Organising science policy: participation, learning & experimentation in British democracy

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Abstract

The incorporation of public participation into science policy processes has been an important feature of policy practice and the academic literature for more than two decades, yet it has failed to realise its democratising potential or to engender broader changes in organisational and political cultures. To understand this apparent paradox this thesis focuses on organisational changes and practices around public participation, thus transcending the conventional focus on individual participation processes which characterises much academic work on the topic. Given the apparent lack of learning from and about public participation in key science policy organisations, this thesis explores diverse processes and facets of organisational learning, reflection and reflexivity in and around Sciencewise, a UK Government-funded body, which is emblematic of emerging professionalised organisations of participation.

Drawing upon ethnographic and qualitative methods within a co-productionist idiom (Jasanoff 2004a), the thesis tells a number of stories about Sciencewise's organisational learning processes during 2013; some are localised and specific, others identify more coherent shifts, and others draw connections between Sciencewise and broader political events. Diverse facets of organisational learning are explored from themes of spatiality, formal organisational mechanisms and organisational memory to non-knowledge, future imaginaries and processes of experimentation. It is argued that organisational learning cannot be understood without attention to the minutiae of everyday meetings and communications systems, or to broader political shifts like civil service reform. Despite the apparent rigidity of Sciencewise practices and discourses, there were significant instances of learning and change observed, resulting in shifting organisational categories, understandings and practices. These represent examples of more reflective and reflexive capacities within the programme. The thesis makes significant conceptual contributions to understandings of organisational learning, contributes empirical insights into the institutionalisation of participation in UK policy practice, and offers practical insights into the challenge of conducting engaged research and encouraging organisational reflexivity.

"The formation of states must be an experimental process. The trial process may go on with diverse degrees of blindness and accident[…] Or it may proceed more intelligently because guided by knowledge of the conditions which must be fulfilled. But it is still experimental. And […] the experiment must always be retried" (John Dewey 1927: 33-34).

"For experiments to be valuable, […] their experimental nature needs to be recognized" (Mark Henderson 2012: 59).

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1

Introduction

Over the last two decades public participation practices have been adopted and institutionalised by a wide variety of bodies across Europe and North America. In response to this Mark Brown has gone so far as to say that 'public participation in the politics of science and technology has become a standard – in some places routinized – feature of contemporary politics' (Brown 2009: 220), whilst over a decade ago Richard Munton noted that it was difficult to find instances of decision-making related to environmental policy issues without some form of public engagement or participation attached (Munton 2003). Greater citizen involvement in policy decisions has long been advocated by scholars working in the domains of planning (e.g. Arnstein 1969), development studies (e.g. Chambers 1983) and environmental or public health problems (e.g. Wynne 1996), as well as being promoted by theorists of deliberative democracy (e.g. Habermas 1984).

A more recent trend in this gradual institutionalisation of public participation has been the professionalization of the practice, with the emergence of an increasingly influential elite community of experts charged with overseeing, facilitating and reporting on participation events (e.g. Chilvers 2008b; Gisler & Shicktanz 2009), and the creation of a growing number of bodies and even organisations of participation as centres of best practice. Such organisations have appeared in a number of different policy domains and national contexts, for example the Danish Board of Technology or the Rathenau Institute in the Netherlands (both focussed around technology assessment), various participation bodies around healthcare in the UK and beyond, and bodies concerned with public participation in science policy topics more generally, like Sciencewise in the UK, which is the focus of this study. Participation organisations have also emerged at a transnational and global level, for

example the International Association for Public Participation, or recent organised attempts to co-ordinate deliberative public engagement across a number of different national contexts, like the 'Worldwide Views on Global Warming' project in 2009, initiated by the Danish Board of Technology and run with multiple partner organisations and facilitators.

For many this institutionalisation of more direct and deliberative citizen engagement has not had the intended effects of opening up policy issues to new perspectives and broader public debate (e.g. Rothstein 2013; Bickerstaff et al. 2010). Furthermore, many have contended that public participation processes have generally had little impact on institutional practices and eventual (policy) decisions (e.g. Chilvers 2013). Whilst public participation processes have faced multiple challenges and limitations in practice, it has been argued particularly by Brian Wynne (e.g. Wynne 2006) that the limited effectiveness and influence of public participation processes in science policymaking has been due to institutional or organisational factors. Chief among these are embedded power relations (e.g. Cooke & Kothari 2001; Tewdwr-Jones & Allmendinger 1998), and an apparent lack of learning or reflection about public engagement practice, for example the influence of the framing of processes (e.g. Marres 2007) or the performative assumptions made about the public or the public view on a particular issue (e.g. Irwin 2001). This inability to learn and reflect at an organisational level has been linked to calls to make scientific and policy organisations more 'reflexive', and therefore more able to take account of public views and other contributions (e.g. Bickerstaff et al. 2010; Wynne 1993).

