparate nonprofit organisations, as well as across well-defined sectoral boundaries.

This chapter leans on scholarship that draws out relational and semiotic practice. These are both terms that should be defined from the outset. To study something from a relational perspective is to simply study connections, necessitating analysis of multiple objects or phenomena. Relational human geographers and nonprofit scholars may view the nonprofit sector as being related to and entangled with, but distinct from, the public and private sectors (DeVerteuil et al., 2019). Nonprofit practitioners may act relationally when they take

time to develop relationships and open up a dialogue with grantees, rather than operate without dialogue (Knight et al., 2017). A relational perspective on data moves understanding from an object-orientated perspective and towards seeing data as connecting people and groups, conveying meaning and information (Viljoen, 2020). This refers to the sociologically relational properties of data, and not the data science practice of joining datasets based upon common properties (although this practice can of course be studied sociologically, too).

Semiotic studies are more uniform in their approaches and understanding than relational scholarship, despite being adopted by various disciplines. At its simplest, the field of semiotics is concerned with the study of signs (linguistic and non-linguistic) and their interpretation in society. Anything can be a sign, so long as it denotes, signifies or represents something. For example, a red tap is understood to mean hot water, and blue means cold. This chapter uses organisational semiotics to identify how "all organisational behaviour is affected by people's communication and interpretation of signs, both individually and in groups" (Liu and Li, 2015, p.24). As with relational data, a more ontologically based definition of semiotics is used in computer and data science which should not be confused with the sociological usage. Such applications assess the interoperability and interaction between code and computational processes, and therefore while there is a broadly shared understanding, the domain-specific usage differs significantly.

This chapter begins by expounding spatial data, spatial data visualisations, and nonprofit organisations as relational. A widely adopted approach in the social sciences to studying relations between actors is to adopt a theory and methodology that primarily assesses relations' structural properties, such as Social Network Analysis (SNA) or Actor-Network Theory (ANT). This chapter makes a case for organisational semiotics, and particularly Ronald Stamper's (2001) organisational semiotic framework, as an alternative theoretical approach that adds cultural and sociological depth to the analysis of the structural properties of organisational ties. This is demonstrated through four case studies (that differ from those presented in Chapter 6), which show how spatial data, spatial data visualisations and underpinning infrastructures communicate knowledge and build relations across and between organisations and sectors. Theoretically, the chapter applies multi-disciplinary social

constructionist scholarship in a way that seeks to overcome the binaries of structural / cultural, and social / technical analyses. In terms of lessons for practice, the chapter shows how spatial data and maps are key communication devices that build community, translate ideas and master narratives, and connect disparate entities.

7.2 Theoretical overview

7.2.1 Data as relational

Scholars from the cognate fields of STS, digital sociology, and critical data studies (see section 2.5.1) advocate the adoption of a relational approach to social studies of data. Individual data points are themselves relational, as people use them to "constitute and enact their relations with one another through the use of data" (Levy, 2013, p. 75). The practice and use of data occur against a social background. Data carry, and are bound up in, sets of collective stories regarding their intended meaning, the social relationships that govern the production, sharing and access of data, and the expertise available to turn them into information and knowledge (Neff et al., 2017). Kitchin and Laurialt's (2014) concept of the data assemblage (see Table 4, section 3.3.1) encourages critical data scholars to see data as products of multifaceted relations between systems of thought, materialities and infrastructures, institutional and organisational practices, governmentalities and forms of knowledge.

Social studies of data that adopt a relational approach often turn to Susan Leigh Star's work on infrastructure, which adopts an ecological perspective and rejects both network approaches and social/technical dichotomies. Star and Ruhleder's (1996) definition of infrastructure is slightly ambiguous (Lee and Schmidt, 2018; Hesmondhalgh, 2021), but is generally taken to refer to the resources which enable action across communities and parts of organisations (Star and Ruhleder, 1996). This definition moves away from a sole focus on the material (such as the pipework in plumbing infrastructure), and towards an understanding of infrastructure as the sociotechnical substrate which supports the practices of and communications between communities (Star and Ruhleder, 1996). We are encouraged to seek out the invisible work that creates and maintains infrastructures and their effect on human organisation through an infrastructural inversion (Bowker, 1994) which foregrounds

the backstage and relational elements of work practice (Star, 1999). In so doing, we can understand contemporary data infrastructures as "distributed accomplishments, constituted by an evolving set of relationships between people and devices, software and standards, words and instruments" (Gray et al., 2018). Making a case for expanding data literacy programmes to cover the "wider socio-technical infrastructures through which data is created, stored and analysed" (p.1), Gray et al., (2018) encourage data infrastructures to be taught as "relations, rather than simply about datasets as resources" (p.13), opening up both debate about the constitution of data infrastructures, and space to reimagine alternative assemblages.

Relational perspectives reveal data as being bound up in social stories and relations, as infrastructures, and in connecting individuals and communities to the "informatic context" (Lee and Cook, 2019, p.3) through acting as interfaces. Data interfaces are the visualisations and digital representations that act as a point of representation, as enabled by the affordances of data and technologies (Lee and Cook, 2019). Spatial data visualisations and spatial media that have developed under the development of 'maps 2.0' (Crampton, 2009), such as interactive maps and dashboards, are examples of data interfaces. They mediate relationships and carry discourse and communications. For NPOs, spatial data visualisations and spatial media are used to legitimise and give credibility to localised and specialised knowledge (Craig and Elwood, 1998; Brudney et al., 2016). They can represent multiple spatial narratives and advance agendas amidst spatial, institutional, and knowledge politics (Elwood, 2006). Interactive and crowdsourced spatial visualisations are particularly powerful at communicating messages and discourses, and under the auspices of the 'geoweb' have changed the communication and relational practices of NPOs (Elwood and Leszczynski, 2013).

7.2.2 The relational nonprofit

The nonprofit sector is theorised in a plurality of ways (see section 2.1.1). The processual or relational perspective views the nonprofit sector as emerging over time and in response to and in relation with the actors in and around it (Corry, 2010). By virtue of being 'not the for profit sector', it is defined at the macro level in relational terms, with the relational positioning in part giving the sector its capacity to translate and mediate between sectors and spatial scales (DeVerteuil et al., 2019). At the meso-level, some nonprofit organisations operate in a quasi-market where both competition and collaboration is necessary (Buckingham, 2009). At the micro-level, strong relationships are key to successful grantmaking (Knight et al., 2017) and developing the trust of service users (Tomczak and Albertson, 2016).

The use of data by NPOs displays relational tendencies: in a form of organisational 'shapeshifting'; NPOs adapt their data-driven operations to meet evolving social and economic contexts (Voida, 2014). Consequently, the fluid and boundary spanning activities must be supported by agile and adaptable technology and reliable data management processes as they reposition themselves in relation to the work of other organisations and external factors (Kline and Dolamore, 2019). Early networked technologies that shared information across disparate localities were seen to change both external and internal organisational relationships (Burt and Taylor, 2000). Contemporary empirical work in the field of human-computer interaction (HCI) documents a failure of rigid data infrastructures to capture dynamic human relationships (Bopp et al., 2019), and the re-entrenchment of existing unequal relations in the nonprofit sector through data collection and impact evaluation practices (Bopp et al., 2017). Finally, data intermediaries that exist to share data and broker relationships purposefully position themselves in relation to existing actors within the nonprofit ecosystem (Yoon et al., 2018).

7.2.3 The organisational semiotic framework

Before turning to organisational semiotics, we should briefly consider the merits and demerits of other relational approaches. A long-used relational approach is Social Network Analysis (SNA), which is a pure form of quantitative analysis which seeks to specify the centrality of actors within networks and the subgroupings and structures of which they are part (Emirbayer, 1997). The failure of SNA to identify the cultural properties of networks was responded to by relational sociologists, such as Harrison White (2008) and Jan Fuhse (2009, 2015), who view culture (practices, meanings and discourses) and structure as fused within a sociocultural setting (Mützel, 2009). They demonstrate that cultural forms are as much formed by networks as they shape them, and that networks themselves are not devoid of meaning (Fuhse, 2015). White (2015) focuses his study on language semiotics (drawing from Piercean semiotics (Fontedevila, 2018)) to understand how discourse and language are used to establish ties within networks. A central claim of White's (2008) is that each set of ties comprises a particular set of stories, symbols and idioms, and that individuals' identities are often developed and forged through switching between ties. This interactionist perspective is summarised by saying "modern social relations are composed of crosscutting sets of ties and accompanying story sets, which constitute specialized, self-reflective domains of discursive interactions" (Mische and White, 1998, p. 701).

Relational sociology scholarship may reinsert cultural analysis into relational and network analysis, but it fails to account for the material and technical components of interactions and relations which are sought within a socio-technical study. The organisational semiotic framework used in this study recognises the affordances of technologies and their materialities. It separates the domains of organisations, therefore bringing a hierarchical perspective on communication processes that a flat ontological perspective (such as Actor-Network Theory) would not bring. Organisational semiotics views only human actors as possessing intentionality (Prado and Baranauskas, 2017), which is logical, given the GIS system cannot be interviewed. Despite this, the defined social and technical strata of the semiotic system that is developed in this chapter guards against Schuurman's (2000) concern that critical GIS scholars may neglect to inspect the technical peculiarities of systems in favour of studying networks through a discourse that is unrecognisable to practitioners.

The organisational semiotic framework adopted by this study was developed by Ronald Stamper (2001) and others (most notably Kecheng Liu and Weizi Li). Ronald Stamper was frustrated by technological progress accompanied by inadequate computer informatic diagrams and an experience of information resources that foregrounded the technical at the expense of the social (Gazendam and Liu, 2005). He viewed organisations as information systems and turned to Charles Morris' semiotics to provide a "scientific basis for the study of information" within organisations (Stamper, 2001, p.120). In wishing to generate an operational definition for the role of information in the modern, technologically enabled organisation, Stamper developed the 'semiotic ladder'. Stamper's semiotic ladder builds upon Morris's three aspects of signs: syntactics (sign relations to other signs and their construction), semantics (signification of objects and meaning through signs) and pragmatics (the ultimate effect of the sign). It permits researchers to take account of the technical, alongside the oft omitted human and social aspects of information (Stamper, 2001).

The ladder is hierarchical, starting with the technical components of signs (physics, empirics and syntactics) before reaching the human aspects where signs deliver their valuable output (semantic, pragmatic and social). Liu and Li (2015) apply the organisational semiotic framework in the modern organisational setting. Table 7 outlines the semiotic ladder as described by Stamper (2001) and Liu and Li (2015), and its application for this study in unpacking spatial data and visualisations as communication devices that create ties and relations.

Function system	Title	Description	Application
Social level	**Social World**	The real-world change in action, attitudes, or norms.	Observable change in organisational behaviour, such as new relationships and working practices
	Pragmatics	The intentions, connotations and effects that result from sign-communication	Desire to act upon the information received – e.g. collaboration to solve an issue

	Semantics	The relation between the sign and what it denotes	Accurate and intelligible representation of reality through visualisation, GIS and wider communication
Technical level	**Syntactics**	The structure of the sign type and required rules and grammar of composition	Design of the GIS or visualisation software and its signs and symbols, structure of databases
	Empirical properties	The transmission of the sign as signals	System interoperability, internet connectivity and liability, often displayed as metadata
	Physical world	The material and digital nature of the sign	Hardware, software, servers, mobile devices, cables, databases

Table 7: Organisational semiotic framework (adapted from Liu and Li, 2015)

The first layer is the ***physical*** form (both digital and material) that the sign requires to operate as a communication device, such as the server, software and hardware and mobile devices. The second layer, ***empirical properties,*** concerns the transmission of the signs as signals through necessary system connections and pathways. ***Syntactics*** refers to the physical structure of the sign, colours and shapes, and its relation to other signs on the screen. In this context, it refers to the design and graphical representations offered by GIS and visualisation software and packages. The first layer that concerns the social is that of ***semantics*** : the capacity of signs to stand for other things and the relationship with what they represent. In this study, semantics refers to the way data visualisations are used to represent and make intelligible real-world phenomena such as the location of service user demand. ***Pragmatics*** refers to the intentions of the users resulting from sign-communication, so in this case, the possible desire to better allocate charity resources, or use the evidence to win support from stakeholders. For Stamper (2001), the ***social*** level brings our analysis into the domain of organisational semiotics as we ask "so what?" and examine the impact of the sign on organisational communication; the tangible and observable impact

the sign has on the real world and human attitudes and norms. For this study, the tangible outcome is likely to be a change in working relationships or behaviours, as well as observable outputs from the nonprofit organisation.

The semiotic ladder helps us to unpack spatial data visualisations and spatial media as communication devices – analytically separating the technical from the social, and structure from culture. It captures both the variable agency of humans and affordances of technology and acts as a heuristic device that can be used for repeatable intra- and inter-organisational studies and for performing an infrastructural inversion (as put forward by Bowker, 1994) which foregrounds background processes. In outlining 'tricks of the trade' for studying infrastructure, Star (1999) encourages us to expose a master narrative or overarching discourse that infrastructure may propagate, but demonstrates the difficulty in studying infrastructure at multiple levels of reference. The organisational semiotic framework provides a codified method of deconstructing spatial data visualisations and spatial media to overcome the technical / social and structural / cultural dichotomies.

7.3 Denoting a reality

7.3.1 The power of visual brokerage (Cases 26-28)

Extant empirical studies of NPO spatial data use show the power of data visualisation for communicating organisational and spatial narratives, participating in a knowledge politics which places the quantitative and visual as truth, and engaging actors in the work of NPOs (see section 2.4.3 and the work of Sarah Elwood and Agnieszka Leszczynki). Allen (2018) terms this work as 'visual brokerage': data visualisations are products that communicate ideas or information, but are also subject to questions of credibility, trustworthiness and expertise that are specific to the social, political and cultural contexts in which knowledge is shared.

The translation of knowledge between communities and sectors is central to the work of three community foundations (Cases 26-28) examined in this study. Community foundations are grant-making organisations that focus on a specific community or geographic region and are funded by private donors, corporations, and other foundations (Graddy and Morgan,

2006). They occupy a space that has resulted in them being characterised as 'intermediaries' (Szanton, 2003) or 'borderland institutions' (Ruesga, 2014); they act as vehicles of community cohesion and empowerment through the alignment of community needs and donor interests (Harrow et al., 2016b). Their multifaceted position requires them to understand community needs as well as existing provision granted by community groups. To communicate their knowledge of needs and provision to donors and wider stakeholders, community foundations will combine data sources in needs assessments that focus on their whole geographic remit or a particular area of concern.

The three community foundations studied use OCSI's Local Insight tool to develop needs assessments. Local Insight is a data visualisation platform that visualises over 1000 social and economic indicators at multiple spatial levels (from Lower Super Output Area to Local Authority) and offers customisable area boundaries and the capacity to upload spatially referenced data (such as the postcodes of grant recipients) as layers. The platform is provided as a Software-as-a-Service (Saas) application, a growing way of accessing software that is hosted by the provider. Users pay a regular subscription to access up-to-date software and data from multiple locations and at a reasonable cost (Wright et al., 2017). The platform is used by foundations to guide their own priorities and generate overview reports of the needs of the area within their remit, such as the county or local authority level.

The use of community data platforms to provide GIS and spatial data visualisation functionality for NPOs has been studied in several settings (Roudebush et al., 2013; Brudney et al., 2016), yet their use in community foundations and philanthropic settings is understudied (Brudney and Prentice, 2018). Therefore, it is beneficial that the three community foundations studied provide three slightly different uses of the same tool. Case 28 is a large community foundation that updates a Vital Signs report every three years. Vital Signs reports typically place quantitative data on neighbourhood indicators (such as employment, health and wellbeing) alongside local research carried out with community groups to present an 'annual community check-up' (Harrow and Jung, 2016a). Case 28 uses screenshots of Local Insight's choropleth maps to gently guide donors towards areas of need, although the donor's preference will always prevail:

"This is about saying these are the problems in the [area] that philanthropy can help with, so it's a community philanthropy guide, it's not a needs analysis." Director of Community Knowledge and Funding, Case 28, Grantmaking NPO

While the Vital Signs reports can demonstrate a knowledge-driven approach to leadership and engage conflicting stakeholders (Phillips et al., 2016), its static and often analogue form reflects the spatial scale and organizational priorities at the time of composition and lacks adaptability. For this reason, Cases 26 and 27 make use of Local Insight's interactivity and frequently use it to produce reports to guide their work. Case 26 is a medium-sized community foundation that uses the visualization to guide their funding-priorities and individually engage with donors to make the case for their support. Figure 25 demonstrates the type of hyperlocal information supplied for donors, such as assessing differences in educational attainment within a small town. It was included as part of a wider report supplied by an impact analyst in response to interest from a donor that has a business in the small town and was seeking to assist with educational and employment programmes. The response to the report was significant:

"So I printed that off, and sent it with our boss who went to see him, and he was going on a business trip to Canada and he read it cover to cover on the plane. He was absolutely blown away by it, he loved the drill down into [the area] to help him understand what and where the problems are. That report has tied him in as a more proactive donor, so it definitely affects people like that."

Impact Analyst, Case 26, Grantmaking NPO

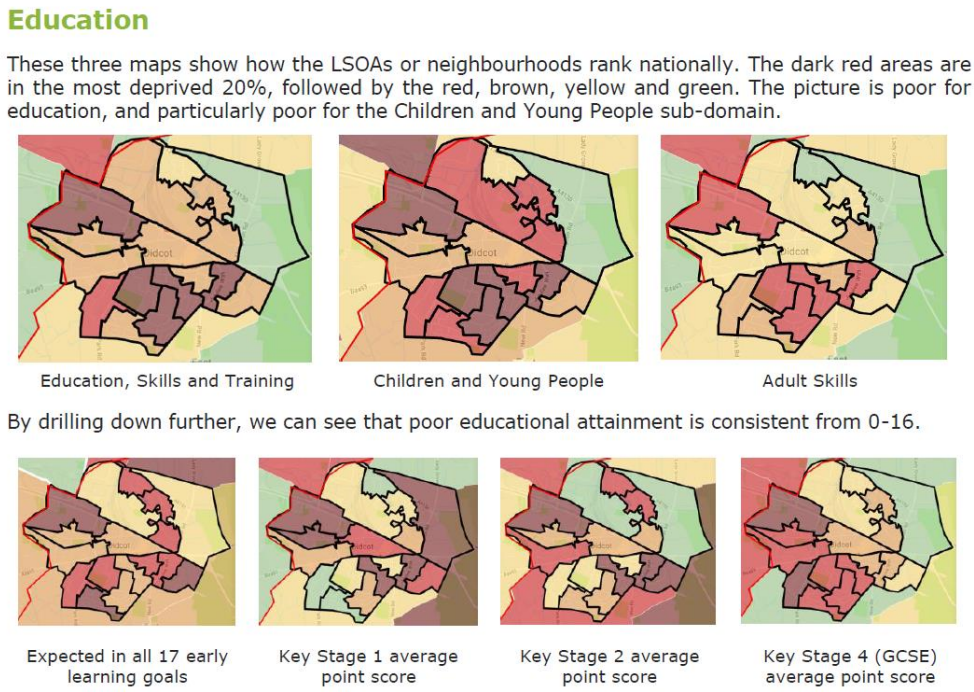


Figure 25: Hyperlocal visualisation of educational attainment for donor

Finally, Case 27 is a community foundation that is similar in size to Case 26 and uses the visualisations to heavily guide the donors' decisions and to guide and present alongside qualitative research undertaken by the foundation. For example, if the foundation was interested in funding mental wellbeing initiatives, then a choropleth map, such as Figure 25, could be used to begin a focus group with local residents by saying "X area seems to have this sort of pattern of deprivation, how do you think that affects wellbeing?".

The organizational semiotic framework can help us conduct a semiotic reading of the use of the Local Insight tool and its outputs by the three community foundations (Table 8).

Function system	Title	Description	Application – Community Foundations
Social level	**Social World**	The real-world change in action, attitudes, or norms.	Proactive behaviour from the donor, greater 'buy-in' to work of foundation and appreciation of organisational knowledge

	Pragmatics	The intentions and effects that result from sign-communication	Demonstrating objective and detailed knowledge of community issues, shared concern for place, interest in donor's concerns and commitment
	Semantics	The relation between the sign and what it denotes	Colour ranking of local area by chosen indicator denotes 'positive-negative' continuum
Technical level	**Syntactics**	The structure of the sign type and required rules and grammar of composition	Consistent coding of data, compatibility between back-end data and front-end visualisation, accurate customisation of visualisation
	Empirical properties	The transmission of the sign as signals	Data visualisation platform, metadata on indicators, smooth movement between data layers
	Physical world	The material and digital nature of the sign	PCs, screens, servers, cables, paper print out

Table 8: Organisational semiotic framework analysis of community foundations' use of data visualisation platforms

When the infrastructure for visualisation is provided externally, the **physical** and **empirical** properties are not typically a concern for the user (Liu and Li, 2015), as is the case with Local Insight, where it is a platform provided as a SaaS package. However, the reliability of the platform is a key reason for subscribing to the service. The **syntactic** structure of the platform is consistent across data sets. The tool uses the Government Statistical Service / Office for National Statistics administrative boundaries, with Output Area being the lowest spatial resolution, to consistently display aggregated statistics at varying spatial scales. The structure of the visualisation (sign) can be customised by the users, allowing subscribers to build custom reports (with Output Areas as the base unit) that correspond closely to their

own area of operation. Output Areas have an average population of 309 people, making them a granular unit of analysis. Despite the ability to produce custom geographies, the ability to only access the front-end of the platform as a user ensures there is syntactic consistency with regards to choropleth colouring (running on a red-green continuum), opacity and gradient, line width and labelling.

Semantics, the first social analytical layer, concerns the relationship between the sign (in this case, Local Insight's data visualisation), and the object. In this case, the use of the red-green continuum denotes a positive-negative continuum. In Figure 25, the dark red colouring of LSOAs represents poor educational attainment, particularly compared to the green areas. For the relationship between the sign and the object to be understood, a description is required to aid interpretation. A critical semantic reading recognises the limitations of such spatial representations: the Indices of Multiple Deprivation are designed for area comparison, and are not to be drawn into an ecological fallacy where it is assumed that all people from that area are equally disadvantaged (Ministry of Housing, Communities and Local Government, 2019). Simplistic visual representations of community, such as Figure 25, may be misinterpreted in this way, e.g. all children in a certain area could be portrayed as reaching a certain standard of educational attainment; this is an ecological fallacy.

The **pragmatic** level of analysis deepens our analysis of the intentions and effects that are found in and result from sign-communication. The community foundations are situated at the nexus of local community and philanthropy and are required to work with and discern the needs of both community groups and philanthropists. The spatial data visualisations are brokering relationships by demonstrating a seemingly objective and detailed knowledge of a particular spatial community to potential and current donors. The ability to present detailed and timely custom reports shows concern for donor preferences and is therefore helpful in "*maintaining momentum by keeping them interested and building relationships with donors*" (Research and Data Analyst, Case 27). The community foundations (cases 26-28) acknowledge a knowledge politics at play which prioritises quantitative, visual representations, over a textual, qualitative one:

"I think that, although I fiercely resist the sense of legitimacy coming from beautiful pictures

because I'm a words person myself, I think there probably is quite a lot of truth in that"
Research and Data Analyst, Case 27, Grantmaking NPO

Elwood and Leitner (2003) and Elwood (2006) show that many NPOs are deft communicators, able to visually communicate multiple narratives and forms of expertise to meet the differing demands of stakeholders. Examining the pragmatic intentions of Cases 26-28 similarly demonstrates the agency and intuition of organisations; just as the community foundations recognise that quantitative perspectives imply one type of legitimacy, presentation of qualitative, anecdotal data alongside the quantitative represents the community foundations' intimate knowledge of a locality. All three cases will present quotations from grantees or focus groups in needs analysis reports. Even Case 28, which typically follows the leads of donors while trying to gently guide them in one direction, stresses the importance of sharing anecdotal knowledge of the capacity of local grantees and their ability to respond to large donations.

Finally, the **social** level concerns the real-world impact and change in attitudes and norms, which in this case, are demonstrated by the donor's appreciation of the specialised knowledge and proactive stance of Cases 26-28's philanthropic endeavours. A semiotic reading of the spatial data visualisation shows that community foundations use Local Insight's platform to represent the specialist expertise that they accrue through being positioned at the intersection of local communities and community groups, and philanthropists. The visualisations are used to communicate this expertise across varying domains. The real-world impact that is sought and realised by all three stakeholders is allocation of generous resources from philanthropists to community groups:

"There's a lot of foundations, there's about 10,000 in the UK, a lot of them don't know what they are doing and they can't even find projects to fund, so they can just come to us with the local knowledge and say you have done the research and know what you are talking about, we have got £20,000 to get rid of can you help us out"
Impact Analyst, Case 26, Grantmaking NPO

7.3.2 Carrying phenomenological reality (Case 24)

For relational sociologists that emphasise the role of culture in establishing networks, relations are not devoid of meaning in the way a structural analysis may suggest, but rather they carry a phenomenological reality; communication between actors is based upon a lived and often shared reality that encompasses expectations of behaviour, layers of culture and values, and stories from previous networks and relations (White, 2008; Fuhse, 2015). Data not only represent phenomena embedded in local practices and shaped through stories, but also carry their own story regarding their localised production, terms of use and patterns of exchange (Loukissas, 2019; Neff et al., 2017). Maps can be used to communicate the story carried by data; they have a "discourse function" (p.3) and describe not *the* world, but *a* world which is selectively curated to tell a particular story (Wood, 2010).

A semiotic analysis of an emergency rescue NPO's (Case 24) use of GIS adequately demonstrates the capacity of data and spatial data visualisation to represent reality and carry an emotionally affective story. Case 24 is a large emergency rescue organisation that falls under the 'social services' ICNPO grouping. They hold an Esri enterprise-level agreement, so use the Esri suite of products for GIS applications throughout the whole organisation. A fundamental use of GIS by NPOs, as discussed in section 5.2, is to display live asset maps of their emergency rescue equipment and personnel, giving an overview of availability when allocating resources to an emergency. Historical data is also used to inform educational and outreach work to prevent emergencies from occurring. Case 24's engagement with commercial fishermen is a good example of this, where historical data on commercial fishing accidents and deaths are mapped and analysed. Case 24's GIS advisor uses ArcGIS Online to develop an interactive map showing where and how commercial fishing fatalities occur, and the location of the home port at which the boat is registered.

A semiotic reading of the ArcGIS Online application shows the power of maps to carry stories and represent phenomenological reality (Table 9).

Function system	Title	Description	Application – Emergency Rescue NPO

Social level	**Social World**	The real-world change in action, attitudes, or norms.	Concern and attention of fishing community, commitment to ensuring safe practice
	Pragmatics	The intentions and effects that result from sign-communication	Demonstrating detailed knowledge of commercial fishing fatality locations and reasons, encouragement to change practice to prevent death
	Semantics	The relation between the sign and what it denotes	Dots on map of UK representing location of death, location of boat registration, detailed qualitative information on each incident
Technical level	**Syntactics**	The structure of the sign type and required rules and grammar of composition	Interactive platform and map, consistent coding of fishing death locations, distinction between home ports and death location, customisation of map visuals
	Empirical properties	The transmission of the sign as signals	Interoperability between ESRI products, data visualisation on ArcGIS Online, smooth transition between data layers
	Physical world	The material and digital nature of the sign	Laptops, Esri servers, good WiFi / internet connection

Table 9: Organisational semiotic framework analysis of Case 24's use of mobile mapping tools

Case 24's commercial fishing team are ex-fisherman who travel to targeted fishing communities around the country, taking with them a laptop that can display the map offline, but in the web browser. Therefore, they are reliant on a host of **physical** infrastructure to load the map when connected to the internet and display the map offline. To aid usability, Case 24 would like to upgrade their physical infrastructure to phones or tablets in the future. At the **empirical** level, the organisation-wide use of Esri products ensures successful interoperability between devices and products (such as moving data and visualisations from the desktop ArcGIS Pro to ArcGIS Online), with tools such as ArcGIS Online providing a smooth interface which adjusts the display or data layer shown without lag or pixilation. **Syntactically**, the interactivity afforded by the 'geoweb' and spatial media, such as ArcGIS Online changes engagement with space and maps from being static to dynamic and participatory (Kitchin et al., 2017). The interactivity and ability to navigate to relevant, localised geographies, as opposed to showing a national, static picture, is crucial to gaining buy-in from fishermen. In addition, fishermen are used to engaging with interactive maps and navigation tools, therefore presenting a form of communicative media that resonates with their day-to-day work is powerful:

"…they [the educational and outreach team] are going to be going around the country to various targeted areas to get this message across, and the audience is going to be fisherman, so they are not going to be reading a PDF document, they are not going to be showing PowerPoint slides, they need to have real evidence, so the map and the application are going to be their supporting tools…"

GIS Advisor, Case 24, Social Services NPO

Semantically, the visualisations carry a powerful truth claim that fishermen are dying at sea, and the location of their death and their home port are represented by coloured dots on the map. The inclusion of home port information has led to identification of a clear visual correlation between where boats are registered and the number of fishing fatalities. Therefore, not only are the dots representing the individual locations of incident, but the aggregate representation of fishing fatalities presents several spatial narratives and a reality

beyond that of the individual point feature on the map or anecdotal evidence passed around the fishing community.

The truth claim and reality of fishing put forward by the visualisation is curated to present a clear story that carries a weighty **pragmatic** aim to communicate the dangers that fisherman face. Through this it is possible to open up a discussion regarding the reduction of risk:

"…to go across and really ram home the message that you guys are not actually coming home and this is why, and this is the evidence, and these are the dots on the map and they prove it."

GIS Advisor, Case 24, Social Services NPO

In curating a map of commercial fishing fatalities, the GIS Advisor is cognisant of the semantic and pragmatic connotations carried by the 'dots on the map'; its "discourse function" (Wood, 2010, p.3). The map is intended to visually communicate knowledge held by the NPOs as true and objective. It is further legitimated through being presented by education and outreach staff that are former fisherman themselves. The two actors involved in the communication therefore have a shared phenomenological reality and understanding of the risks involved, resulting in an authentic delivery of the map and accident prevention advice. White's (2008) sociological analysis of communication and networks claims that individual identities are created as individuals switch between domains of communication. The identity of the ex-fisherman is currently as an educator and outreach staff member for the NPO, yet he possesses an identity which makes him suitable for the role as he carries the lived experience of working in the fishing community.

The final stage of the organisational semiotic framework is the effect of communication at the **social** level. Successful technical delivery coupled with hard-hitting semantic and pragmatic delivery may change working practices and appreciation of the present risks. As White (2008) claims, the phenomenological reality of the stories represented in the visualisation generates relations, as the map recounts ties between rescue worker and deceased commercial fisherman, and then from outreach worker to the current lived reality of the fishermen.

7.4 Spatial data and media as infrastructure

7.4.1 Infrastructure connecting disparate parts of the organisation (Case 33)

This chapter has so far described dyadic relations between two people or groups. The following section takes a broader, systemic perspective on the role of spatial data (and its necessary infrastructures) in connecting 1) domains of action within large nonprofit organisations and 2) spatially proximate organisations (section 7.4.2). Social constructionism differs from pure systemic thought in that it can explain, rather than simply describe, patterns of action, yet it retains a concern with holism and seeing "a whole made up of parts" (Campbell, 2000, p. 31). Campbell (2000) and Gergen (2015) approach organisations as relational, systemic processes held together through shared narratives, aims, cultures and material practices. Organisations are continuously being reconstructed, as new problems, dialogical conversations, and shared practices arise, either within a silo or sub-grouping, or at the whole organisational level.

This section of the chapter explores the relational work of NPO spatial data use by performing an infrastructural inversion (Bowker, 1994) to see the role of spatial data and data infrastructures in underpinning the relational, systemic processes that hold and bring organisations together. In using the organisational semiotic framework to foreground the backstage elements of data practice, analysis can surpass the human / non-human dichotomy that both Campbell (2000) and Gergen (2015) reject. This approach attends to the technical infrastructure but not at the expense of the social and cultural factors that power the infrastructure's relational work. For Star (1999), information systems infrastructures are defined by their reach beyond an individual or event, embodiment of standards and conventions, link to practice, and invisibility in everyday life. A challenge for the information systems researcher is to distinguish and give analytical space to the multiple levels of reference contained in the above list of attributes (Star, 1999); a need which is met by the structured multivalency of the organisational semiotic framework.

In developing the organisational semiotic framework, Stamper (2001) and Liu and Li (2015) intended for it to be applicable to discrete sign forms, in the way it is operationalised in section 7.3, but saw its greatest utility in deconstructing organisations as information systems. Liu and Li (2015) advocate use of the semiotic framework in undertaking an

infrastructural analysis to: "understand the social, organisational, cultural and technical contexts, to understand the business objectives and strategies in an organisation, and to identify business and technical problems and the feasibility of solving those problems" (p.64). The categories of the organisational semiotic framework carry the same topic of focus as previously, except the wider organisational information system is brought into scope.

This broader organisational infrastructural analysis can be used to explicate the semiotic properties of Case 33's use of data. Case 33 is a large environmental organisation with numerous applications of spatial data and GIS. It is responsible for managing a significant number of estates and conservation areas around the country and possess a large information systems and GIS department which is central to the organisation's operations. The data for this analysis draws on an interview with the Head of Conservation Information, who leads a team of 16 to support the wider organisation with a range of data and GIS applications and queries. Case 33 primarily uses Esri's tools for their GIS analysis, although they store their data in an Oracle database and use Tableau for operating dashboards. In large organisations it is a continual challenge to ensure that the construction and understanding of knowledge are consistent, and the organisation functions as a whole system and not siloed arenas of disparate conversations (Gergen, 2015). Case 33 navigates this difficulty by developing an information architecture that scales and aggregates spatially granular and detailed data points from the point of collection to aggregate analysis against Key Performance Indicators at the senior management and trustee level. Figure 26 gives a simplistic representation of how data captured on Esri Collector, a mobile ArcGIS app, traverses the organisational hierarchy.

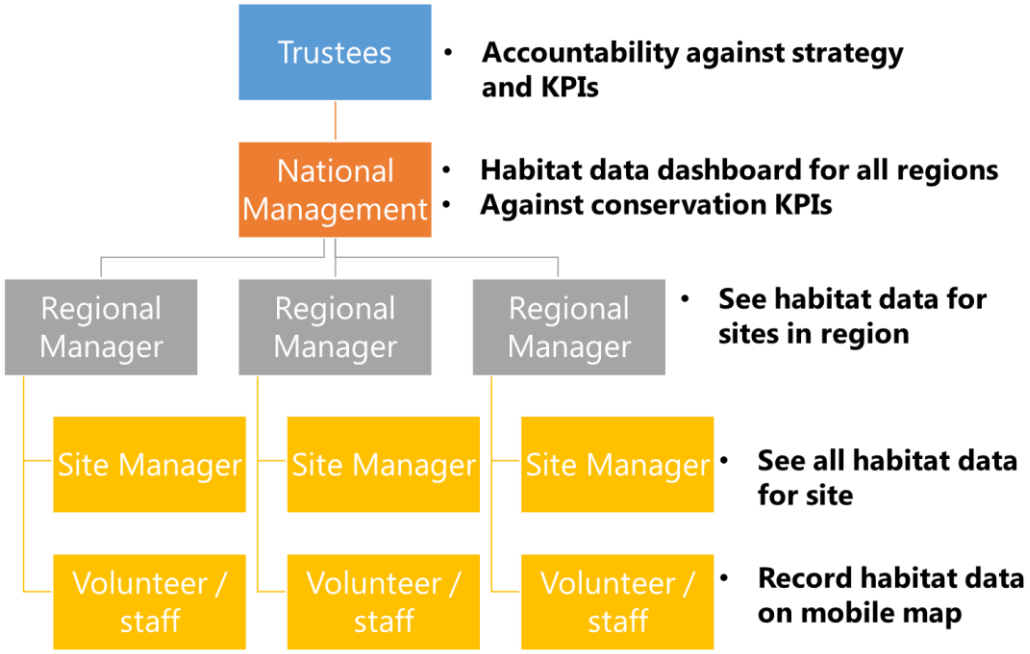


Figure 26: Case 33 data pathway representation

On the ground, a volunteer or park ranger can record point or polygon data, along with attributes, on a mobile device using Esri's ArcGIS Collector App which is specifically designed for capturing spatial data while out in the field. An example of the data collected is tree audit data, which assesses the risk posed by a tree to staff and the public. The data collected at the site level is then aggregated and viewed by the site manager, and likewise, the regional data managers have instant access to aggregated data for all the sites in their patch. At the national management level, the data are transformed through a Tableau dashboard that gives top-line figures for each region. The data is also compared against targets for key performance indicators (KPIs), to provide an idea of where the organisation is heading in relation to its long-term strategy and targets. This is also the trustees' concern, who use the data to view long-term performance and hold staff accountable.

Function system	Title	Description	Application – Environmental NPO
Social level	**Social World**	The real-world change in action, attitudes, or norms.	More efficient processes, holistic understanding, shift in culture
	Pragmatics	The intentions and effects that result from sign-communication	Indicate work at the local level, but also progress at organisation-wide level
	Semantics	The relation between the sign and what it denotes	Represent multiple issues and multiple spatial scales, yet maintain an ability to follow the data point
Technical level	**Syntactics**	The structure of the sign type and required rules and grammar of composition	One form of truth, ability to represent multiple phenomena and points / polygons, and include photographs / textual information
	Empirical properties	The transmission of the sign as signals	Interoperability between Esri products and Oracle database, smooth transformation into Tableau dashboard, auditable process
	Physical world	The material and digital nature of the sign	Paper copies, mobile phones, laptops, servers, Oracle servers, cables

Table 10: Organisational semiotic framework analysis of Case 33's spatial data data infrastructure

Table 10 breaks down Case 33's use of spatial data in accordance with the organisational semiotic framework. The organisation relies on **physical** infrastructure to collect, store and analyse the data. Historically, this used to be a mixture of analogue (paper and folders) and digital infrastructure, but it is now all digital and consists of the mobile phones and laptops

on which the data is collected, the servers to store it and cables to connect the system. **Empirically**, the transfer of data between products and databases relies on the interoperability of standards and systems. The transmission of data digitally, as opposed to reliance on paper systems, has led to an important audit trail:

"It gives us more transparency because previously it was just a paper exercise so they just went into lever arch files so your manager for example couldn't see whether the tree safety reviews have been done…it was just a case of "have you done it? Yes, it's in the file", whereas now they can see either a geographical display or report of what's been done along with the action list and whether or not that was followed up and actioned or not, so it's opened that up to a more auditable transparent process."

Head of Conservation Information, Case 33, Environmental NPO

The **syntactic** properties of the data collected ensure consistency as the data point is only collected once and in keeping with the organisational schema. The individual data point includes location and basic attribute data, however, the Esri Collector app allows photographs to be attached to the data point and uploaded to Case 33's internal web GIS browser. This means staff throughout the organisation, such as the estate management teams, have a record of the condition of a site at a particular point in time and can make judgements about future work without having to visit the site.

The data collected by the ranger has a **semantic** congruency with users throughout the organisation. Whilst it denotes an individual feature, such as a tree or patch of estate, it carries the ability to represent multiple issues through a wide range of attribute data attached to it, and at multiple scales, through being aggregated alongside similar data. Despite this aggregation, the individual data point does not lose its representation of the individual feature. It is this ability to maintain its syntactic integrity whilst holding semantic value that means the data is of just as much interest to the trustees at the top of the organisational tree, as the rangers who collect the data:

"In the past trustees have been willing to see a headline figure and go ok that looks like you are on the right track, but increasingly they are more demanding and want to drill down and

say "ok well how are the actions that you are taking in this place delivering against your overall strategy and objectives" and you have to be able to tell that story and the only way that you can really do that is through quite granular data, you can't have an abstracted data set." Head of Conservation Information, Case 33, Environmental NPO

Signs are used to communicate intentions (the **pragmatic** dimension) between actors. While the organisation's mission and intention of staff, volunteers, and trustees is to "look after the places in their care" (Case 33 2019 annual report), each stakeholder in Figure 26 uses the data visualisations to communicate slightly different intentions. The ranger or volunteer on the ground collects the data point to communicate the current state of play, or that work is underway in that area. The site and regional managers aggregate the data to demonstrate an awareness of what is happening across the estate and across multiple sites, and how it fits with estate and organisational-level plans and aims. National management aggregate and present the data to communicate a concern with organisational-wide progress against KPIs and long-term strategy.