This thesis aims to address the challenges of organisational learning, reflection and reflexivity identified by other authors, through a focus on one institutionalised public participation body working in and around the UK Government. Whilst earlier studies considered processes of and challenges to organisational learning in science policy organisations themselves (e.g. Bickerstaff et al. 2010; Pelling et al. 2008; Rothstein 2013), this research instead focusses on the emerging category of organisations of participation, which though they have grown in number and experienced increasing policy traction, have thus far been understudied. Furthermore, organisations like Sciencewise are particularly relevant to the theme of organisational learning as they were often set up with the explicit aim of

promoting learning and change more broadly amongst policy organisations, and sometimes present themselves as learning organisations.

Sciencewise was set up in 2004 by the then Department for Trade and Industry, in the wake of public controversies around issues like BSE (mad cow disease) and genetically modified organisms, which had been damaging for Government credibility and democratic legitimacy. In the terms of a landmark House of Lords report, the body aimed to make public dialogue an integral and necessary part of science policymaking across Government (House of Lords 2000), in order to restore legitimacy and authority to Government bodies and also foster deeper conversations around future UK science policy. Run as an arm's-length Government programme by a consortium of organisations overseen by the Department for Business Innovation and Skills, Sciencewise was chosen as a case study for this research as an archetypal example of the kinds of bodies which have been created as part of the professionalised and institutionalised practice of public participation. Furthermore, the Sciencewise programme was set up as a central institutional response to concerns about public participation and engagement in the UK Government context, and is thus more broadly indicative of trends around public participation in the UK during 2013. Since 2007 Sciencewise has also been increasingly drawn upon internationally as an example of innovation and best practice around public participation, for example by the Japanese Government and European governments, and has also experienced increasing influence within the UK Government.

Through in-depth empirical study of Sciencewise this thesis aims to contribute new insights on emerging institutionalised practices of public participation, as well as to improve understanding of processes of organisational learning, reflection and reflexivity related to the initiation, practice and evaluation of public participation processes. The study also responds to Alan Irwin's call for scholars to empirically study and theorise what he refers to as 'the new scientific governance' (Irwin 2006), moving away from approaches which seek to suggest new methods for public engagement or to evaluate individual public participation processes, and instead attempting to understand the broader effects of this increasingly influential and institutionalised practice. In doing this, the research takes stock of the current state of public participation mechanisms and practices in the UK, in order to aid an

understanding of diverse influences on processes of organisational learning and reflection, and to identify possible ways to promote organisational reflection and reflexivity around public participation in future.

To address these aims I undertook qualitative research in and around the Sciencewise organisational network throughout 2013, including participant observation, semi-structured interviews and document analysis. I adopted a co-productionist approach (Jasanoff 2004b), which entails a conviction about the mutually constitutive relationship between the creation of knowledge about the world and attempts to govern the world, but also provides a co-evolutionary framework for understanding gradual learning and change in institutions, discourses, individuals and practices. The research was designed as a multi-sited ethnography to enable an in-depth comparative study of organisational learning processes at different scales and in different organisational spaces in and around the Sciencewise programme. The concept of organisational spaces was one derived from the literature (e.g. Conradson 2003; Pelling et al. 2008), to acknowledge the ambiguity often apparent in organisational structures and boundaries, encompassing both formal and informal parts of organisations, and also capturing the diversity which is often present in organisational characteristics and learning processes. The central focus of the study was on processes of organisational learning, and the research design attempted to capture a diversity of these processes by studying in depth several different organisational spaces, with contrasting characteristics and positions in the Sciencewise network.

The research also took what could be described as an 'engaged' approach, taking inspiration from action research and more interventionist approaches to human geography and STS research. For example, the project built on an existing relationship developed with Sciencewise actors during my masters research which looked at more historical trends of organisational learning (published here: Pallett & Chilvers 2013). Prior to starting the study my research questions and design were developed in collaboration with Sciencewise actors, with particular reference to what kinds of questions about learning were of interest to them and what kinds of access to Sciencewise activities would be possible and appropriate within the project. This was not part of an overtly ethical and normative stance towards participatory research methods, but rather a consideration of the practical,

conceptual and normative benefits of carefully cultivated partner relationships and reflexively designed academic interventions. My partnership with Sciencewise actors improved my understanding of central Sciencewise aims and concerns and afforded me access to internal meetings and events. I was also able to give feedback to the programme based on my research, attempting – and reflecting upon – small-scale normative interventions within the programme and its practices, and testing the responses of programme actors to my analysis.