Finally, the development of an organisation-wide information infrastructure has led to significant real-world changes in actions, attitudes and norms (the **social** dimension). Organisations are complex ecosystems that require clear communication channels to prevent silos from forming and organisational narratives to be diluted. The semiotic analysis demonstrates the communication channels across domains of expertise, but also hierarchies, as staff and volunteers at all scales of operation have access to the same data, albeit for different purposes:

"In the past there has been a disconnect between what operational staff observe and feel about the places and then what regional hubs or the whole organisation argue is happening. When it came to reporting we had to design a process that worked locally but also for the regional or central hubs and the two didn't really meet in the middle, but now the data collected locally by the ranger or the person on the ground is connected to a place but is scaled up to an organisational level so it's that 'capture once, use many times' mentality". Head of Conservation Information, Case 33.

Relational scholars emphasise the capacity of networks and relations to both shape and be shaped by culture, attitudes and norms. The organisational culture in Case 33 has shifted over time to one where staff, and particularly trustees, expect decisions to be informed by evidence that can be related back to operations on the ground. The Head of Conservation Information attributes this in part to an internal shift in perspective, but also believes it is indicative of wider society where data and data visualisations are ubiquitous. Organisations are constantly under construction through dialogue and negotiation; reaching a level of data-maturity where decision are expected to be evidence-informed required a culture shift and "*a process of trying to explain to the organisation that if you're property staff you're not just collecting local records for use in your local office, we will use them regionally and nationally as part of a bigger picture as well" (Case 33 interview).* There is something of a co-construction at play here between structure and culture. A cultural shift which encourages the use of data at all levels of operation has ensured that local data is collected in a way where it maintains its syntactic and semantic integrity at all levels of analysis. Culturally, this then leads to a sense of connectedness between disparate parts of a large organisation.

If organisations are systems that are constructed through dialogue, then silos cause organisations to fail because they restrict the ability to co-create an organisation through innovation, partnership and examining current practice (Camargo-Borges and Rasera, 2013). Case 33 overcame silos by having a well-connected information architecture, and a culture that espouses the benefits of data sharing and an organisation-wide perspective. By contrast, Case 31 is another environmental NPO that uses GIS and spatial data throughout the organisation, but is hampered by fragmented systems that aren't integrated with common empiric and syntactic structures. In addition to and because of the fragmented systems, work between teams is often siloed, resulting in poor visibility of data use across the organisation and missed opportunities for data-sharing to take place.

7.4.2 Delivering a master narrative across organisational and sectoral boundaries (Case 8)

While empirical work on maps as relational devices demonstrates their boundary-spanning capacity (e.g. Craig and Elwood, 1998), it fails to fully unearth the technical, social and cultural properties which affords maps this power. This final section of Chapter 7 uses the organisational semiotic framework to show how visualisations that, on the face of it, may seem rudimentary and functional, are leaning on complex technical infrastructure. The framework also demonstrates how a basic pin-cushion map is a powerful semiotic device to build relations and carry narratives across organisational and sectoral boundaries.

Section 5.2, which looks at the primary drivers of GIS and spatial data use, lists asset maps as a central use case for organisations and gives Case 8 as a successful example. Case 8 is a large religious NPO that maintains a publicly available map of community activities and events within their geographic area of jurisdiction. The map started out as a way of locating the 650+ churches that are under Case 8's remit but quickly became a tool to see not only where church buildings are, but where people were meeting and carrying out social action and community activities. Figures 27-29 show the map's user interface, with Figure 29 showing the expansion of a pin with an ellipsis icon. This indicates there is more than one activity going on at that building.

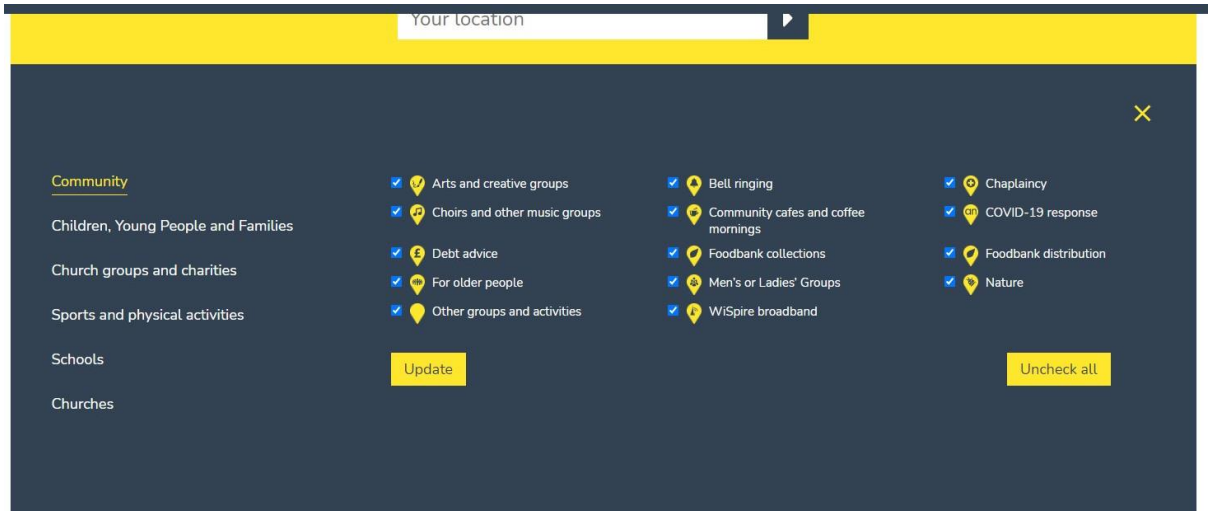


Figure 27: Case 8 asset map options (Source: Case 8)

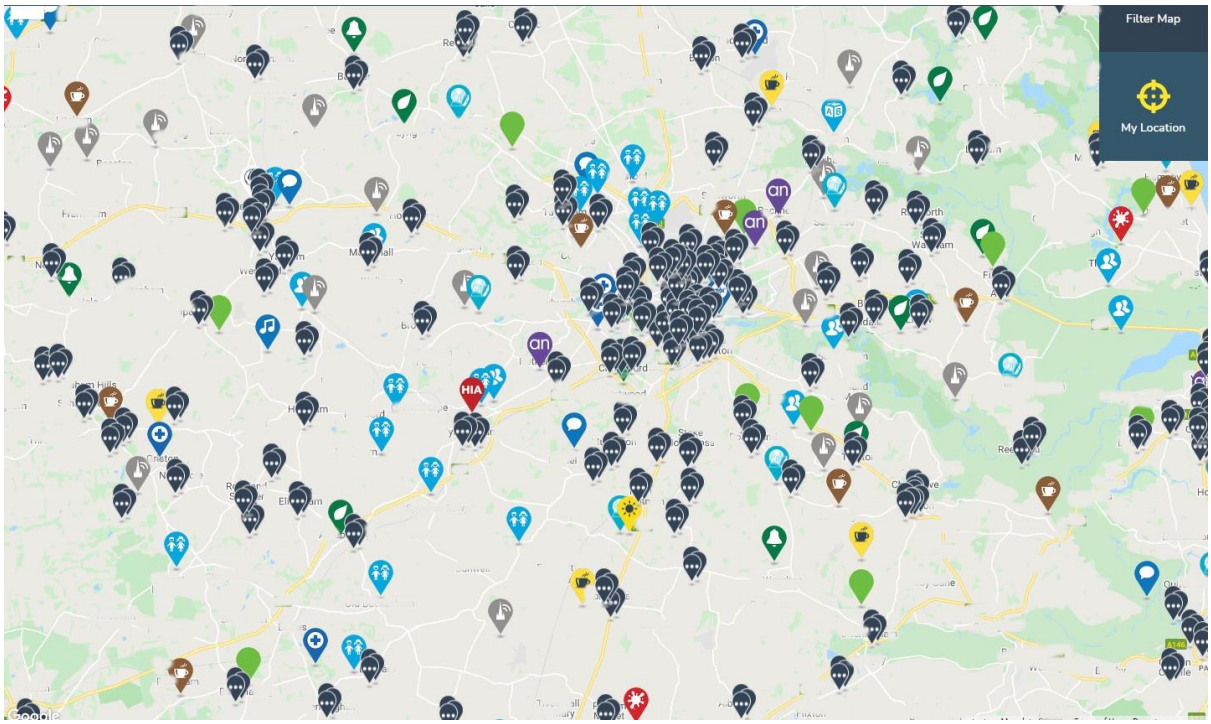


Figure 28: Case 8 map overview (place names redacted) (source: Case 8)

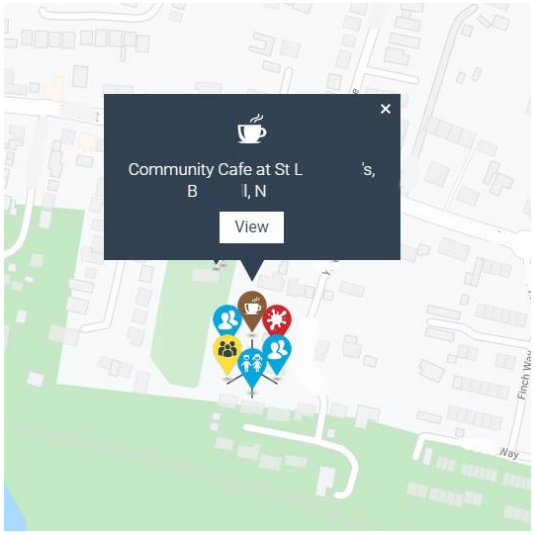


Figure 29: Case 8 detail view (names redacted) (source: Case 8)

At the **physical** level of the organisational semiotic framework, the map relies on a complex set of digital and physical systems. The database which sits behind the map sits on a local server, while parts of the map are hosted on 'cloud' storage. Both the server and front-end side require maintenance and updating. Case 8's asset map is a rare example of a live and successful asset map, as they require regular updating and are resource intensive. This example is notable for the organisational backing it receives; there is a small budget put

aside for development time each month, and the organisation has two staff members who spend a small amount of time approving new entries to the map.

Empirically, the data is either entered manually into the database behind the user-interface, or it is pulled from another source via a live feed. Similarly, Case 8 has data sharing agreements in place with partner organisations, where data is fed from Case 8 to another organisation. Case 8 undertakes engagement analysis to see how many people the map is reaching online, however, the true impact of the map is not captured as it fails to represent offline conversations and capture the online journey of someone after they viewed an activity.

The **syntactic** structure of the map is fundamental to its success. The basemap is Google Maps, which is easily navigable due to its ubiquity and clean presentation. Figure 28 shows the simple 'pins' that represent a location, with the icon representing the type of event or activity. Each location only has one pin to ensure the map doesn't get cluttered. Multiple events at one location are clustered and expand upon being clicked (Figure 29). Users can then click through to see more details about the event or contact details. As each location only has one pin, it means that a church that has only one or two regular events gets the same coverage as a really active church, meaning a balance is maintained. While the pins are syntactically simple, they come with the drawback that they are basic representations, meaning services that regularly move around or are split across multiple sites are difficult to represent. The syntactic structure of the website is also important, as it is search engine optimised to flag up in relevant searches.

In semiotics, **semantics** concerns the relationship between the sign and what it denotes. The common use of the 'pin' across map interfaces to represent a singular data point means a user clearly understands what is being represented upon opening the map. Here, the most direct semantic denotation is 'this event is happening here'. It shows that the church and wider community are hosting activities and connects people seeking an activity to those hosting them.

An interview with the Director of Marketing and Communications at Case 8 revealed a secondary **pragmatic** connotation that is intended to carry through. Whilst providing the

event or activity information is the primary communication purpose, the map is viewed more widely as "*a new front door into church activities*" (*Source: Director of Marketing and Communications, Case 8*) and a chance to show that many of these activities occur in response to faith-based mission. It was decided quite early on in the development of the map that there would be little organisational branding on the website so its affiliation to the organisation and religion would not deter people from continuing on to find an activity. However, the ultimate intention of the religious NPO and the churches and religious groups involved is to tell people about their faith.

The design of the map was intended to change the perception of community activity in rural areas, and establish a point of critical-mass where organisations that don't upload their events to it feel like they are missing out. Figure 28 shows a section of the map and the density of points, creating a busy and lively visual effect.

"*So for me it has highlighted the depth of community involvement in rural areas, in a way that nothing other than a map could have done*".
Director of Marketing and Communications, Case 8, Religious NPO.

The **social** level of the semiotic organisational framework best reveals the relational work of Case 8's asset map. The map is open to all types of organisation, including denominations of church that differ from that of Case 8. It therefore provides a starting point for conversations between Case 8 and churches in their area of jurisdiction. Having a visual overview means they can see what is and isn't happening, and suggest a church goes on a visit to find out how they can replicate activities. Case 8 has a close working relationship with the local council, where data on activities is carried on a live feed across the map. The data sharing process has proved a catalyst for developing ongoing relationships with a range of public and third sector partners, such as the local community foundation, who themselves are fed data from the map to provide a layer showing activities and church-based social action in their data visualisation system.

"It is just a live feed of data, so again it helps us because it's more pins on the map and so more people visit and you get that barrel roll effect, but at the same time it creates incredibly

positive relationships, so the more conversations we have had with [public sector partner organisation] we say why don't we do sports ministry, or did you know we are running this number of youth clubs and you start to link up.

So it is a win for everyone even though commercially if you are one of the big organisations such as Google or Facebook you don't want to share your data, we are finding that is the most powerful tool there is."

Director of Marketing and Communications, Case 8, Religion NPO.

Therefore, the map is not just a communication tool, but a relational tool, to bring people and groups together. This is exemplified in the Director of Marketing and Communications claim that they are not concerned about getting in the local newspaper for the work with the map, but rather forging links and putting people in the same room. In this way, Case 8 is acting as a form of data intermediary, where an organisation positions itself in such a way as to broker relationships and share data (Yoon, 2018).

Organisations are constructed through discourse between parts of the organisation, and external actors (Campbell, 2000; Gergen, 2015). Running through the discourse is a master narrative that guides the conversation and activities within the organisation, and in relation to external stakeholders (Gergen, 2015). Infrastructures, too, are capable of propagating a master narrative that draws attention towards a particular discourse or way of thinking (Star, 1999). Case 8's mission strategy is centred around *Listening, Celebrating, Imagining, and Empowering.* We see this master narrative being carried through in the relational work of the map: organisations and those involved in social action are given a platform to shout about their activities, they are listened to and celebrated. The Director of Marketing and Communications is very clear that the map is not just a communicative tool but a relational one, where people are empowered to build connections, with the map or data-sharing process acting as a catalyst.

7.5 Conclusion and contribution of the chapter

This chapter uses the organisational semiotic framework to demonstrate the relational properties of spatial data, spatial data visualisations and the infrastructures which facilitate their production and use. The organisational semiotic framework overcomes common binaries found in network and relational analysis, such as technical / social, and cultural / structural divides. It provides a close assessment of the social factors that facilitate the relational work of spatial data and their visualisations, without neglecting the physical infrastructure that they rest on. The theoretical analysis conducted in this chapter is applicable to all cases in the study, however, the cases shown here provide discrete examples that fill gaps in extant literature. For example, there is little work on community foundations and their use of data to fulfil their aims, and section 3.1 concludes that there is a significant empirical gap in our understanding of how large, professionalised NPOs use enterprise or large-scale information architectures to produce, use and share spatial data.

Theoretically, this chapter presents an alternative to orthodox relational and network approaches in proposing the use of the organisational semiotic framework. A semiotic approach places the relational work of the sign at the centre of the analysis, and in so doing, has demonstrated the power of spatial data for: communicating expertise and situational positioning (section 7.3.1); representing phenomenological reality in an affective way (7.3.2); connecting disparate parts of large organisations (7.3.3); and forming partnerships to deliver a master narrative (7.4.2). This chapter draws on the range of scholarly thought outlined in the theoretical overview (chapter 2.5), but integrates them with social constructionist perspectives on organisations as communicative constructions. In each case, spatial data play a different role in either maintaining the structure and work of the organisation or extending its reach.

For practice, this chapter should be seen as an encouragement to use spatial data and visualisations for relational work. They can broker relationships and communicate expert knowledge across boundaries. The interview quotes from the community foundations (cases 26-28) in particular show the importance of presenting a compelling, visual argument for achieving buy-in and commitment from donors. Both Cases 24 and 33 use Esri's products to

give staff and volunteers 'on the ground' the visual tools to engage in outreach work and collect and communicate information. Interoperable systems that preserve the integrity of individual data points, while being aggregated alongside other data points, leads to a scalable and auditable system that serves all levels of large and disparate organisations. For organisations that want to be wholly data-informed, the organisational semiotic framework identifies levels of communication and sketches out the technical and social components required of infrastructures that overcome silos and carry master narratives. However, it is acknowledged that few NPOs will have the resources to invest in large scale information infrastructures and therefore, while many organisations would benefit from using maps for relational purposes, such investment should not be seen as a normative imperative.

This chapter has positioned spatial data and spatial data visualisations as relational devices that work across intra- and inter-organisational boundaries. The next chapter takes a broader perspective and situates NPO spatial data use amidst institutional pressures and explores the subsequent tension placed on output and normative legitimacy.

8. Exploring an institutional approach to nonprofit spatial data use: in search of logics and legitimacy

8.1 Introduction

Running throughout the thesis so far is an explicit and implicit recognition that nonprofit organisations do not exist as isolated units, instead they are an analytical midway point between the individuals which collectively make up organisations, and the institutions which shape the cultural and material practices of nonprofits. This final chapter situates nonprofit organisations as 'nested' within wider institutional and exogenous settings. It takes a more expansive perspective than Chapters 6 and 7 by drawing on neo-institutional theory to examine the external logics which are internalised by NPOs and then manifest in spatial data use.

The notion of an external and objective reality in the form of institutions is foundational to much social constructionist and nonprofit scholarship. For Berger and Luckmann (1996, see section 2.5.2), institutions are socially constructed through actors' repeated, habitualised actions. Institutions come to be objectified and held as part of the common stock of knowledge from which people make sense of the world. Institutionalisation is possible in any form of social interaction (even between two people), as actions are repeated and therefore become predictable and anticipated by others. In practice, institutions typically arise from shared understandings among a large group of people. Berger and Luckmann (1996, p.73) describe law as one such institution, where responses to certain situations (such as theft or murder) are commonly understood and lead to action. Yet, laws and their concomitant outcomes are collectively decided and written, and therefore law as an objectified institution is socially constructed and subject to amendment and change.

Increasingly, nonprofit scholars are placing an institutional perspective as central to theorising and explaining the actions and form of nonprofit organisations. Section 2.1.1 introduces scholarship which posits that NPOs display a hybrid constitution drawn materially and symbolically from three institutions: the state; the market; and the community.

Institutions are said to carry certain institutional logics, defined as the "socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality" (Thornton and Ocasio, 1999, p.804). If, as suggested, nonprofit organisations are hybrids of (at least) three institutions, then the guiding logics from the constituent institutions should be identifiable in the material practices, assumptions, values, beliefs, and rules of nonprofit organisations. This chapter examines the 35 NPOs studied in this thesis for identifiable institutional logics and the interplay between institutional logics and spatial data use.

Therefore, this chapter responds to research question 2: *How is spatial data used by UK nonprofit organisations to position themselves within and across sectors?* by adopting an established framework for assessing hybridity in NPOs to identify the uses of spatial data which propagate of conflict with certain institutional logics. We see how organisations are cognizant of wider institutional and organisational field level pressures and employ strategies to amass conferred legitimacy. For practitioners, this chapter demonstrates strategies and approaches that can be adopted to negate loss of legitimacy, as well as some of the inherent challenges in occupying a hybrid space. It demonstrates the importance of aligning practice with values amidst ongoing processes of datafication and pressure to adopt data-driven practices.

For theory, it offers an in-depth assessment of nonprofit spatial data that situates individual practice within wider organisational and institutional spheres. It explores the manifestation of a hybrid organisational constitution through spatial data use and theoretically foregrounds the interplay between data use and institutional logics as existing within the agential reach of NPOs. Theoretically, the chapter connects social constructionist thought on hybridity, organisational institutionalism and legitimacy, and the use of data by NPOs. It concludes by building on recent conceptualisations of a 'data logic' by proposing the existing of an identifiable 'nonprofit data logic'.

8.2 Theoretical overview

8.2.1 Organisational institutionalism and institutional logics

As this thesis draws on data collected from nonprofit organisations and, despite drawing out commonalities, analyses them as discrete organisations, this chapter borrows from the form of neo-institutional theory that is referred to as 'organisational institutionalism' (Greenwood et al., 2008). Organisational institutionalism is the application of institutional theory to understand how and why organisations behave as they do, and with what consequences (Greenwood et al., 2008). It explores the interaction between institutions and organisations with a particular focus on processes of organisational legitimation and agency amidst institutional structures (Reid and Yang, 2016).

The institutional logics approach used in this chapter is one such organisational institutionalist approach for "analysing the interrelationships among institutions, individuals, and organisations in social systems" (Thornton and Ocasio, 2008, p.2). Friedland and Alford (1991) seek to situate analysis of individual and organisational behaviour as taking place within a society which operates as an interinstitutional system. They conceive of institutions as "supraorganisational patterns of activity through which humans conduct their material life in time and space, and symbolic systems through which they categorize that activity and infuse it with meaning" (Friedland and Alford, 1991, p. 232). They describe five central institutions that guide Western society: market capitalism, state bureaucracy, democracy, nuclear family, and Christian religion. Each institution carries a set of logics that guide its organising principles and provides social actors with motives, meaning and identity. Thornton and Ocasio (1999) describe these logics as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality" (Thornton and Ocasio, 1999, p.804). Institutional logics are therefore both supraorganizational and abstract, but are manifest in the material practices and rules of organisations, and the symbolic values, assumptions and beliefs which guide their action.

Thornton and Ocasio (1999, 2008) intend for the institutional logics approach to be an applied theory, where researchers measure the effects of content, meaning and change in institutions through identifying and analysing the expression of logics. To identify the expression of logics, ideal types of institutional logics are used to facilitate interpretative analysis. Ideal types are formal typologies that are abstractions of reality and are used to provide a yardstick against which actual behaviour can be measured. Ideal types are, in practice, rarely observed in their entirety and in isolation, but are important for providing a replicable and objectively valid form of interpretative analysis (Giddens, 1971; Hearn, 1975). For example, the institution of religion would be characterised by an association with deities, norms based on congregational membership, legitimacy gained by a sense of sacredness, and a strategy of increased religious symbolism (Thornton et al., (2012). Of course, ideal types are prone to challenge and revision, as with Gümüsay's (2020) critique of Thornton and Ocasio's (2012) depiction of the religious logic as being too Western-centric. Ideal types are then 'put against' a population or sample to be compared and inform analysis. Interpretative methods are typically used to examine the content and meaning of institutions in line with refined logics. Researchers may use content analysis, discourse analysis, ethnography or narrative analysis to analyse a wide range of 'texts' and situations for identifying instances of conformity to or rejection of institutional logics (Thornton and Ocasio, 2008). To increase robustness, data sources can be triangulated, e.g. findings from an analysis of interview data can be compared with organisational documents to check for congruency of analysis.

Nonprofit organisations are considered to be hybrid organisations that sit on a continuum between the state, the community, and the market, and that organisations adopt the practices, logics, and characteristics of all three to varying degrees (Evers and Laville, 2004; Billis, 2010; Macmillan, 2013; Skelcher and Smith, 2015) (see Figure 2, section 2.1.2). Given their prevalence in previous research (Vickers et al., 2017; McMullin and Skelcher, 2018; Coule and Bain, 2021) and centrality to theories of nonprofit hybridity, this chapter identifies the logics of the state, the market, and the community in the work of NPOs. Figure 30 demonstrates the application of the institutional logics approach in this study. The *state* logic is defined by an emphasis on the redistribution of resources through bureaucratic means to improve welfare. Statist actions may gain their legitimacy from democratic participation and aim to distribute public goods. The state logic sits in contrast with the *market* logic, which is

characterised by the desire to gain legitimacy by occupying a market position which facilitates profit making ventures. Operational efficiency is sought to reduce costs, while bureaucratic hierarchies maintain positions of authority and structure. Finally, the *community* logic emphasises legitimacy coming from local trust and reciprocity between individuals within a shared geography or with a common set of values. The community logic is based on an emotional connection and leads to cooperation between actors in order to do the "right thing in the right way" (Coule and Bain, 2021, p.36).

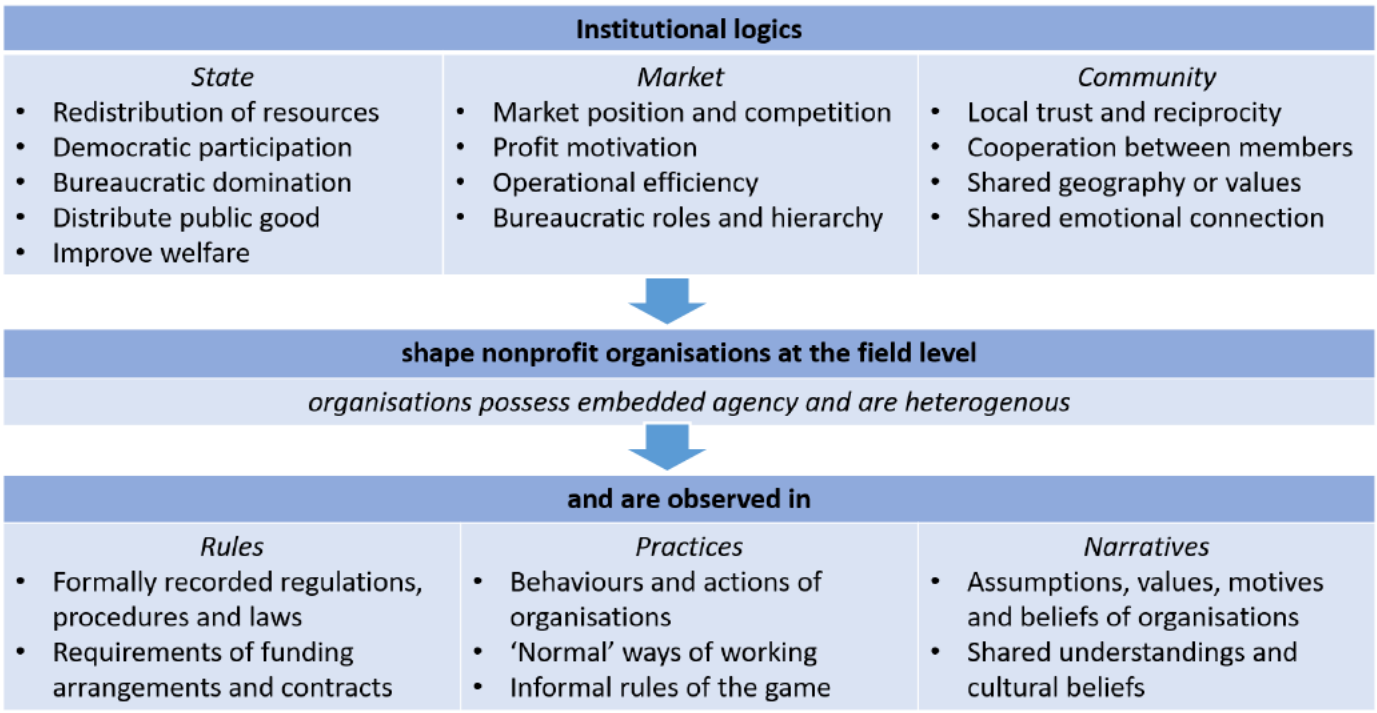


Figure 30: theoretical framework for examining institutional logics in NPOs, drawing on Thornton et al., (2012); McMullin and Skelcher, (2018); Coule and Bain, (2021).

Institutional logics, such as those of the state, market, and community, shape the identities of organisations as they adopt the ideals and principles of a particular institutional framing. Organisations that adopt similar logics will be classified in similar ways and thus find collective identity within a grouping. For example, building societies are financial institutions that their members own, therefore drawing on both market and community institutional logics. Organisations that share a common meaning system and interact more deliberately than others are often referred to as existing within an 'organisational field' (Scott, 2013). Again, building societies share meaning systems and interact in forums such as through the

Building Societies Association.

The institutional logics approach emphasises that whilst the practices and beliefs of organisations are both enabled and constrained by prevailing institutional logics, they are not simply passive recipients but possess the agency and partial autonomy required to shape the direction of institutions and their logics. Institutions are ultimately socially constructed, and therefore the concept of 'embedded agency' (Thornton and Ocasio, 2008) captures the interplay between organisations as both being shaped by institutional logics and through changing practices and beliefs, catalysing new and changing institutional logics (Thornton et al., 2012). This interplay is often neglected in the application of institutional theory; section 2.2.2 draws on literature which largely describes the process of nonprofit isomorphism without recognising the agency of organisations in adapting to or reshaping logics. While organisations may come to resemble each other through shared norms and being part of a common collective or organisational field, the institutional logics approach recognises that each organisation follows a separate path dependency and will draw on different material and cultural foundations of institutions at different times (Thornton and Ocasio, 2008). In this sense, the institutional logics approach offers nuance and a slight rebuttal to organisational theory which presupposes perpetual convergence of organisational practices and norms.

Once the embedded agency and partial autonomy of organisations is acknowledged, we see organisations as more than just passive recipients of institutional pressures. Organisations exercise agency in acting to gain legitimacy, a long-standing concern of institutional theorists. Organisational legitimacy is defined as "generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed systems of norms, values, beliefs and definitions" (Suchman, 1995, p.574). Organisations gain legitimacy by behaving in a way that is in line with the institutional and organisational fields which they occupy or from which they draw guidance, i.e. does an organisation behave how it would be expected to behave? To use the building society example given earlier, an organisation may lose legitimacy if it is seen to not listen to the concerns of its members. Legitimacy matters because it determines whether stakeholders will engage with and trust an organisation or not (Deephouse et al., 2017). It determines reputation, trust and status within a field. It is more apparent when legitimacy is not conferred by an internal or external audience, than when it is: a negative newspaper article about an organisation is more

common than a positive one. Organisations can undertake strategies to manage perceived legitimacy, with strategic decoupling whereby an organisation abides only superficially by institutional pressures being one such strategy (Meyer and Rowan, 1997).

To summarise, this chapter pays attention to the way the state, market, and community institutional logics shape nonprofit organisations at the field level, through *observing the rules, practices and narratives* of the organisations (Figure 30). Institutional logics are at once both intangible and abstract ideal types that are under constant reconstruction, and tangible forces that manifest in the work of organisations. This chapter adopts the three sites of logic manifestation used by McMullin and Skelcher (2018) in their study of community regeneration organisations in England and France: the rules; practices; and narratives that structure and guide NPO decision making and practice. Thornton and Ocasio's (1999) definition of institutional logics as playing out in "material practices, assumptions, values, beliefs and rules" is aligned with McMullin and Skelcher's observance of rules, practices and narratives. *Rules* are the formally recorded regulations, procedures and laws which constrain and enable actors. For nonprofit organisations, these rules are found in the requirements of funding arrangements or contracts. For NPOs that are registered charities, they must abide by charity law, notably the Charity Act 2011. *Practices* are the behaviours and actions of organisations, so for an NPO, practices are their main activity, such as service delivery. Practices are deemed acceptable or unacceptable according to the 'rules of the game' and what is expected of an organisation. It is important to study organisational practices in an institutional context as this is where institutional logics are most explicitly enacted, resisted, and shaped (McMullin and Skelcher, 2018). Finally, the nonmaterial assumptions, values and beliefs of organisations that are shaped by institutional logics are observed in organisational *narratives*. That is, the expression of ideas and justification for actions in conversation and text. If practices capture the material manifestation of institutional logics, then narratives contain the symbolic or cultural elements.

8.2.2 Applications of institutional logics

Scholars use the institutional logics approach to demonstrate and explicate the hybrid constitution of nonprofit organisations (see section 2.1.1) (Coule and Patmore, 2013; Vickers et al., 2017; McMullin and Skelcher, 2018; Coule and Bain, 2021). For example, McMullin and Skelcher show how community regeneration NPOs are bound by state-enforced rules, which are often in conflict with their community logic, and that they simultaneously desire to be business-like whilst retaining a strong emphasis on community engagement. The hybrid constitution of NPOs and their ability to draw on multiple logics may form part of their comparative advantage over the for-profit and public sectors (Billis and Glennerster, 1998), and provide a unique space for innovation to take place (Vickers et al., 2017).

Nonprofit scholars have paid close attention to the tension between money and mission in NPOs, a tension that may arise when NPOs seek to maintain financial success without compromising their ultimate mission (Sanders and McClellan, 2014). This concern is heightened by the professionalisation of the sector and the adoption of NPM and NPG monitoring and evaluating practices, which are centred on commercial logics (see sections 2.1.2 and 2.2.2) and may lead to loss of sectoral independence and mission drift (Buckingham and Rees, 2016). The institutional logics perspective and the concept of embedded agency are used to demonstrate that, despite concerns over loss of independence, nonprofit organisations exercise discretion in choosing to align themselves with logics for their own gain. Coule and Patmore (2013) show how the logics of New Public Management and New Public Governance are employed skilfully and their weaknesses exploited by NPOs. Similarly, Knutsen (2012) shows that NPOs adapt to the logics of the state and market when required, although this may of course put pressure on their identity as third sector organisations. This may be particularly true of large organisations, such as many of those included in this study, as with size comes bureaucracy and an appearance of the wholesale adoption of state or market logics.

NPOs may conform to institutional logics to maintain legitimacy; there is a wide range of literature (section 2.2.2) which attributes adoption of monitoring and evaluation practices to a desire for legitimation by internal and external stakeholders. Yet, this adoption of private-sector working practices, alongside the inherent 'money-market' tension, places the

legitimacy of NPOs under pressure (Sanders, 2015; Bopp et al., 2017). Nevile (2010) characterises a common form of tension as existing between normative legitimacy and output legitimacy: normative legitimacy arises from the distinctive values of NPOs and their attachment to community, whereas output legitimacy arises from successful delivery of a goal or efficient performance. This tension can also be described as downward accountability (normative) vs upward accountability (output) (Nevile, 2010). NPOs employ various strategies to balance the tensions caused by competing logics (Nevile, 2010; Coule and Patmore, 2013): they may discursively package the work they do creatively, drawing on their values and organisational history; maintain a mixed resource-base; and maintain links to a relevant community and set of like-minded organisations. Sanders and McClellan (2014) offer two ways of reframing the money-market tension in order to resist totalising narratives of sacrificing one in favour of the other: talk of 'stewardship' may reframe the conversation around ensuring resources that belong to others (members or future generations) are well used; talk of 'sustainability' may allow organisations to pursue financial viability by reframing it as ensuring the organisation can continue to deliver its much-needed work. Recent work by Carré et al. (2021) presents a nuanced analysis of legitimacy, suggesting that stakeholders who are 'closer' to an organisation are less likely to view it as legitimate than those who are 'further' away.

The second application of institutional logics that is significant to this chapter is situations where the theory has been extended to document emerging forms of logics, such as a specific 'data logic'. Macintyre (2020b) provides one of the few examples of a 'logics' approach being taken when examining nonprofit data use, and in addition, one of the few examples of data use being studied in a large, UK-based nonprofit organisation. Macintyre (2020b) deduces from extant literature that a 'data logic' may exhibit characteristics of quantification, scale, standardised technical processes, and algorithmic thinking. The extent to which this 'data logic' is adopted varies, with fundraising and communication work being two areas where it is employed, although qualitative, relational work still forms the basis of most organisational decision-making. Whilst the creation of a new 'data logic' ideal type may simplify analysis, it reduces analytical scope to that of the organisation and fails to account for wider institutional factors. This is also observed in the discussion of a 'social-media logic' (van Dijk and Poell, 2013), or 'platform-logic' (Andersson Schwarz, 2017), which describe

field-level (and not institutional) characteristics as logics. This chapter takes inspiration from Selwyn's (2021) analysis of data use in schools, which successfully attends to institutional pressures and influences on data use, while examining the extent to which an individual 'data logic' exists as independent from institutional logics.

8.3 The expression of institutional logics

The application of an institutional logics approach to NPO spatial data use is presented in three sections. The first section looks at the sites of data use where the institutional logics of the state, community, and market are expressed and seen in rules, practices and values. The second section explores the tensions and risks to legitimacy caused by the expression of logics and the strategies used by NPOs to negate loss of legitimacy. The third section extends nascent literature on a 'data logic' ideal type by asking, if a 'data logic' was observed as a guiding principle in NPOs, what would it look like? It differs from Chapters 6 and 7 in that it presents a cross-cutting thematic analysis, as opposed to an in-depth analysis of individual case studies.

This first section (8.3) starts from the premise that if NPOs are hybrid organisations that sit on a continuum between the state, the community, and the market, then the logics, practices and characteristics of all three institutions should be observable in the 35 cases studied in this thesis. While an individual action may display characteristics of all three institutions, the three logics are separated for analytical purposes.

8.3.1 The state logic

The state logic is characterised by a desire to (re)distribute resources, particularly public goods, to improve welfare. It draws legitimacy from bureaucratic domination as it forms one of the 'highest' decision making arenas and carries the power to legally impose rules, as well as through democratic participation, as citizens play a role in deciding outcomes. The most widely observed use of spatial data by the 35 NPOs studied is to inform service delivery (see Table 6, section 5.2), emphasising the equitable allocation of resources and redressing existent inequalities. Spatial inequalities, particularly in welfare delivery, and notions of territorial (in)justice have long been the concern of social policy scholars and geographers (Harvey, 1973, Mohan, 2003). The UK's highly centralised system of government means that solutions to redress inequality have typically emerged through central government policy,

even with solutions often being formalised and enacted at the local level. Area-based initiatives such as the Single Regeneration Budget and the New Deal for Communities are earlier examples of action by the state to redress inequalities. Concern for spatial inequality is ingrained in contemporary political discourse, evidenced by the frequent use of 'left behind places' and 'levelling up' in research and government policy narratives (Leyshon, 2021). Discourse and action from NPOs that centres around a need to equitably allocate resources is therefore a clear example of state logics manifesting in the work of nonprofit organisations.

Case 25 is a national corporate grantmaking foundation in which the state logic of equitable distribution of resources and redressing inequalities manifests in rules, practices and narratives. Case 25 lists equality and equity as a prominent organisational value:

"We level the playing field, prioritising under-resourced communities, whether defined by where people live or their shared interests or identities"

Case 25 strategy 2017-2019

Case 25 ran a grant funding round that was match-funded by central government and aimed to reduce inequality of access to youth social action projects. Central government requirements dictated that the funding had to be spent in England (due to devolved decision-making). The foundation targeted the funding at areas poorly served by existing youth social action programmes. It devised its own composite indices using both the Indices of Multiple Deprivation and a dataset of access to youth social action opportunities ranked by local authority. Case 25 then picked out the bottom three local authorities of every region using their indices and would only fund organisations and programmes that took place in those local authorities. Partnership funding meant the state *rules* dictated which UK nation received the funding, the *practice* of Case 25 was inherently centred on redressing inequality, which lived out their *narrative* of equitable resource distribution.

It is expected that organisations that sit closer to the state within the triad of the state-market-community (Figure 2, section 2.1.2) would display state logics. Case 12 (covered in detail in section 6.4.1) is both a registered charity and a non-departmental public body (NDPB). NDPBs are organisations which have a role in the process of national government

and may be financially supported by government, but are operationally independent of government and are not part of a government department. Therefore, it is not surprising that Case 12 draws heavily on the state logic of equitable distribution of public goods in the rules that govern their work, the narratives surrounding their operations, and their outward service delivery. The management agreement (*rules)* which dictates the relations and terms of funding between Case 12 and the Department for Digital, Culture, Media and Sport includes equal social and geographic access to the films and programmes offered by Case 12 as a key performance indicator. The organisation's strategy (*narrative)* places great emphasis on ensuring geography isn't a barrier to access, and their work in digitising and geolocating a large and varied collection of films (see section 6.4.1) delivers on this strategy (*practice).*

To some extent, given their national remit and Case 12's close relationship to the state, we may expect both Cases 25 and 12 to exhibit state logics in their operations. In contrast, cases 5 and 6 are umbrella bodies that exist to support the voluntary sector in their respective regions and cities, and similarly display the state logics of reducing spatial inequalities in service provision. Operationally, they map the work of their member organisations and the wider voluntary sector to assess whether there are gaps in activity, and then work to redress them:

"For example, we might not have any disability organisations in the area despite the demographic data showing a higher than average percentage of disabled people there. So, we'd work with the organisations that do provide those services to look at how they could move into those areas and how those groups can work with other organisations. With the data we can be proactive and work with funders, the council and health bodies, to make sure that people have equal level of access to services".