The research was carried out at a time of flux in broader UK Government structures and in meanings of democracy, from large-scale reform of the civil service and approaches to policymaking, to the prospect of Scottish Independence and the undermining of long-held democratic and constitutional certainties. There was therefore much at stake in contemporaneous and sometimes competing claims to democratic process and to democratic accountability and legitimacy. Substantive debates too about the role of evidence in policymaking, precisely who could speak in policymaking processes and what was considered to be credible evidence simultaneously presented opportunities and threats to those advocating citizen participation, and held the potential to radically alter practices of policymaking and implementation in Whitehall. This PhD thesis is one attempt to engage with these incipient changes in democratic practice and ideas, in the broader context of the gradual institutionalisation of public participation approaches.

1.1 Research questions

The research aim and questions for this project arose from its initial justification, as described above, and were informed by themes from the geography and STS literatures on public participation and science policymaking. Whilst a focus on processes of learning, reflection and reflexivity is self-evident from the justification for the project above, the more specific use of the concept of organisational spaces (question 2) and the focus on the role of visions of the past and the future (question 4) will be explored and justified in chapter 2. The purpose of the questions and objectives was to provide as rich and varied a picture as possible of processes of organisational learning, reflection and reflexivity within Sciencewise.

Aim: To explore organisational learning processes and opportunities for reflexivity within the Sciencewise organisational network

Questions:

1. What did Sciencewise actors learn from and about public participation in science policymaking in 2013?
2. Did different kinds of learning occur in different kinds of organisational spaces?
3. Through which mechanisms did learning occur and what qualities did this learning have?
4. What visions of the past and future of science and technology innovation, democracy and publics are at play in these learning processes, and what role do they play?
5. Were there any opportunities for broader reflection and reflexivity, and what could be done to encourage this in Sciencewise and similar organisations?

Objectives:

1. To develop a co-productionist framework for understanding organisational learning
2. To identify and characterise different organisational spaces within Sciencewise, including the kinds of learning taking place in them
3. To identify the main mechanisms of learning within Sciencewise and characterise the qualities of learning they foster
4. To identify important memories and visions of the future at play in the Sciencewise network and explore their influence on learning processes
5. To explore opportunities for institutionalised processes of broader reflection and reflexivity

1.2 Structure

The structure of this thesis is largely conventional, beginning with a review of the existing literature, and moving towards an increasingly analytic and conceptual voice through the presentation of empirical findings. The thesis begins with a review of the literature, situating the co-productionist approach taken in this study and exploring the central themes of public participation, the nature of organisations, the nature of learning, and debates about reflection and reflexivity. In place of a conventional methodology chapter I have chosen to weave descriptions of and reflections on my methods of data collection through my presentation and discussion of findings, to highlight the role my methods and position played in the narrative of Sciencewise's organisational practices and learning which is presented. The choice of methods and research design are discussed in the literature review (chapter 2), and also further explored in chapter 3 where I start to present

empirical findings. My empirical chapters (3-5) begin with a discussion of highly specific and situated learning processes, broadening out to consider learning processes and their influences at broader scales. Chapter 3 presents stories of organisational learning from four different organisational spaces in the Sciencewise network, and discusses the relationship between the characteristics of these spaces and the qualities of learning they have fostered. The empirical discussion then moves outwards in chapter 4 to describe patterns of learning at an organisational level within Sciencewise, and explore the different ways, systematic and diffuse, in which Sciencewise learned during the period of research.

The empirical chapters culminate with what might be considered in another study as contextual or background processes in and around the British state, which influenced and were influenced by Sciencewise processes in a number of ways during the period of research. Chapter 5 engages with the broader political landscape within which Sciencewise's learning processes played out, drawing connections between Sciencewise learning processes and broader movements related to democratic practice and policymaking. The rationale for this structure is linked to my central argument about the need to understand the specificities and contexts of learning processes (chapter 3) as a basis for in-depth analysis and interpretation. Furthermore the co-productionist approach taken also entails a closer consideration of processes of learning and change at a constitutional level (chapter 5), making the arrangements of the British state not merely useful background information but rather a central part of the thesis' analysis and interpretation.