Manager, Case 6, *Umbrella Body*

Cases 5 and 6 are committed to providing the infrastructure for the voluntary sector to develop in their cities and regions and working to reduce 'cold spots' of activity is a significant part of that work. In addition to a strong commitment, their focus on spatial equity of access and widespread voluntary sector action is driven by funding contracts with local authorities and councils; for the year 2018/19 both umbrella bodies were financially reliant on contracts awarded by local authorities and councils to deliver city or region-wide

programmes. Therefore, whilst Cases 5 and 6 display a strong ideological commitment to spatial equality (which overlaps with a community logic), the influence of state funding is directly observed in their approach to service delivery.

In addition to ensuring resources are distributed equitably, we see the influence of the state logic in NPO adherence to the rules and laws involving data protection and surrounding their charitable activities. The UK General Data Protection Regulation is enforced by the Data Protection Act 2018, and requires organisations to ensure that they collect and use data in a compliant way and that personal data (e.g. on service users or donors) can be deleted at the request of the data subject. All but two of the 35 organisations studied in this thesis are registered with the Charity Commission for England and Wales; Case 16 is a project stemming from a Community Interest Company, and Case 29 is an NDPB that is mandated by law. While all 35 organisations adhere to the nondistribution constraint, organisations that are registered charities must ensure their activities work towards their charitable purposes and for the public benefit. They are regulated by the Charity Commission and are required to submit annual reports and accounts, with organisations that have an annual income of over £500,000 having to meet higher reporting standards. Section 8.4 explores instances where compliance with legal texts and regulatory standards causes organisations to adapt strategies to negate negative consequences and loss of legitimacy.

8.3.2 The community logic

The community logic is characterised by legitimacy arising from local trust and reciprocity between individuals within a shared geography or with a common set of values. The community logic is based on an emotional connection and leads to cooperation between actors in order to do the "right thing in the right way" (Coule and Bain, 2021, p.36). Of course, the right way of acting is subjective and decided upon by the actors within the community. The community logic is prominent in the NPOs studied in this thesis where spatial data are used to support a spatial community, a non-spatial community, or a membership body.

Organisations that employ a place-based approach seek to direct funding and resources in a particular geographic area while working holistically with multiple stakeholders in order to

achieve 'joined-up' systems change (Taylor and Buckly, 2017). Community foundations (Cases 26-28) are good examples of organisations committed to serving a spatial community; they are often bound to working in a specific geographic area by their governing documents (*rules*) and will often jointly fund projects with other stakeholders. A typical community foundation mission statement (*narrative*) may read:

"A better life for everyone in X. We connect people who care with causes that matter, inspire local philanthropy, and nurture community-based solutions to key social problems across X." (Case 26 mission statement).

The three community foundations studied use visualised, quantitative spatial data to differing degrees to prioritise their work and guide funding allocation (see section 7.3.1). It is important for the community foundations to gain local trust and engage community members. Case 27 does this by undertaking focus groups that explore local issues in more depth and therefore ensure community members feel 'heard.:

"It's very helpful to be able to present that kind of quantitative picture and test it literally with the focus group people who would say, well yes that does make sense or no these things don't really cross that divide….what you're looking for from the qualitative information is an understanding of why [the quantitative data] might look like that, and how that actually has an impact on how communities function"
Research and data analyst, Case 27, Grantmaking NPO

In addition to the three community foundations, the community logic is prominent in Case 16, a development and housing NPO that aimed to use technology and community engagement to kick start community-led housing programmes in a UK city. Case 16 explicitly sought to move the housing supply chain away from for-profit, market-based development projects and towards community-led initiatives in the host city, therefore explicitly pitting the community logic against the market logic:

"The thing that I've started to talk about is the supply chain of housing and how to look at the full supply chain, and people are part of that supply chain, so the commissioning of that can come from a developer, but it can also come from a community. So how do you bring communities into that, and some of that is about demystifying the rest of the supply chain

and demystifying the process of identifying land and all that sort of stuff which is where the geospatial stuff comes into it".

Director, Case 16, Development and Housing NPO

The community logic also manifests in the rules, practices and narratives of NPOs when their concern is with engaging or developing a non-spatial community. Religion has long been a motivation for drawing communities together in the nonprofit sphere (Frumkin, 2005). The organisations studied in this thesis which explicitly espouse religious values (Cases 7-9) are guided far more by a community logic than market or state ideals. Case 9 is a national religious NPO, which maintains an asset map of their constituent church boundaries alongside relevant social and demographic data. They recognise that whilst they operate at the national level, the purpose of the map is to allow local churches to use the data to understand and engage with their community. Cases 7 and 8 represent interesting cases where NPOs are cognisant of the wider institutional environment in which they are situated and operating in, but display rules, practices and narratives that privilege a commitment to community. They both list their charitable objectives as aiming to advance the Christian faith within a certain geographic area and use spatial data to understand the location of their members (Case 7) and publicise the church's work (Case 8). However, Case 7 has moved away from hand-delivering leaflets to advertising on Facebook, as it offers access to a wider and more targeted audience. Case 8 is highly cognisant of ensuring their website is search engine optimised (SEO) to appear amongst the first few entries for relevant searches. Both techniques draw on market logics but are employed to further the growth and strength of their respective communities.

The community logic is also prevalent in NPOs that operate a paying membership model. The members represent not only a source of income (market logics), but notably a group of people that share the organisation's value set and view their work as worthy of support. It is therefore important for organisations to use spatial data to gain community buy-in. Several of the environmental NPOs studied in this thesis (Cases 31 and 33-35) offer membership packages and encourage members to voluntarily collect spatial data on habitats or animal sightings. Case 34's organisational narrative envisages open spatial data as an important part of facilitating membership-led campaign and advocacy work that is in keeping with the

organisational aims. For example, open data on species location or land use change can be viewed, downloaded and used by the membership to launch their own local campaigns, or write to their MP asking for change.

"There's a desire to shift from being a charity which will save nature on behalf of the membership, to really empowering membership to take action to save nature themselves"
Senior GIS Analyst, Case 34, Environmental NPO.

8.3.3 The market logic

The third institutional logic that we would expect to observe in NPOs is the market logic. The market logic is characterised by a desire to gain legitimacy by occupying a market position which facilitates the accrual of surpluses. Organisations seek to operate efficiently and are internally maintained through bureaucracy and hierarchy. The adoption of market logics by nonprofit organisations has been the source of much debate and concern from nonprofit scholars and practitioners (Eikenberry and Kluver, 2004; Sanders and McClellan, 2014; Maier et al., 2016), as NPOs risk losing their legitimacy and status which is founded on being 'value guardians' and not profit-driven (Eikenberry and Kluver, 2004). Similarly, the supposed 'professionalisation' of the sector in which private-sector management tools are used to improve efficiency is viewed by scholars and practitioners as a threat to NPO legitimacy (Marberg et al., 2019). Of all three institutional logics, it is the increasing adoption of market logics which has garnered the most attention to date and has often been framed as an inexorable change that is occurring within the sector.

There are three key instances where the market logic is prominent in the NPOs studied. The first is the use of analytical approaches and tools that have emerged from or are typically used by the private sector. Private sector techniques are used for marketing purposes, or to develop a programme of work or service offer. For marketing purposes, NPOs use spatial geodemographic classifications, such as Experian's Mosaic (discussed in section 6.3.2), to better understand current supporters and to identify spatial areas where future supporters may come from. Despite early developments in geodemographic classification emerging from the public sector and academia, the widespread adoption of spatial profiling

techniques by marketing agencies from the 1970s onwards means they are associated with the aims of "commercial sociology" (Webber and Burrows, 2018, p.73).

The marketing and audience insight team of Case 33 works with the GIS team to better understand where their potential members may live:

"We use Mosaic, a socioeconomic profiling data set, so sometimes we do a bit of manipulation of that into postcode areas or something that they're interested in…we have got quite an aggressive commercial strategy at the moment. For example, we segmented our members into socio-economic profiles and then I think they have done a load of work looking at things like where those profiles are across the whole country and where we should be targeting our marketing, in terms of things like these people are like our members so we should be targeting more memberships in this area"

Head of Conservation Information, Case 33, Environmental NPO

While the practice of geodemographic profiling offers great utility for NPOs to market their own offer, it also facilitates partnerships with companies that wish to gain access to the NPOs stakeholders and supporters. This is particularly prevalent in the arts, where organisations often rely on corporate sponsorship for long-term financial viability (Finkel, 2010). We see this in the narratives and practices of Case 11, a large arts and culture NPO. Case 11's Head of Insight background in the private sector has left a slight scepticism over the efficacy of geodemographic segmentation:

"So I worked for [company] and I suppose I am slightly suspicious of Mosaic, it is quite tenuous and I think postcodes and geography are an indication but they are not a great way, it is quite inaccurate science, yet people like Experian are going full out and making a lot of money out of it"

Head of Insight, Case 11, Arts and Culture NPO

Despite this scepticism, Case 11 is investing in CRM and marketing software to advance their understanding of the profiles and attitudes of their audience, alongside outsourcing work to market insight companies. The use of private-sector techniques to profile and understand their audience allows them to form a narrative that fosters legitimacy in the eyes of corporate partners:

"Where we use geo-targeting and geo-profiling the most is to get sponsors and to profile our audience and say this is the audience that we have, it is who you want. Say you're going to [corporate sponsor], then it is a common language, and we can say you are trying to target these people, we have these people for you, so we are a great match."
Head of Insight, Case 11, Arts and Culture NPO

The application of spatial data to understand user groups or predict where future users may be found also takes place for service delivery purposes. For example, Cases 13 and 15 are healthcare NPOs that use third-party data on pertinent trends, such as long-term cancer rates to shape the future form of their campaign work and service delivery. Case 15 partnered with a social investment organisation to purchase data from a data analytics company on people's spending patterns by income decile within the spatial area of concern. This granular insight allowed Case 15 to narrow down the spatial areas and socio-demographic groups they engaged with to ensure maximum impact.

The second instance where the market logic is prominent is in the use of spatial data to apply for funding and 'win' contracts. The legacy of the New Public Management era is one of contractualism and hyper-competition, where NPOs are required to compete for public sector contracts to deliver work. The market logic guides the rules of the game and the data practices that organisations undertake, in that organisations are required to evidence their work in bids to offer the greatest value for money and being flexible to the desires of funders is advantageous:

"Funders are trying to become more data-driven in how they allocate their funding. So for us to be able to say, "yeah okay, well here's the data of what we did with your money and it's good data. It's precise. And oh, right you're more interested in this? Let me quickly redo that chart", that's a big advantage to us in putting together bids"
Director of Impact, Case 21, Social Services NPO

Many NPOs studied routinely used spatial data to demonstrate both need and evidence of previous impact when applying for funding and bidding for contracts. Once the contract is delivered, organisations frequently provide progress reports that use quantitative evidence to demonstrate successful impact. Case 6, an umbrella body, currently holds a large contract

from the local authority to support their local voluntary sector with capacity building. The Policy and Influence team manager at Case 6 is a long-standing voluntary sector worker and attributes the need to collect data and evidence impact to the introduction of national programmes such as the Single Regeneration Budget, which brought about a place-based approach to working where funds were allocated to those that could evidence both need in a place and impact. Therefore, whilst the requirement to use spatial data to meet funding requirements is imposed by the state and other third sector providers (such as trusts and foundations), it is an expression of both state and market logics of operational efficiency and being in a strong 'market position' to bid for contracts. For some organisations, their success is, in part, defined by the fulfilment of their contracts and good relations with stakeholders who commission contracts:

"I think without wanting to blow our own trumpet [the contract] is seen as quite a prestigous contract for us to hold…I think generally speaking as long as our commissioners are happy then our senior staff are happy as well"
Information Manager, Anonymised Case.

The third instance in which the market logic is observed in the 35 NPOs studied is in the narratives that organisations use, particularly to describe their own work and their stakeholders. Organisational reports regularly discuss 'winning' or 'losing' contracts and outline a business strategy for growth. For example, Case 23's 2019/20 annual report describes a competitive working environment that would be indistinguishable from that of a private-sector competitor:

"The operating environment continues to be challenging meaning that pastoral support services such as ours continued to be cut and we lost one contract due to funding issues and unrelated to the quality of service delivery. We also faced increasing competition for school commissions from private practitioners, other services or internally recruited appointments"
Case 23, 2019/20 Annual report.

Private-sector language and phrasing are most noticeable in large, service delivery organisations with a high degree of professionalisation. The Head of Data at Case 4, a large law and advocacy NPO, described how their *"customer journey team, which used to be*

digital, is now about making the overall client experience better, more efficient, more effective and more meaningful to clients".

8.4 Strategies for maintaining legitimacy

This chapter has so far demonstrated that NPOs display the institutional logics of the state, the community and the market. It has not yet addressed the normative question which is found in an institutional logics approach: does it matter that NPOs subscribe to different and multiple institutional logics, and if it does matter, how do NPOs respond internally and externally? The research question addressed by this chapter: *How is spatial data used by UK nonprofit organisations to position themselves within and across sectors?* implies that nonprofit organisations possess agency and an awareness of their positioning within institutional and organisational fields. This section (8.4) examines the embedded agency that nonprofit organisations possess in navigating conflicting logics. That is, the agency organisations have to shape and respond to institutional logics, rather than simply being passive recipients of logics as nonprofit isomorphism theory would often suggest.

Extant literature provides ample evidence of institutional logics conflicting between organisations (e.g. Buckingham and Rees, 2016), and within a nonprofit organisation (e.g. Coule and Bain, 2021). Conflicts are often framed through being a case of money vs mission, in which isomorphic and institutional pressures force NPOs to choose between financial sustainability and staying true to their mission, although NPOs can employ strategies to negate this tension (Hersberger-Langloh, 2020). There is a conflict between the marketized ideologies adopted by funding agencies that require detailed, quantitative evidence to monitor the impact of their grants and the community logics of many NPOs, which favour long-term assessment of impact through more qualitative, relational means (Polonsky et al., 2015). The tensions in data collection practices lead to an erosion of autonomy, data drift, and data fragmentation, where organisations are pulled away from their community-based logics and towards marketized ones (Bopp et al., 2017).

One way of measuring whether a conflict of logics matters to nonprofit organisations is by assessing its impact on legitimacy. Legitimacy is important because it determines whether

stakeholders will engage with and trust an organisation or not (Deephouse et al., 2017). Nevile's (2010) bifurcation of legitimacy into normative legitimacy and output legitimacy moves past individual cases of conflicting logics and gives a broader analytical framework. Normative legitimacy arises from the distinctive values of NPOs and their attachment to community, whereas output legitimacy arises from successful delivery of a goal or efficient performance. The tension between normative and output legitimacy is observed in the use of NPOs for public sector service delivery; governments value the normative legitimacy NPOs possess through a close link to community yet pursue output legitimacy from delivering state contracts which may conflict with the desires of certain communities (Nevile, 2010). NPOs possess the agency to navigate and negate the tensions between output and normative legitimacy in their day-to-day work (see section 8.2.2). In this study, we see organisations deploy four distinct (but not mutually exclusive) strategies for maintaining legitimacy amidst conflicting logics: reflexivity; active resistance; polyphony; and taking a values-first approach. They are not strategies in the sense that they are codified as a named approach, but rather they are attitudes and tactics adopted by organisations and stakeholders to reconcile conflicting logics or maintain legitimacy.

8.4.1 Reflexivity

The first strategy is important, for without it, an organisation could not see the threat to either normative or output legitimacy posed by conflicting logics. Observed in the rules, practices and narratives of organisations is an introspection and reflexivity which actively examines the congruency between logics and the basis for legitimation. Reflexivity is more than passive reflection, instead it necessitates an active process of questioning, and if necessary, a change of working practices and attitudes. There is a clear process of reflexivity in organisations that are highly influential within their field and could be seen as shaping or reinforcing the dominant logics at play. For example, Cases 4, 9, 12 and 29 are all large national organisations that display strong statist characteristics through a close working relationship with the state or as an artefact of their position at the top of a national hierarchy. To avoid losing the normative legitimacy conferred on them through being a nonprofit (and not a state-based) organisation, they ensure output-based demands do not compromise trust and goodwill. Case 29, a large grantmaking NDPB, is extremely conscious

of finding the balance between ensuring resources are spent well, and collecting data on impact (thus satisficing demands for output legitimacy), whilst not sacrificing the willingness of fellow nonprofit organisations to engage with them and apply for grants (normative legitimacy).

"I'd say 90% of our grants are very small and this means that we want people to be applying for grants, we don't want to be a bureaucratic nightmare which I know we can be at times. So, there's a balance between data collection and how we make ourselves better and not being in the way and letting people do great things".
Senior Head of Information, Case 29, Grantmaking NPO

Cases 4 and 29 are national organisations that work for the benefit of their wider network which operates at the local level. Their position at the top of the bureaucratic hierarchy brings benefit in that they gain a 'birds-eye' view of operations and can display trends at spatial scales beyond the work of individual local members. They are in a position to enforce institutional logics, such as the state logic of equality of provision and bureaucratic practice, by collecting outcome and operational data. Both organisations recognise their hierarchical position and seek to avoid practice that conflicts with the wider network's desires. Case 9 recognises that their data collection practices could seem intrusive, but through feeding information back to the individual organisations a paternalistic and supportive attitude is conveyed and legitimacy is maintained:

"Sometimes the attitude is, well you're checking up on us, and in a sense we are...you could use that phrase and that sort of is what we're doing, but we're not checking up on you because we want to tell you off, we're checking up on you because we care about how things are going and if they're going badly we'd like to make it better and I think most people understand that and a few churches are still coming around to that point of view".
Senior Statistical Researcher, Case 9, Religious NPO

At the same time, the individual research team is beholden to the state logic which pervades the work of the organisation at the national level and must satisfice the demands of both the wider church network which they serve and stakeholders operating at a national level:

"In some senses, [this team] is being paid to provide useful information for national church institutions, but it's also being paid to provide useful information to churches, and if we can convince both of those groups that we do is worth the money, independently of each other then that feels like the way to go to me, nobody feels like they're being taken advantage of, like they're being checked up on".

Senior Statistical Researcher, Case 9, Religious NPO

In a similar act of self-awareness, Case 25, a national grantmaking body, is careful to maintain a link to 'community' amidst the enactment of state logics. As previously outlined, the organisation delivers national funding programmes using metrics that guide equitable allocation according to need. To ensure the organisation maintained 'close' to the communities in which it seeks to affect change, local Voluntary and Community Sector (VCS) support organisations were encouraged to promote the fund to groups that work in underserved communities. Working with VCS support organisations negated a distanced and abstracted identification of suitable areas through compilation of a national metric by engaging the staff's local knowledge to promote the fund to eligible groups in underserved communities that they were aware of.

8.4.2 Active resistance

The second strategy demonstrates the agency of NPOs in reshaping or negating the impact of logic conflicts. NPOs displayed an active resistance to the imposition and adoption of logics, notably by funding agencies. Buckingham's (2012) typology of nonprofit contractual relationships includes 'cautious contractors'; those that resist or have difficulty in adapting to the requirements of contracts. Case 5 is a small umbrella body that would fall under Buckingham's definition of a 'cautious contractor', as it is careful not to sacrifice the legitimacy and trust conferred by the local community and its member organisations to fulfil the data requirements contracts with local authorities. Case 5 delivers contracts on behalf of the local authority that engage vulnerable and marginalised groups, and are often required to collect data, such as postcodes, of the people they work with as part of the contract. They recognise that many vulnerable people are hesitant to hand over personal details for fear of state surveillance. Therefore, they requested the restructuring of a contract with the local

authority so that data on specific individuals was not collected and presented back at an aggregate, summary level. The organisation relies on funding from local authorities and recognises that private-sector logics of constant monitoring and evaluation are a necessary part of this (output legitimacy), yet are not willing to accept this to the detriment of community trust, which sits at the heart of the community logic (normative legitimacy):

"There's anxiety within the most vulnerable people and that's who we most specifically work with. Our instinct as an organisation is to protect people's data , so when [local council] say can you give us names, can you give us postcodes, can you give us something, we always say no, so that's kind of the prebuilt feeling within [Case 5], we are a trusted organisation and we won't break that trust at all. So even if it is openly shareable data and data that you could look up, it's still no."

Active Communities Connector, Case 5, Umbrella Body.

It is well documented (e.g. Bach-Mortensen and Montgomery, 2018) that many NPOs lack the capacity to measure their work and the demands of funders places strain on the information systems of NPOs (Bopp et al., 2017). Case 23, a social-services NPO, delivers public health contracts which come with demanding data collection requirements which puts a strain on their own human resources and information systems:

"Our experience is once you hook up with public sector institutions, they have got systems already up and running for the services and when you try to apply the NHS model onto a small charity it is going to creak…"

Director, Case 23, Social Services NPO.

In response, the Director of Case 23 has applied for increased funding from their commissioning body to develop their data capabilities so that they can respond adequately to demands for data without sacrificing other areas of service delivery by diverting financial and human resources towards fulfilling the reporting needs of contract.

The above cases are examples of NPOs navigating the money vs mission tension. However, we see NPOs being required to stand their ground amidst conflicting logics even in situations where the NPO is in a position of financial dominance. Section 6.4.2 describes Case 12's development of an interactive crowdsourcing and video display platform, which has a

map of the geotagged videos as the main component. Case 12 was keen to ensure that place was the central organising concept for the videos and therefore developing a map meant that spatial communities could be identified, and people could organise videos by geographies that were relevant to them. This community logic conflicted with the market logic of the agency that was developing the tool, which believed that a map interface wouldn't be engaging and was a bit old fashioned. Case 12's commitment to organising the videos around spatial communities meant they pushed back and insisted that the final product would be a searchable map, which would be engaging and useful to people.

8.4.3 Polyphony

Nonprofit organisations that occupy a hybrid space and display a plurality of logics may deal with issues arising from a conflict of logics in different ways. They may display segmented or segregated organisational form, where functions of the organisation that are orientated to different logics are compartmentalised within the organisation, or within a separate but associated organisation (Skelcher and Smith, 2015). They may also blend logics synergistically, or adopt some practices and symbols of a logic and not others (Skelcher and Smith, 2015). One difficulty faced by mangers of NPOs that adopt a hybrid and multi-logic approach is how to ensure the appropriate logic and value-set is communicated to the correct stakeholder group. For example, an organisation may want to demonstrate their careful use of resources to donors, but a benevolent and welcoming community-orientated approach to recipients or grassroots partners. The communication of multiple 'voices' or narratives by a singular organisation is characterised by Akerstrom-Andersen (2001) as 'polyphony'; organisations may deal with an inherent possession of conflicting logics or values by speaking to different systems and stakeholders when it is advantageous for the organisation. The use of hybrid models to support polyphonic practice is observed as an active strategy by several organisations studied in this thesis.

For example, Case 10 is an arts and culture organisation that occupies a unique position in the arts sector. It segments audience data and feeds it back to arts organisations for use in audience analysis work. It is set up as a charitable company and therefore has a trading subsidiary through which it undertakes research, strategy and evaluation consultancy work

for a range of nonprofit and public sector organisations. Skelcher and Smith (2015) refer to this form as segmented hybridity, where different logics are compartmentalised within the organisation. This organisational form allows Case 10 to act in a polyphonic manner:

"We are deliberately positioned…well what we aim to be is trusted custodians of shared data and because we are a charity that let's us do that but also because we operate as a private company as a consultancy and we work with a lot of public sector clients we speak those different registers"

Research Director, Case 10, Arts and Culture NPO.

Case 10 desires to be a "trusted custodian of shared data" (see above). Their work funded by Arts Council England to increase access to the arts through greater audience insight is demonstrative of state logics, where the distribution of public goods and redistribution of resources are desired. Yet, their status as a charitable company with a trading subsidiary places them in a position to use their expertise to inform private clients, using market practices and narratives to appeal to the "different registers" (see above). Interestingly, the conflict of logics between the market and the state (money vs mission) that is frequently seen in arts organisations (e.g. Voss et al., 2000), is not an issue for Case 10, for many organisations they work with understand and recognise the tension and need for compromise. Instead, there is a tension between the communities which arts organisations serve, and the state logics of equality of access, for certain arts audiences wish for the arts to maintain an aspect of exclusivity:

"So going back to what you said earlier about the purpose or rationale behind what we do and is there a conflict between wider engagement and everything else, when we are talking to our clients, no not particularly as they want maximise revenue and maximise reach and they know there is a trade-off. But when you talk to the audience and say we are going to make opera less exclusive, they say what is the point of that? We are coming because it is exclusive, if you tell me that everyone can come then frankly, I'm not interested in coming"

Research Director, Case 10, Arts and Culture NPO.

Polyphonic practice is displayed in situations where an organisation takes account of a difference between their own priorities and that of their stakeholders and adapts their

narrative or practice to appeal to an alternative concern. For example, Case 1 is an NPO which focuses on ensuring equality of digital access. It is funded through project-based work and as such has to appeal to the priorities and different logics of their project partners to gain buy-in and ultimately achieve their end goal:

"I think we're getting better at framing [the social imperative]….e.g the change for you as a local authority might look like cost savings through channel shift…it's our job to frame the necessity to deal with the social bit in order for that to happen, if that makes sense, and I think we're getting better at that. We did a channel shift calculator for example, which is based on the social behaviour change stuff and then looked at how we could re-present that to the person who goes, well I've got £1m to save in face-to-face visits around housing benefit"

Data and Evaluation Manager, Case 1, (Other, Digital Access)

8.4.4 Maintaining a values-first approach

The final strategy that NPOs employ to ensure legitimacy is maintained amidst a conflict in institutional logics is to explicitly place their organisational value set and priorities at the forefront of their work. An identifiable and unique value set helps build trust in nonprofit organisations and can form the "cornerstone of their competitive advantage" (Frumkin and Andre-Clark, 2000, p. 143). Organisational values go beyond just competitive advantage as they form the basis of wider normative legitimacy (Nevile, 2009); all stakeholders involved in nonprofit activity confer legitimacy on the nonprofit sector due to the sector's supposed shared moral imperative to uphold value-sets. This implicit social contract and values of integrity, accountability and charity provide trust that is "the essential lifeblood of the nonprofit sector" (Jeavons, 2016, p.191). NPOs studied in this thesis are cognisant of the need to be seen to be guided by their values and to be working towards their end goal when using data. Question 4 of the interview schedule (Appendix 3) asked respondents about the congruence between their use of spatial data and their stated organisational aims and espoused values. Most respondents felt that there aims and values and use of spatial data were closely aligned, for example, responses included:

"I think you can almost make an argument that anything that we or anyone else do from a GIS perspective links directly through to those aims…"
GIS Manager, Case 31, Environmental NPO

"If you think about our mission coming out of our values, then our mission has to be to reach as many people as possible. We can only do that if we can measure that, and I think we can only measure that geographically, as there are some areas of the country that we don't have a presence in, so I see a strong link in holding ourselves to account there."
Head of Finance, Case 3, Education and Research NPO

"I guess the key driver of the organisation is a very basic one, it is to cut [avoidable deaths] by 50% by 2024, so quite ambitious … so overall yes, I think we are 100% committed to one goal and GIS is picking up speed and the buy-in is really good to see. The potential is huge and it has only been in the organisation about 5 years, so it is still new but it is a massive organisation and we have a lot to work with."
GIS Advisor, Case 24, Social Services NPO

Some respondents were clearly aware of the potential for legitimacy to be lost if they were seen to adopt private-sector approaches to data use that didn't necessarily directly support their mission or aims. For example, the Senior Data Analyst at Case 17, a large homelessness organisation, was conscious of maintaining a clear link between the use of data (for output legitimacy) and their end mission (to maintain normative legitimacy):

"We want to make sure that we're using it [the data] in the spirit that it was given, we're using it to end homelessness, we've got to remember that, we're not using it to make more money for us, we're using it for the same reason that it was given."
Senior Data Analyst, Case 17, Development and Housing NPO.

The Senior Data Analyst is cautious throughout the interview to stress that their developing data strategy will ensure that data use is used to support their long-term mission, and doesn't become viewed as a form of capital from which financial value can be extracted. For the Senior Data Analyst, this is a key distinction between the private and nonprofit organisations: data is used as a commodity by private sector organisations and is used to

create value, whereas NPOs are often volunteered the data and must treat their data subjects with respect and in line with their values. This distinction speaks to a challenge that NPOs may increasingly find themselves grappling with: amidst the datafication of everyday life and the use of data as a form of capital by a range of actors (Sadowski, 2019), how do NPOs signal that their use of data is value-driven and slightly distinct from wider the processes of datafication? If the tools, techniques and terminology (such as profiling and data-driven decision making) are borrowed from the private sector for purposes of gaining output legitimacy, then how do they safeguard their status as 'value guardians' (Eikenberry and Kluver, 2004) and prevent loss of normative legitimacy?

To challenge hegemonic market discourses, NPOs must create a counter-discourse (Eikenberry, 2009), such as one centred around the virtues of 'stewardship' or 'sustainability', as suggested by Sanders and McClellan (2014). Sanders and McClellan propose reframing nonprofit work around stewardship or sustainability to shift discourse away from a binary of money vs mission and business logics, and towards a discourse which maintains legitimacy through alternative framings. Sanders and McClellan's (2014) proposed narratives are of use to organisations that seek to avoid loss of legitimacy through using data in ways that aligns with either the public or the private sector, and crucially, carries negative connotations. For example, the following quote describes the process of using geoprofiling of audience members to attract corporate sponsorship:

"Where we use geo-targeting and geo-profiling the most is to get sponsors and to profile our audience and say this is the audience that we have, it is who you want. Say you're going to [corporate sponsor], then it is a common language, and we can say you are trying to target these people, we have these people for you, so we are a great match."
Head of Insight, Case 11, Arts and Culture NPO

Marketing agencies and private sector organisations have long used statistical inference and profiling techniques, yet they operate within a transactional framework and as such are bestowed limited trust by the wider public (Open Data Institute, 2019b). Case 11 could avoid a loss of normative legitimacy by reframing corporate partnerships within a wider act of stewardship; Case 11 is an organisation that has a long and successful history of preserving

space for the arts and artists in central London. Corporate sponsorships are necessary to ensure that the physical space and artistic community of which Case 11 is a steward can thrive and be supported. By placing long term stewardship of resources and associational space as the ultimate reason for geoprofiling of data and forming corporate partnerships, the narrative is future focused and not centred around a false binary of mission vs money.

Similarly, Case 23 is a social services NPO that runs youth counselling and support services. It is largely funded by contracts with statutory services that come with demanding data collection requirements on the details of service users and support offered. The public sector commissioners expect Case 23's staff to collect data on the names and postcodes of young people they work with, a requirement with which staff often feel uncomfortable. There is a tension between the public sector framing of service users as 'patients' and therefore as no different to any other health service user, and the community framing used by the NPO which relies on an individual relationship with service users which is built on long-term trust. The director of Case 23 recognises this tension and the compromise that must be made, yet believes it is necessary to ensure long-term sustainability and increase the reach and scale of their service:

"The tension that exists for us is that 60-70% of our funding comes from statutory bodies so we are beholden to them for keeping ourselves financially going. How can we hang on to our integrity and our individuality and moral stance on things when we are being paid by institutions that come at this from a slightly different angle, that's an ongoing issue. The voluntary sector has traditionally maintained its independence but there will be a cost to that as well, there will be some charities who say I'm not going down that path, we won't take NHS funding, they won't compromise. We are a charity that has made that compromise for reasons obviously of trying to expand and reach as many people as possible, but there is definitely a compromise."

Director, Case 23, Social Services NPO.

8.5 Attributes of a nonprofit 'data logic'

This final section of the chapter diverges slightly in its use of the term 'logic' from the neo-institutional application which attributes logics as emerging from socially-constructed, hierarchically dominant institutions. Instead, it builds on literature that supposes a 'data logic' ideal type can be identified in the work of organisations but (with the exception of Sewlyn, 2021) fails to situate it within wider institutional movements and pressures.

Macintyre's (2020b) thesis examines how personal data is used in two NPOs, with one being a large UK campaigning organisation. Macintyre (2020b) deduces from extant literature that a 'data logic' ideal type would exhibit four principles (p. 21):

- Quantification: the belief that it is possible to represent anything in numbers
- Scale: the belief that more data is better
- Standardised technical processes: the belief that standardised processes are the best way to achieve results
- Algorithmic reasoning: the belief that modelling and testing and controlling inputs can deliver desired outputs

Macintyre's (2020b) compilation of this ideal type rests on literature which is not sector-specific, although it leans slightly towards the private-sector in its focus. The underpinning literature is critically positioned but not necessarily empirical (e.g. boyd and Crawford, 2012). It is therefore not surprising that the four principles of a 'data logic' do not align with the findings and analysis presented in this thesis so far; we have seen examples where the principles have been adopted in part, but they are not adopted uniformly or to the extent that they can be viewed as part of a coherent 'data logic'. Therefore, based on the cases studied in this thesis, we can ask: what would be the foundational principles of a 'nonprofit data logic'? This section proposes four features of a nonprofit data logic:

- A pervasive culture of data use
- Collaboration across fields and institutions
- A concern for data governance and ethics

- Support for open-source software and open data

A pervasive culture of data use

The most apparent attribute of a nonprofit data logic is an organisational culture which supports, or is rapidly coming to support, the use of data across the organisation. It is defined by a desire to use data to get the most from resources and to aid in the successful achievement of the organisational mission. The change in culture could be explicitly outlined through the development of a data strategy, or (as shown in section 5.6), could occur slowly over time as an imperative to use data is imported with the arrival of a new staff member or trustee. It was common across the cases for the interviewee to have previously worked in a private or public-sector setting and act as a carrier of an institutional logic by bringing new working practices and narratives into their new workspace. Likewise, trustees act as strong carriers of institutional logics as they come to expect similar working practices to that which they're used to:

> *"The trustees are very interested [in using data more], we've got a new trustee who used to hold a senior position in a large telecoms company, so as you can imagine he is quite data savvy, and so he will say I want to know the answer to this…"*
>
> *Community Impact Analyst, Case 26, Grantmaking NPO.*

Kline and Dolamore (2019) propose that as NPOs come to rely further on data for fulfilling their core mission, data use and innovating with data will become a core organising value. It shifts from holding instrumental value for staff and volunteers to being a core part of the organisation's culture. Many cases studied in this thesis demonstrated the adoption of data-use as an organisational value, sometimes held within the more explicit articulation of their values as 'innovation', 'creativity', or 'evidence-based'. In practice, being data-driven as a core value meant, where possible, using data to support all areas of the organisation to fulfil their role. Case 35 is a large environmental NPO that has a small GIS team which sits in the IT and finance directorate and serves the entire organisation. Over time, the organisation has shifted towards a culture of interrogating data regularly and using spatial data and GIS to underpin their day-to-day work:

"The first question alot of people ask now is, is there a data set for that? I want to see it. So last week, somebody phoned me up and said: "Low Emission Zones, London, I need to see it on a map, because we need to see where it impacts us". 5 to 10 years ago you wouldn't have got that question. Through that sort of thing, we can help in nearly all areas to deliver the strategy and make savings, and improve people's lives at the same time."
GIS Manager, Case 35, Environmental NPO.

Collaboration across fields and institutions

The second observable attribute of a nonprofit data logic that isn't captured in Macintyre's (2020b) characterisation is the willingness to conduct data-driven work openly across fields and institutions. A direct manifestation of an NPOs hybrid constitution is collaboration and use of resources from multiple fields and institutions. Chapter 7 demonstrates the relational properties of spatial data and the capacity for visualisations to legitimate nonprofit work but doesn't directly demonstrate the role of institutional logics in relational working practice. Case 15 is a place-based healthcare NPO that purposefully works across institutional boundaries to improve the public health prospects of residents within its spatial jurisdiction. Its data use draws on logics from all three institutions. Firstly, it exists to support the work of an allied NHS trust, so there is a direct state-driven imperative to improve public health. It takes particular concern with access to healthy foods and childhood obesity, and not only partners with a range of public, private and nonprofit organisations in delivering initiatives but uses data drawn from all three institutions:

- the National Childhood Measurement Programme (NHS, state)
- localised consumer spending patterns (provided by a private company, paid for a social investment bank)
- research with the local community (e.g. ethnographic research, subjective understandings of place through geo-located surveys)

Case 15's hybrid constitution and close working practices with organisations from all three institutions manifests in data-driven work that draws on a range of sources.

In some cases, a pervasive culture of data use (attribute 1), necessitates cross-boundary working. The CEO of Case 2, a large animal welfare charity, wants to position the organisation as the leading authority on animal behaviour and research. A research project which looks to estimate the size, constitution and spatial distribution of the UK's dog population relies on data gathered from 15 partner organisations, including nonprofit organisations and private-sector organisations such as dog chip manufacturers and insurance companies. In addition, the organisation collects data from web-scraping data from adverts online. Case 2's desire to be the authoritative source on a topic means it must take a holistic perspective and build partnerships to access data sources.

A concern for data governance and ethics

Matters of data protection and governance and data ethics weren't brought into the conversation as part of the interview schedule, but were raised by most interviewees in conversation. The EU's General Data Protection Regulation 2016 and the UK's Data Protection Act 2018 serve as examples of institutional logics manifesting in legally binding rules (see Figure 30). Whilst any organisation that processes personal data is bound by the rules, NPOs exercised particular caution in ensuring they were more than just compliant with the regulations but were upholding their own ethical standards. In some ways, this isn't surprising as the sector's legitimacy rests, in part, on possessing a strong moral and ethical code of conduct. For example, the lead research officer for Case 2 ensured data sharing agreements were in place to prevent Case 2 becoming a data controller, in addition to ensuring that the datasets used cannot be used to identify an individual person or dog.

There is a sense that the GDPR requirement for personal data to be erased upon request meant NPOs had to 'get their houses in order' from a data governance perspective. It required organisations to reassess what data they had, where it was stored, and how it was being used. For Case 17, a large homelessness NPO, the desire to accrue, store and retrieve data in an orderly and logical way was the catalyst for tasking an employee with developing a data strategy for the organisation. The data strategy will streamline processes to facilitate data-driven decision making:

"And one of things we want to build is a proper, robust data strategy, because at the moment we have data stored in various places, and when someone asks a question, then whoever has been tasked with answering it, has to go around and try and find the data before we even get started. There are no set processes for how we do things. It's just very ad hoc."

Senior Data Analyst, Case 17, Development and Housing NPO.

Support for open-source software and open data

The fourth attribute of a nonprofit data logic is supporting and using open-source approaches to data sharing and tools. The community logic is characterised by reciprocity and cooperation, which manifests in the desire of NPOs to use and support non-proprietary tools and share data for wider benefit. Throughout the thesis, we see examples of staff using a range of free and open-source software and languages (such as R, QGIS and Python), even when their organisation pays for proprietary software:

"We also use QGIS as well, I'm sort of an open-source evangelist, hence I was presenting at [open-source conference] so I'm quietly trying to push the use of QGIS a bit, but ArcGIS is our go to application"

Senior GIS Analyst, Case 34, Environmental NPO.

There is a strong ideological commitment amongst the organisations studied in this thesis to ensure that data are made available for use by others, including groups that contribute data or are not able to compile and analyse data. For example, many of the national organisations place great importance on ensuring their data are useful at the local level. Three of the environmental organisations are members of the National Biodiversity Network, an independently run membership organisation that collates biodiversity data to set standards from individuals, public, private and nonprofit organisations. All five grantmaking organisations studied in this thesis release their grant award data to 360giving, in accordance with the 360giving data standard.

There are two significant examples of software being developed by NPOs and being purposefully open-source so that they can be built on and expanded. The GIS tool developed for Case 13 to understand need and allocate supply is developed from open-source packages (such as QGIS and PostgreSQL). Case 8's asset map is one of the few examples of a successful, independently developed NPO asset map that has been maintained over time. The Director of Marketing which overseas it is supportive of it being repurposed or used elsewhere in the sector:

"I'm happy for people to look at it and think about it and share it, there is not one piece of copyright in our code, people can use it and expand it whenever they like."
Director of Marketing, Case 8, Religious NPO.

8.6 Conclusion and contribution of the chapter

This chapter uses an institutional logics approach to demonstrate the influence of and tensions arising from the logics of the state, market, and community in use of spatial data by NPOs. We see a clear influence of the state logic of equitable resource allocation in the rules and narratives surrounding, and the use of, spatial data. This is particularly evident in organisations that sit 'close' to the state or are national in operation and are in a position to propagate state-like logics. The community logic manifests in the use of spatial data by NPOs to support or better understand a spatial community, a non-spatial community or a membership body. Community foundations are good examples of organisations that are committed to serving a spatially defined community and use a range of spatially orientated data (including qualitative) to serve the needs of that community. We see the market logic in the use of geodemographic classification systems (such as Experian's Mosaic) for marketing and audience engagement purposes, in using data when competing for contracts, and in the narratives that NPOs use to describe their operations and stakeholders.