A discussion of broader themes around learning emerging from these three chapters comes in chapter 6, which brings the presentation of empirical findings into conversation with key concepts identified in the literature review in chapter 2, offering more synthetic insights into processes of learning, organising, and reflection within Sciencewise. The chapter also discusses organisational reflexivity, and the implications of my research findings for academic interventions in and feedback to policy organisations. Chapter 7 concludes the thesis, exploring how the empirical findings have addressed the research questions and objectives, highlighting the key contributions of the work and suggesting further areas for research.

2

Organising democracy and science policy: knowledge, learning and reflexivity

Democracies depend to a large extent on organisations and technical procedures to facilitate citizen involvement in and engagement with the issues of the day, and to give meaning and mechanism to democratic principles. In the context of an ever-changing, complex and at times controversial science policy landscape, such organisations are continually changing or being recreated in the hope of creating better and more democratic science policy. With evolving demands for and modes of democratic engagement and constantly dynamic relations between science, technology and society, such organisations must be responsive and adaptable. Some have suggested even that they must have the capacity to learn and be reflexive (e.g. Bickerstaff et al. 2010; Gottweis et al. 2007; Wynne 2006). However, in the face of ongoing calls for organisational learning, reflection and reflexivity, it has been claimed that policy and scientific organisations continually fail to learn from past experience, to reflect on their own embedded practices and assumptions or to be open to uncertainty, surprise and indeterminacy. This chapter is concerned with developing a framework for understanding organisational learning and reflexivity – or the lack thereof – in these organisations, which will be used for the analysis of learning processes in later chapters. It seeks also to contextualise public participation institutions and organisational learning against the wider landscape of UK democracy and science policy, to historically and geographically situate this study and the subsequent analysis.

Organisations and forms of public participation have long been important objects of study in their own right in both the human geography and science and technology studies (STS) literatures. Furthermore, such studies have frequently drawn from a wide range of other disciplines, in the case of organisations, from policy studies to governance and management, and in the case of public participation, from development studies to planning and conflict mediation. Yet it is the interplay between the admittedly eclectic disciplines of STS and human geography, which most informs and stimulates the conceptual approach developed here. From the STS literature, a sense emerges of organisations as highly networked bodies, consisting of multiple practices and characterised by certain ways of knowing and doing. The geography literature has emphasised the often dynamic or even fleeting nature of organisational structures, and has also started to theorise the active role played by space in such structures. Both geographers and STS scholars were heavily involved in the initial development and assessment of public participation methods and processes around science policy, as well as acting as advocates for the inclusion of lay knowledges and perspectives in decision-making involving science and technology. Whilst both disciplines have arguably struggled to fully conceptualise and engage with the subsequent institutionalisation of public participation practices in certain areas of science policy and beyond, it is scholars from STS who have made the most concerted efforts to do so.

To lay the groundwork for analysis and further discussion in subsequent chapters this literature review presents a view of both democracies and organisations as *in the making.* Both entities are constantly changing and evolving, being struggled over and remade, with their structures and boundaries taking different forms in different contexts or from contrasting perspectives. These perspectives are set up in opposition to the commitments of much of political theory to essential democratic values upheld by immutable democratic structures and practices, and the assumptions of parts of organisational theory of a machine-like, tightly bounded and rationally controlled organisation. This more fluid and dynamic vision of democracy and organisations then helps to form the basis for an understanding of learning as multi-faceted, multi-directional and multi-vocal, and reflexivity as conscious, outward-looking and experimental.

This chapter begins with a discussion of the idiom of co-production and different ways of understanding science and democracy as being co-produced. This will then lead into an overview of the institutionalisation of public participation methods in UK science policy, and of the role played by the academic social sciences in stimulating and understanding such movements. The chapter then moves on to consider the nature of organisations themselves in the context of what is often referred to as the 'science-policy interface', developing the conceptual approach to the study of organisations and organisational change which will be used in later chapters. Learning and the movement and management of knowledge within organisations will then be explored to further flesh out a conceptual approach to studying organisational learning and change. The final section considers contrasting perspectives on the potential for and nature of organisational reflexivity, and introduces the concept of experimentation which will be developed in later chapters.