Scholarship that adopts an institutional theory approach to NPO data use typically attributes the increasing adoption of data-driven practice to isomorphic pressures. In particular, there is an underlying sense that the professionalisation of NPOs that puts pressure on the normative legitimacy of NPOs is an unavoidable process of becoming more business-like. Instead, an institutional logics approach demonstrates that a) all three logics pressure

legitimacy in different ways, and b) organisations are able to adopt strategies which negate or stop loss of legitimacy. The strategies are summarised as: reflexivity; active resistance; polyphony; and taking a values-first approach. NPOs are not passive recipients of institutional logics, instead they are acutely aware of their role in perpetuating and enforcing logics through reflexive practice. They possess the agency to resist the imposition of logics and utilise hybrid constitutions for their benefit and adopt a polyphonic communication strategy. Whilst NPOs may find a tension between upholding both output legitimacy and normative legitimacy, the strong value-base of the sector (on which much legitimacy rests) typically wins through, as organisations look to use data in a way that reinforces and lives out their values and organisational mission. Sanders and McClellan's (2014) proposed narratives for reframing nonprofit work are offered as a third route beyond the binary of data use either supporting financial interests or pursuing an organisational mission. In short, an institutional logics approach brings a nuanced understanding to the connection between individual uses of data and the institutional logics which guide and give meaning to individual actions.

Finally, the chapter diverges slightly from the previous use of the term 'logic' to speak to literature that presupposes the existence of an independent 'data logic'. It suggests that a data logic adopted by the value-driven nonprofit sector may display characteristics of: a pervasive culture of data use; collaboration across fields and institutions; a concern for data governance and ethics; and support for open-source software and open data. On the one hand, it is feasible that the simultaneous display of these characteristics is unique to a sector that is value-driven, innovative and open to change and outward looking. On the other hand, this chapter demonstrates and argues that NPOs are hybrid organisations which adopt the logics and practices of all three institutions (the state, market and community). Therefore, the extent to which a nonprofit data logic is unique and significantly different from that of the private and public sectors could be brought into question, as organisations may simply be drawing from all three institutions' logics and data practices.

9. Conclusion

This concluding chapter is presented in three parts. The first part takes the three overarching research questions and answers them in turn, drawing on the analysis presented in Chapters 6-8. The chapter then demonstrates the theoretical, heuristic and practical significance and contribution of the thesis, before looking at future avenues for research and developments in nonprofit practice.

9.1 Looking back: answering the research questions

9.1.2 RQ1: How is spatial data used by UK nonprofit organisations to construct and represent reality? (organisational)

This thesis adopts a soft social constructionist perspective in recognising that an objective reality exists, but the way the world is described and explained is the product of choices and relationships. This research question explores how nonprofit organisations use spatial data to construct and represent reality. It seeks a deeper examination than is currently offered by studies of nonprofit spatial data use as it moves away from a utilitarian description and towards an understanding of how affordances and context impact the creation and application of data.

All data points are a representation of a phenomenon, they have very little use or value in and of themselves, instead, their value is derived from their application in a setting. The organisational epistemological framework presented in Chapter 6 examines the origins of organisational knowledge and its application. Using the framework, we can see that nonprofit organisations use spatial data to construct knowledge of people and place. Knowledge of people may be an understanding of the common issues people seek advice on within a local area, or the typical preferences of arts audiences by postcode. Knowledge of place may be an understanding of the joined-up action occurring through place-based working, or a historicised representation of place through digitised film footage. Such knowledge claims are informed and shaped by the contextual setting in which data are constructed, such as organisational missions and value sets, position within the wider institutional field, and material and legal constraints.

The technical and imagined affordances of technology and media and the mediated and mediatized nature of data enable or constrain the way data are used in knowledge application. For example, geodemographic segmentation classifications are constructed through recursive iterations of layers of analysis and reclassification before being presented as an objective truth. Tsoukas and Vladimirou (2001) define knowledge as being the ability to draw distinction when acting in the world; spatial data are used to separate *this* and *that;* Case 4's analysis of data at the constituency level so as to appeal to the concerns of individual MPs is a good example of drawing distinction in the pursuit of conveying knowledge.

The organisational epistemological framework demonstrates the dynamic and iterative nature of knowledge construction in acknowledging acts of single- and double-loop learning. It shows that knowledge construction using spatial data is a product of ever-changing practice, priorities and values.

The visualisation of spatial data or its representation within a wider spatial media application is itself an epistemic tool for nonprofit organisations. For large organisations, spatial media, such as a Tableau dashboard, provides a uniform view across siloed parts of the organisations to present a 'single source of truth'. It ensures the ontological stability of individual data points whilst aggregating data up to provide a broader overview, allowing staff and volunteers to make sense of and act in the world. A technical infrastructure that connects disparate parts of an organisation enables data to carry relational properties, as data are captured at multiple spatial scales and presented for use in different organisational subdomains. Spatial data visualisations are themselves shaped by the choices and priorities of the NPO and the designers, and they afford and invite certain ways of interacting with and interrogating the data. In several instances, Google Maps is chosen as the base map as its ubiquity means the imagined affordances (i.e. the perceptions and experiences of interacting with a technology, shape how it's interacted with) mean people are familiar with it and will dive straight in to explore and interrogate the data.

Throughout Chapters 6 and 7 we see the power of spatial data and their visualisation for representing local experiences and phenomenological realities. Spatial data captured on

individuals, for example, on handheld devices whilst delivering a service, represents a localised reality. Similarly, crowdsourced data (as seen in section. 6.4.1) offers a way of collecting a wide variety of local and experiential knowledge whilst maintaining a centralised and uniform collection system. The sociotechnical perspective provided by the organisational semiotic framework captures the importance of both the technical infrastructure in providing a stable and syntactically consistent representation, and the social action arising from sign-communication. The framework deconstructs the constituent parts required to carry a phenomenological reality through spatial data and data visualisations.

Central to the notion presented in this thesis that spatial data and their visualisations are socially constructed is the recognition that nonprofit organisations construct spatial data and representations of a reality for their own benefit and to fulfil their mission. For example, a community foundation may opt to display data on a topic of interest to a donor, to encourage further buy-in, or an arts organisation may use postcode data to geodemographically segment their audience to build relations with a corporate sponsor. To recognise that representations are not neutral is not to say that these uses are normatively wrong or deceive others of an *actual* reality, but that NPOs are able to construct and represent *a* reality in order to work towards their overall mission.

In summary, the thesis demonstrates that spatial data is widely used in multiple ways across a range of organisational missions. We can see how spatial data and their visualisation operate as social engines (Wood, 2010) for NPOs, communicating a reality and affecting change in a desire to realise organisational missions and purposes.

9.1.3 RQ2: How is spatial data used by UK nonprofit organisations to position themselves within and across sectors? (organisational and institutional)

This question recognises that nonprofit organisations do not exist in isolation, but in relation to organisations within their wider sector and to organisations that exist in alternative sectors. The question uses the term sector to refer to both a group of organisations that

display similar characteristics and associate with each other (also called a field), as well as macro institutional sectors, such as the market and the state. It recognises that organisations are cognisant of their position vis a vis other organisations and sectors and possess the agency to use spatial data to shift or embed their position.

The UK nonprofit sector is large and heterogenous; organisations take a wide range of organisational forms and adopt a plurality of missions and aims. This thesis demonstrates how organisations use spatial data and their visualisations in multiple ways to demonstrate issue-specific expertise and position themselves in a strategically useful way. All 35 organisations studied lay claim to expert knowledge of a particular issue and use spatial data to gain knowledge or demonstrate it, therefore occupying a specific space within the nonprofit sector. For example, Case 24 positions itself as an expert authority on the prevalence and causes of certain emergency situations, while Case 32's internal GIS of the UK's national cycle infrastructure state of repair gives them a unique claim to knowledge. For smaller organisations, demonstrating knowledge of a spatially bound area or of a particular community is central to gaining wider legitimacy and recognition. The three community foundations studied in this thesis use spatial data visualisations to position themselves at the interface of communities, and donors and grantmakers. By presenting qualitative or quantitative spatial data on the issues facing a local community, the community foundations lay claim to knowledge of hyperlocal issues facing the community.

For many organisations, spatial data doesn't just underpin vital knowledge but is an explicit manifestation of their core values and raison d'etre. An organisation that is explicitly committed to ensuring equality of access would use spatial data to discern which areas are currently underserved and therefore where to prioritise the allocation of resources; use of spatial data to ensure adequate and equitable service provision is the most widely observed use of spatial data by organisations in this study (see section 5.2). Once a service has been delivered or an action has taken place, nonprofits are under great pressure to demonstrate their wider contribution to society or delivery of their public benefit to position themselves as a legitimate actor and demonstrate that they are worthy of wider support. Spatial data is used to demonstrate past and current impact; Case 6 is a small organisation but places great

value on being able to demonstrate both its knowledge of target demographics and past engagement with groups by location as evidence of successful service delivery.

A relational perspective on nonprofit data use reveals instances where spatial data infrastructures and sharing agreements facilitate intra- and inter-sectoral work and organisational positioning. A semiotic analysis of the asset map developed by Case 8 (see section 7.4.2) shows the technical relations between organisations as data is fed from one partner organisation to the database of events that underpins the map. The joint work involved in setting up this data sharing process leads to a closer partnership and relationship between Case 8 and fellow nonprofit and public sector organisations, positioning Case 8 as an important social actor in the network. Collaboration across fields and institutions is identified in this thesis as an attribute of a 'nonprofit data logic', as organisations use data sharing to communicate a master narrative and develop partnership working. For organisations that regularly work across sectors, using data drawn from multiple sources (such as Case 15, p. 241) that reflect differing ideological and sectoral priorities signifies their position as an actor at the interface of multiple sectors.

We see how spatial data are used by NPOs to work across sectoral boundaries in acts of 'visual brokerage' (Allen, 2018). Throughout the thesis, there are numerous examples where spatial data visualisation acts as a precursor to fostering or deepening relations between actors. In some situations, the content of the visualisation is not scrutinised, but rather a quantified assessment of a phenomenon is granted automatic respect as a proposition of truth. The 'pragmatic' and 'social world' strands of the semiotic analysis show real world action occurs from pragmatic intentions, as communicated through spatial data visualisations. The pragmatic intention is often to affect change in line with the organisation's mission, with developing relational working practices as a secondary effect; this study demonstrates that visual communications have a purpose beyond the content of the visualisation.

Finally, Chapter 8 introduces an institutional perspective to the use of data by NPOs. Nonprofit organisations occupy a hybrid position and work across domains characterised by the institutional logics of the state, market and community. The logics of all three institutions manifest in spatial data use, with nonprofit organisations purposefully choosing to enact

certain logics to position themselves amidst other actors. For example, an organisation may purposefully show spatial data on a community of concern to 'locate' themselves in close proximity to the community. Similarly, advanced geodemographic analysis and audience segmentation may signal to a for-profit company that the NPO is innovative and aware of their 'target audience'. The adoption of plural logics to work across sectoral boundaries, and particularly the adoption of business-like practices, may put pressure on the normative legitimacy conferred on nonprofit organisations by stakeholders. This thesis demonstrates that to continue cross-sectoral working and adopt a plurality of logics without losing legitimacy, organisations enact processes of reflexivity, active resistance, polyphony, and maintain a values-first approach. Amidst ongoing processes of datafication and pressure to use spatial data in line with multiple logics, Sanders and McCellan's (2014) proposed narratives for reframing nonprofit work are offered as a third route beyond the binary of data use either supporting financial interests, or the pursuit of an organisational mission.

9.1.4 RQ3: How can nonprofit spatial data use be theorised using frameworks drawn from the fields of human geography, nonprofit research, and social studies of data? (theoretical)

This final question recognises that the study is highly interdisciplinary and by drawing on the theoretical contributions of each discipline, a deeper analysis of nonprofit use of spatial data can be realised. Reading the research data through a certain theoretical approach, or in this case, multiple approaches, narrows down from a broad range of possibilities exactly what it is that is being researched. This research question can be read in two ways, with the first asking how does each disciplinary background contribute to our understanding of NPO spatial data use? It is important to note that this is distinct from exploring the theoretical contribution of the thesis, which is discussed in the next section.

Human geography scholarship is itself interdisciplinary but seeks to understand the world through the concepts of space and place. It encourages us to view space as an active participant in shaping the way we act in the world, and our relationship to place as being actively reformed based on our past experiences. This thesis is heavily informed by human geography scholarship on the ontological makeup and epistemic capacities of spatial data –

i.e. what is spatial data and what can it tell us about the world? It is critical cartographers that deconstruct maps and spatial data visualisations as not neutral, value-free representations of the world, but socially constructed propositions of a world, guided by the ideologies and aims of the maker (Crampton, 2001; Wood, 2010). This tradition of interrogating maps and spatial data visualisations to examine their underlying truth claims is seen throughout the thesis: Chapter 5 describes the organisational factors surrounding the production and use of maps, Chapter 6 deconstructs epistemic use of spatial data as socially constructed, Chapter 7 examines the relational intentions of visualisations, and Chapter 8 teases apart the guiding ideologies and logics which influence the construction and use of spatial data and their visualisation.

The positioning of emergent technologies with a spatial orientation as 'spatial media' (Leszczynski, 2015) broadens the scope of analysis to include spatial dashboards, crowdsourcing software and location-enabled devices. The concept of spatial media brings into focus the dynamic and ontologically fluid nature of contemporary map making and allow us to see the iterative nature of knowledge production (as seen in Chapter 6) and the importance of interactivity for communicating narratives and encouraging a participatory process of knowledge discovery (Chapter 7).

Finally, section 2.4 shows the contribution of human geographers to building the foundation on which this study rests: a theoretically informed analysis of spatial data and GIS use by grassroots organisations in the 1990s and early 2000s. Under the banner of the research initiative *The Social Implications of How People, Space and Environment are Represented in GIS* (NCGIA, 1996), human geographers engaged with nonprofit organisations to explore not only how GIS was and could be used to achieve their aims, but how organisations used GIS as an epistemic tool to empower underserved and minority groups to act in wider state and urban planning processes. From this research agenda emerged a concern with the role of GIS in perpetuating and challenging knowledge hierarchies and politics, building community-informed spatial narratives, and fostering closer working partnerships between community and cross-sector groups. This thesis builds on and develops these research themes and theoretical approaches in several ways. Firstly, this thesis presents a more diverse use of spatial data across a wider variety of organisational missions and types than documented by

scholars in the late 1990s and early 2000s. Secondly, it combines central themes developed from the NCGIA research agenda (see section 2.4.3.) with broader explanatory theory, such as organisational epistemology, semiotics, and institutional logics. In this way, a deeper and more theoretically connected exposition of the use of spatial data by NPOs is presented.

The overview of empirical studies of nonprofit spatial data and GIS use (Table 2, section 2.4) shows that more recent interest in the use of spatial data by NPOs has come from scholars who take a geographically informed approach, but ultimately sit within and draw on **nonprofit studies**. For example, Jeff Brudney and others look at the adoption of specific GIS platforms with recommendations for nonprofit organisations (Brudney et al., 2016) or a summary of the literature on NPO GIS use so far (Brudney and Prentice, 2018). In some ways, nonprofit studies of data use by NPOs more widely are of greater theoretical use in this study. Section 2.2.2 *The use of data by nonprofit organisations* takes note of specific theoretical developments linked to data use, such as the concept of 'data-drift' (Bopp et al., 2017), the role of NPM in driving an audit culture (Harlock and Metcalf, 2016), or organisational effectiveness arising from performance measurement (LeRoux and Wright, 2010)

Chapters 6-8 draw on and develop theoretical propositions from nonprofit scholarship that cut across the subdiscipline. The contention that nonprofit organisations are professionalising is picked up throughout the thesis, as is the notion that NPOs possess expert knowledge. Discussed throughout the thesis, but specifically in Chapter 8, is the hybrid constitutional form that many nonprofit organisations take, and the role of institutional logics in shaping nonprofit action and values.

Thirdly, theories from the broad group of **social studies of data** contribute a sociotechnical understanding, where neither the social or the technical are prioritised but rather examined in conjunction with each other. Studies that adopt a critical examination of data and attend to the wider assemblages which bring them into being (such as Kitchen and Laurialt, 2014) provide a fuller examination of data production and foregrounds background processes. The STS tradition of questioning data and technology as value-free sources of truth is followed throughout the thesis, but is particularly influential in Chapters 6-8, where the construction and application of data are critically examined. The organisational semiotic framework used

in Chapter 7 adopts a material-semiotic focus to show spatial data as a communicative device that builds relations between actors. The organisational semiotic framework, and the adoption of STS and social studies of data perspectives more widely, ensure the thesis overcomes common analytical binaries such as studying technical or social elements, and material or cultural attributes. The collective theoretical approaches grouped as social studies of data provide analytical depth, and across Chapters 6-8, ensure the local sights of data production and use are prioritised but without losing sight of wider influences and context.

The second reading of the research question focuses not on the individual contributions of the disciplines but examines how they can be combined in productive synergy. Tied to this is Tracy's (2010) final criteria for successful qualitative research: whether the study is meaningfully coherent, and whether it interconnects extant literature and theory with the research questions, methods, and findings. Despite being highly interdisciplinary, commonalities are found throughout the thesis between disciplines, such as all three disciplinary perspectives encourage multi-scalar analyses and a critical examination of the study topic. However, it is by returning to foundational social constructionist scholarship that the three disciplines are applied synergistically across the corpus of data. As discussed in section 3.2, it is common for social scientists to implicitly adopt a social constructionist position without anchoring their analysis to a core theoretical framework (Knoblauch and Wilke, 2016). This approach risks analyses becoming relativistic, confused with constructivism, hollow, and failing to identify exactly the *process* by which something is constructed.

Whilst Berger and Luckmann's (1966) thesis is built on previous scholarship (such as the work of Mead and Schutz), its primary contribution is the articulation of the dialectical process between objective reality and subjective reality, thus avoiding a relativist position whilst acknowledging individual agency and opportunity for change (Segre, 2016). This distinction and recognition of a dialectical process between the objective and the subjective provides a common thread throughout chapters 6-8 and provides a firm foundation from which theory is applied and extended. For example, Chapter 6 explicates the ongoing process by which knowledge is constructed through subjective understandings and framings, but then made part of objective reality through institutionalisation and shapes the very nature of the fixed

reality through action. Chapter 7 picks up Berger and Luckmann's (1966) (and latterly, Couldry and Hepp's, 2017) concern with communication and its role in constructing shared realities. Chapter 8 examines the use of data by NPOs using an organisational institutionalist perspective; itself founded on Berger and Luckmann's (1966) writing on the role of institutional orders in providing guidance and legitimating the everyday actions of individuals and organisations (Meyer, 2008).

9.2 Contribution of the thesis

Qualitative research can offer a significant contribution in four different domains: theoretical, heuristic, practical, or methodological (Tracy, 2010; Tracy and Hinrichs, 2017). All research should be able to answer the "so what?" question, and Tracy's invitation to split the contribution of the research into four domains aids in answering this question. This research doesn't contribute much methodologically, for it adopts an orthodox method of data collection and analysis. However, it does offer a significant theoretical, heuristic and practical contribution.

9.2.1 Theoretical significance

The theoretical contribution of the thesis is two-fold. Firstly, existing theory is applied in new settings. Current research on the use of data by nonprofits, specifically spatial data, is centred on North America and is predominantly concerned with small, grassroots groups involved in local, community issues. This thesis takes theoretical insights developed by this body of literature (see Table 2, section 2.4), such as the production of spatial narratives, and applies them to a wide range of organisations in a non-North American setting. Their use in theorising the work of large, professionalised nonprofit organisations is significant, as many of these organisations have substantial incomes and are influential in their field (see section 8.4.1), are household names and are national or international leaders in their field of expertise. They are the organisations that people would name when asked to think of a 'charity', and therefore understanding their use of spatial data and applying existing well-developed theoretical framings is an important exercise.

In addition, this thesis synergistically applies existing theory (through a social constructionist perspective) from other disciplinary fields to yield new insights. For example, in the thesis we

see several instances of NPOs seeking to spatially locate aspatial digital services or interactions; human geography scholarship would examine the epistemic affordances of the spatial media, nonprofit and institutional theory scholarship may highlight the innovative practice, link to community and fulfilment of output legitimacy, while social studies of data scholars may critically examine the apparatus surrounding the production and application of such knowledge. Individually, these theoretical approaches are well-developed and insightful, but through their joint application under a social constructionist framework a deeper and multifaceted insight is brought to bear on the use of data by nonprofit organisations. The bringing of allied but distinct theoretical approaches into contact with one another is a primary contribution of this thesis.

Secondly, this thesis offers significant extension and development to existing theoretical frameworks. Chapter 6 uses the organisational epistemology framework developed by Seirafi (2012), but adapts it for use in situations where technology and data inform the production of knowledge (see Figure 19). The framework is adapted to account for the effects of both technological affordance (Hutchby, 2001) and imagined affordance (Naggy and Neff, 2015), capturing the way that technologies and spatial media "invite certain actions and shape conditions of possibility" (Fussey and Roth, 2020, p.5). It is also adapted to account for the mediated and mediatized nature of data, reminding us that data which underpins knowledge production has often been recursively mediated through layers of analysis and classification (Couldry and Hepp, 2017). Chapter 7 uses the organisational semiotic framework developed by Stamper (2001) and Liu and Li (2015). This is part of a wider complex and substantial methodology developed by semioticians for ascertaining the computing and communication needs of an organisation, and as such the framework is rarely used to the level of detail that it is in this thesis. The application of the well-established institutional logics approach (Thornton and Ocasio, 2012; Skelcher and Smith, 2015) to studying nonprofit data use in Chapter 8 is a novel one. Significantly, the chapter develops its concern with loss of legitimacy arising from the adoption of logics by suggesting four strategies that are observed in nonprofit use of data for negating loss of legitimacy. Finally, Chapter 8 builds on nascent proposals for an identifying data logic, by outlining the characteristics of a 'nonprofit data logic' based on the observations made in this study.

9.2.2 Heuristic significance

Qualitative research holds heuristic significance when it offers new research on a topic, encouraging people to study it further or engage in action or change (Tracy, 2010; Tracy and Hinrichs, 2017). This thesis makes a significant empirical contribution by presenting an evidence base for our understanding of nonprofit use of spatial data across a wide range of organisational missions, and captures data use more generally (including in previously undocumented scenarios, such as within grantmaking NPOs). Of particular importance is the table of use cases (Table 6, section 5.2), which outlines primary drivers and use cases of spatial data use by NPOs, alongside comparable documented use cases in the public and private sectors. This table is a heuristic tool; it not only demonstrates that this practice exists in the UK's nonprofit sector but provides a shorthand guide for quickly understanding the primary drivers and use cases. It is hoped that this table is developed in future academic research.

Over the past few years, a network of organisations has been set up to facilitate digital transformation of civil society organisations by providing tools, support and community spaces. I was involved in user research led by the network which sought to identify the priority data needs of the sector, during which I advocated for a greater understanding of the spatial data needs of the sector and the development of tools to aid with spatial data use. In addition, I wrote a blog for Catalyst, a recently formed but well-connected infrastructure organisation, giving a precis of the descriptive chapter in this thesis (Chapter 5). Over 400 people read the blog post, and a summary of it reached a wide audience on Twitter (14.3k impressions). At around the same time, the user research identifying priority data concerns in the sector led to the announcement of funding for the development of a geospatial tool which was specifically aimed at the nonprofit sector. I worked with the winning design agency as a project advisor during the development and roll out of the tool, with my blog post and wider research influencing the direction of the tool and identifying the most pressing need. By providing the evidence base, resources could be committed to assisting NPOs to use spatial data.

Thirdly, this research contributes to a growing body of literature that documents the adoption and use of new technologies and cultures of working with data in nonprofit

organisations. Nonprofit organisations are often assumed to be unsophisticated users of technology and slow to adopt innovative practice. This research shows a broad spectrum of innovation, with some organisations just beginning to explore the use of data in their operations, and others adopting advanced computational techniques such as natural language processing (NLP). The thesis accounts for significant changes in the nonprofit data landscape since the early research programme led by Sarah Elwood and others in the 1990s and early 2000s. That is not to say that *every* use of data documented in this thesis is significantly different from that captured by the early research programme, but rather the wider context in which spatial data use takes place is markedly different and the number of organisations using spatial data is considerably larger. As with studies that specifically focus on spatial data, most scholarship on nonprofit data use more generally is US centric, and therefore this thesis provides an important perspective on data use within the European and UK regulatory environments.

Finally, whilst the research contributes to our knowledge of nonprofit data use more generally, an additional contribution of the thesis is marking spatial data as worthy of study and attention, as distinct from general data use. The maxim "spatial is special" (Longley et al., p.11) is used by geographers to point out that almost everything has a spatial component to it, and that the spatial component is important for our understanding of the phenomenon and its relation to others around it. During the interviews with staff and volunteers from NPOs, there were instances where geographical imaginations (Harvey, 1973; Gregory, 1994) were activated as staff considered how their data use is, or could be, spatially orientated.

9.2.3 Practical significance

Qualitative research has practical significance when it helps frame an issue or provides useful outputs (Tracy, 2010; Tracy and Hinrichs, 2017). Throughout the process of researching for and writing the thesis I have been keen to disseminate knowledge on the best tools and approaches for NPOs who wish to use their own or third party spatial data. I have presented twice at the UK's Data for Good conference on *Mapping tools for the third sector* and have a well-visited blog post outlining key tools and approaches. I have worked with individual

organisations to recommend tools and approaches to mapping their data, based on my research.

However, the practical significance for this thesis goes beyond best practice case studies and guidance on which tools to use. Chapter 8 presents quotes from NPO staff members which show cognisance of the potential issues arising from the increasing use of data across all NPO operations. The chapter also demonstrates key strategies employed by NPOs to negate loss of legitimacy, practice which could be adopted by NPOs wishing to innovate with data use or adopt data-driven practice and retain trust and conferred legitimacy.

Finally, this thesis provides a theoretical contribution in the form of a wide-ranging social constructionist analysis. The practical implication for NPOs of spatial data being socially constructed is that they have agency to shape the construction and application of spatial data for their own benefit. A corollary from the analysis presented in this thesis which says that spatial data does not provide a necessarily objective truth, but that it is linked to organisational values and priorities, is that NPOs can use spatial data to propagate their values and achieve their organisational priorities.

9.3 Looking forward: future directions for practice and research

Based on the interviews with practitioners, many of which are leaders in their field, what does the future look like for nonprofit data use? The general perception across interviewees is that organisational practice will increasingly be data-informed and organisational cultures will continue to encourage and support this shift. Chapter 8 demonstrates that nonprofit organisations are not isolated from wider exogenous shifts and are directly involved in and impacted by the increasing datafication of social life. The extent to which organisations adopt data work depends significantly on individual capacities to innovate and organisational cultures. The nonprofit sector is heterogeneous and for some organisations, they have no need to incorporate data use into their practice. In other cases, organisations are investing in the development of data strategies and increasing the use of programming languages and computational analysis. Across the cases, there is evidence of increasing caution with regard to public-facing data use; nonprofit organisations value the trust and

legitimacy conferred upon them and as general critical awareness of data practice grows, NPOs are keen to ensure their data practices (or even perceived data practices) do not lead to a loss of legitimacy.

Secondly, what are the fruitful areas of research that follow on from this thesis? This thesis presents a broad and in-depth analysis of nonprofit spatial data, however, a shortcoming of the methodological approach is that it presents quite a static perspective, relying on organisational documents or interviewees to account for past or future action. Having established a sample of organisations that use spatial data, and a general recognition that NPOs use spatial data in the first place, an ethnographic study of a small selection of organisations would better capture organisational dynamics and relations and examples of single- and double-loop learning. Social constructionist scholarship has a long pedigree of conducting phenomenological studies and being embedded in an organisation for a period of time could produce new and deeper insights, such as the differing approaches to data construction and application across the organisation.

Throughout the thesis, care is taken to analyse both the technical and the social in conjunction. However, further study conducted with researchers from a more technical background could bolster the technical analysis and broaden the appeal of the study beyond the social sciences. For example, the organisational semiotic framework and accompanying scholarship provides scope for a deep technical, as well as social, analysis which this thesis hasn't been able to provide. Finally, there were surprisingly few instances where monitoring and evaluation (M&E) practices led to spatial data use, given its prominence in nonprofit literature on data use (see section 2.2.2). It may be that spatial data underpins M&E practice less than other forms of data (such as aspatial feedback surveys), however, further research could clarify the role of spatial data in M&E practice.

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Appendices

Appendix 1: Overview of cases

Case No.	Organisational aim	Spending (£p.a.)	Interviewee(s) job title	Primary uses of spatial data	Software	Data
1	Other (digital access)	5m to 10m	Data and Evaluation Manager, Research Intern	Mapping provision against need, and qualitative concerns of support centres	Google My Maps, Google Sheets	IMD, internal survey data
2	Animal Welfare	Over 50m	Research Officer	Mapping dog population and movement of puppies	QGIS, R - using skills learnt in biology PhD	Postcode / town and city from web adverts, insurers, national registers
3	Education and Research	10m to 50m	Head of Finance	Resource allocation: location of training courses and propensity of local population to engage by demographic	Excel	Location of courses, birthrates, socio-economic data by MSOA
4	Law and Advocacy	Over 50m	Head of Data	Map issue specific demand by various geographies, inc. from advice received online. Feed data back for use by federated members.	SQL, Python, ArcGIS, QGIS, Tableau	Case-note data (postcodes), and web geolocation
5	Umbrella Body	100k to 500k	Active Communities Connector	Local asset map used for internal and external purposes	Google My Maps	Postcodes of local groups, filtered by org aim
6	Umbrella Body	1m to 5m	Policy and Influence Team Manager	Local asset data, used for capacity building and facilitating collaborative working to cover gaps in provision	Excel	Location of local groups, IMD, Census data
7	Religion	100k to 500k	Pastor	Location of members and activities across city	Google Earth	Location of members and activity hubs
8	Religion	10m to 50m	Director of Marketing and Communications	Asset map of church and externally run activities in the county	Custom database and website	Manual and automatic feed of activities from local groups and partners

9	Religion	Over 50m	Senior Statistical Researcher	Display organisational boundaries, customizable maps of church facilities, parish deprivation and demographics of attendees	ArcGIS Online, FME, MapInfo	Postcode of church facilities, shapefiles of boundaries, IMD data by parish
10	Arts and Culture	1m to 5m	Director of Policy Research	Develop geodemographic classifications of audience types for internal and wider subsector use	SQL, Micromarketer, Experian Mosaic	Geodemographic classification, audience location, audience survey data, location of venues, drive time to venues
11	Arts and Culture	10m to 50m	Audience Insight Manager	Geodemographic profiling and distance travelled analysis of audiences and visitors to inform marketing, partnerships and curation	Tessitura, outsource some work.	Location of members and postcode from ticket purchase data
12	Arts and Culture	Over 50m	Head of Data	Geolocating historical footage and crowdsourcing location of individual scenes	Pybossa, custom built interface	OS Place names, lat/long of films/scenes
13	Healthcare	5m to 10m	Head of Research	Optimally place mobile treatment buses, predict future cancer incidence rates and locate charity shops	QGIS, Python	Cancer prevalence rates, location of other treatment centres, footfall data
14	Healthcare	5m to 10m	Data and Insight Manager	Targeted giving mailshots by postcode area based upon recent birth data	Excel, CRM	Recent births by postcode
15	Healthcare	10m to 50m	Head of Data and Analytics	Study childhood obesity and its determinants and various spatial scales	Tableau, R, Mapbox, Alteryx	Childhood obesity by ward, geolocated consumer spending data, qualitative opinion of place, individual movements captured by GPS

16	Development and Housing	Under 10k	Director	Map available plots of land to develop community housing on	QGIS, Mapbox	Crowdsourced location, INSPIRE Polygons, Land registry ownership
17	Development and Housing	10m to 50m	Senior Data Insights Analyst	Map of supporters and engagements, location of charity shops	Google Maps, QGIS	OAC, postcodes of supporters, donors, fundraisers and volunteers. Consumer spending data. Location of charity shops.
18	Development and Housing	Over 50m	Information Manager	Database and mapping of rough sleepers and their location for multi-agency service delivery	QGIS, Google Fusion, Salesforce, Google Maps API, MapIt	Unique identifier for rough sleepers. Qualitative description and location of rough sleepers (from outreach workers and crowdsourced)
19	Development and Housing	Over 50m	Head of Data and Insight / Data Manager / Senior Analyst / Head of Technology	Prevalence of housing concerns and homelessness for campaigns, ensuring adequate demand/supply allocation	SQL, Excel, R, Python, PowerBI, SPSS, Stata	LA level homelessness data, IMD, location of advice centres, lat/long of planning applications and developments
20	Social Services	100k to 500k	Senior Care Officer / Placement Student	Location of members and service users to inform service delivery and local public sector engagement	Excel – just getting started with mapping tools	Postcode and ward data on service users and members
21	Social Services	100k to 500k	Director of Impact	Postcode data of service users for eligibility assessment and impact monitoring	Google Maps API, SQL	Postcode data, OS codepoint open, IMD
22	Social Services	500k to 1m	Support Worker	Mapped distance of active and inactive service users from activities to apply for minibus provision	Excel, Batchgeo	Postcode data on service users

23	Social Services	500k to 1m	Chief Executive Officer	Mapped location of service users against location of service provision and reallocated accordingly	Hand drawn map, Excel, Google My Maps	Postcode data on service users, IMD
24	Social Services	Over 50m	GIS Advisor	Numerous: static asset maps, mapping rescue operations and incident rates, feeding geodemographic trends back into educational campaigns	Esri suite (inc. ArcGIS Online)	Details of rescue operations (inc. coordinates), postcodes and other data on rescued people
25	Grantmakers	1m to 5m	Programmes and Partnerships Advisor	Grant allocation targeting	Excel	Postcode of applicant organisation, IMD and Horizon Youth Social Action dataset
26	Grantmakers	1m to 5m	Community Impact Analyst	Use socio-spatial indicators to target grant funding and influence donors	Local Insight by OCSI	Variety of socio-spatial indicators, location of grant awarded
27	Grantmakers	1m to 5m	Research and Data Analyst	Use socio-spatial indicators to target grant funding, influence donors and frame qualitative work	Local Insight by OCSI	Variety of socio-spatial indicators, location of grant awarded
28	Grantmakers	5m to 10m	Director of Community Knowledge and Funding	Use socio-spatial indicators to loosely target grant funding	Local Insight by OCSI	Variety of socio-spatial indicators
29	Grantmakers	Over 50m	Senior Head of Information	Mapping location of grants and grant applications by various geographies	Tableau, Python	Grant location by postcode, aggregated to various geographies. Qualitative description of grant allocation.
30	Environment	5m to 10m	Principal Technical Advisor	Qualitative description of local accessibility and routes mapped	OpenStreetMap, Google My Maps	Qualitative description of place and individual locations

31	Environment	10m to 50m	GIS Manager	Numerous: crowdsourcing location of ancient trees, mapping habitats and woodland for campaigning, map of volunteers and roles	QGIS, MapInfo, CadCorp, ArcGIS, FME, SQL	Widespread data on habitats and woodlands, planning applications, estates etc. Postcode data on volunteers.
32	Environment	10m to 50m	GIS Manager	Numerous: maintaining national cycle infrastructure, local infrastructure analysis, population distance from infrastructure, map survey responses regarding cycling infrastructure. Location of volunteers.	MapInfo, R, QGIS, Python, Earthlight, Carto, FME but consolidating to Esri enterprise system	Vector infrastructure data, OS Mastermap, user count point data, qualitative survey responses, volunteer postcode data
33	Environment	Over 50m	Head of Information	Numerous: Management and analysis of estates, conservation areas, visitor data	Internal web GIS browser, Esri suite, Experian Mosaic	Widespread data on habitats and estates, Postcode data on visitors and volunteers.
34	Environment	Over 50m	Senior GIS Analyst	Numerous: management and analysis of habitat and conservation areas	Bespoke internal GIS browser, Esri suite, QGIS, R	Aerial imagery of conservation areas, widespread data on habitats and estates.
35	Environment	Over 50m	Senior GIS Specialist	Numerous: management and analysis of estates, assets waterways and their users, members and volunteers	Esri suite – enterprise	Widespread data on estates, assets, waterways (such as boat licences, sign and towpath quality), postcodes of members and visitors

Appendix 2: Information and consent form

Information and Consent form

Title of Project: The role of geospatial data in third sector service provision: developing a framework for research and practice.

Name of Researcher: James Bowles. Research supervised by Professor John Mohan and Dr Peter Lee.

Background and aims of the study

This study aims to assess how third sector organisations in the UK make use of geospatial data and Geographic Information Systems (GIS) to achieve their organisational aims. Geospatial data concerns any data that has a geographic component to it, such as a postcode, XY coordinate or descriptive reference. Examples may include service user data or trend data on an area of operation. Geographic Information Systems (GIS) are used to display and analyse geospatial data, with ESRI's ArcMap and QGIS being commonly used packages.

As a result of the lack of credible and substantive research, the use of geospatial data in solving key societal issues has been omitted from seminal geospatial texts and the work of government bodies (such as the newly formed Geospatial Commission). Therefore, this study aims to construct a framework that outlines use-cases for geospatial data and analysis by different types of third sector organisation.

The study will involve content analysis of relevant publicly available and disclosed texts, which by disclosing, you agree to be used (anonymously) in the study. Following this, a semi-structured interview with yourself will take place. The interview will last no more than one hour. The research outputs will not identify the individual organisations or person(s) involved, instead citing e.g. '*Head of innovation, large healthcare charity'.*

The research will be primarily used in the submission of a thesis for the qualification of Doctor of Philosophy, School of Social Policy, University of Birmingham. The research may also be used in associated publications in academic journals, conferences and third sector blogs. The research period will end on the 1st April 2020. This study is voluntary and you are free to withdraw from the project (and request the erasure of any associated data) at any point prior to 30th April 2020.

You will be notified of any research outputs containing your data (which will be anonymous to readers). This research has passed the ethical review process at the University of Birmingham, and all data will be securely stored within the University of Birmingham's research data store.

Contact information

Researcher: James Bowles, PhD Student School of Social Policy University of Birmingham [redacted] Ethical review number: 18-0596	Principal Supervisor: Professor John Mohan School of Social Policy University of Birmingham [redacted] Ethical review number: 18-0596

Consent

1. I confirm that I have read and understand the background and research information for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time prior to 30th April 2020, without giving any reason.
3. I consent to the interview being audio-recorded for transcription purposes.
4. I consent for publicly available and disclosed documents to be used anonymously in the research outputs.
5. I understand that my name or any explicit reference to my organisation that may allow me or my organisation to be identified will not be included anywhere within the project or further publications.
6. I am aware that the information provided will be stored securely for the duration of the research project.
7. If necessary, I have made the relevant person(s) (line managers etc.) aware that the organisation is being used in this research.

I agree to take part in the above study.

Name of Participant:

Name of Organisation:

Role:

Email address:

Telephone number:

Signature of participant:

Date:

Appendix 3: Interview schedule

Interview Schedule

The role of geospatial data in third sector service provision: developing a framework for research and practice.

Name of Researcher: James Bowles. Research supervised by Professor John Mohan and Dr Peter Lee.

Thank you for agreeing to take part in this research. This research aims to explore the role that geospatial data use plays in service provision in <80 third sector organisations in the UK. The following interview will take no longer than one hour.

Key research questions for the study:

RQ1: Which organisational aims necessitate the use of geospatial data for their delivery?
RQ2: What technical and analytical capacity exists for further use of geospatial data to meet organisational aims?
RQ3: How does the geospatial data use reflect the value-led approach of the third sector?

Questions around the following themes will be asked:

- The participant's role within the organisation and the organisation's structure and broader aims
- The organisation's current use of geospatial data and/or GIS (inc. types of geospatial data)
- The particular themes of work, organisational aims, or specific projects that necessitate the use of geospatial data and any relevant challenges
- How geospatial data use links back to the organisation's broader aims and values?
- The extent to which geospatial data represents service users or reflects societal trends (the interplay between data, technology and society)
- The organisational culture towards data use and whether data use is supported by a senior leader within the organisation
- Engagement with any external organisations in an effort to improve data use. e.g. consultancy, training
- The extent to which they would like to better / further use geospatial data and what this would enable the organisation to do which they currently cannot
- Awareness of any other pertinent examples of geospatial data use within the UK's third sector