2.1 The co-production of science and democracy

This study takes the co-productionist idiom, namely the claim that *'the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it'* (Jasanoff 2004b: 2), as a basis for understanding the relationship between science and society and as an analytical tool. Co-production is a constructivist perspective attempting to provide non-deterministic accounts of developments in society and in the domain of science and technology, assuming a symmetry between the different domains (e.g. Latour 2004) and positing a relationship of mutual influence or coevolution (e.g. Nowotny et al. 2001). Drawing inspiration from Foucauldian accounts of the state and political action (e.g. Foucault 1977; Scott 1998), co-productionist approaches emphasise the strong relationship between ways of knowing the world and ways of manipulating or governing it. Alongside emphasising the cognitive, institutional and normative dimensions of social life, co-production also recognises the importance of material dimensions, though it does not assign as primary a role to the material as actor-network theorists would (e.g. Callon 1986; Latour 1993). Co-productionists refuse to take for granted certain central constitutive categories or entities such as 'science' and 'society' – or for the purposes of this study 'democracy' – instead focussing on how

such apparently stable arrangements have been made and the ways in which their meanings and boundaries change (e.g. Gieryn 1983).

As W B Gallie (1956: 168) reminds us, democracy itself is an essentially contested concept with no one clear definition or set of unarguable characteristics. Rather the meaning of the term itself, as well as its mechanisms and ideals, has been a site of constant struggle and contestation, illustrated by changing meanings and modes of democratic practice across time and space (e.g. Jasanoff 2005a; 2011a). The political scientist Yaron Ezrahi suggests that specific forms of democracy and democratic practice are determined through complex interactions between the available sociocultural materials and ideas of order in a given society (Ezrahi 1990: chapter 1). On a national level the liberal democratic state can take many different forms, with variations in electoral systems, the role of the executive and legislature, the level of centralisation of the administration, and the role of the legal system (Dryzek & Dunleavy 2009: chapter 1), as well as in less formal structures including preferred registers of objectivity, the accepted bases of expertise and dominant styles of public knowledge-making (Jasanoff 2005a: chapter 10). According to the anarchist geographer Mark Purcell, the precise ends of democracy and democratic struggle are unknowable and undefinable, but rather constantly emerge and evolve through instances of democratic struggle (Purcell 2013: 20-27). The planning scholar Patsy Healey (2012) writes in a similar vein, emphasising the role played by micro-practices of democracy-in-action, which have the potential to generate more transformative changes in political structures over time. Thus although democracy consists largely of social institutions or procedures it is not entirely defined by them, rather it is responsive and emergent (Dewey 1927).

STS scholars and historians of science have long argued that advances in science and technology and the increasing permeation of science and technology into everyday life and culture have significant consequences for the theorisation and practice of democracy. Shapin and Schaffer's (1985) landmark study of the formation of the Royal Society in seventeenth century Britain offers an early example of the coevolution or co-production of political and scientific orders, with Boyle's experimental method offering a source of authority and stability much longed for in the wake of the English Civil War. Similarly Porter's (1995) account of the importance of statistics as a source of authority and perceived objectivity in 20th

Century US politics illustrates the role of political events in helping to shape this emerging science, and the recursive effects which the growth of statistics had on politics. Knowledge controversies, where science and politics are intractably intertwined, have increasingly had implications for democratic practice and policy-making, from health scares to debates around climate science and politics, or food production and security (Bingham 2008; Hinchliffe 2001; cf. Rip 1986; Whatmore 2009). Such controversies and expressions of dissent may be primarily driven through social protest (e.g. Bingham 2008; Epstein 1995), civil society groups (e.g. Seyfang 2010) and non-governmental organisations (Jasanoff 2005a; chapter 5), but attempts proliferate to bring such discussions into formal governmental structures, for example through orchestrated deliberative fora. Developments in science and technology also raise new questions and challenges for democratic governance, for example by creating the potential for new environmental or social ills (e.g. Beck 2009), by creating new spaces and fora for democratic deliberation or by challenging conventional legal and political definitions (e.g. Jasanoff 2011b).

The story of democracy then, is a story of continual popular struggles for representation against a constantly changing cultural and material context, from the suffragettes to struggles against colonialism, and the environmental movements of the 1960s. Moments of social protest, knowledge controversies, shifting societal attitudes and increasingly the voice of the mass media constantly respond to and also help to shape democratic structures, institutions and practices. John Dewey (1927: chapter 1) describes the formation of the democratic state as an experiment to be retried as the state is constantly rediscovered through the emergence of new public problems. Thus democratic structures are never complete or entirely stable. Furthermore, in the context of the increasing connectedness of different states and individuals, and what has been called the 'Knowledge Society' (e.g. Nowotny et al. 2001), developments in science and technology become increasingly important in shaping the meanings, practices and expectations of everyday life. Relatedly, public problems, such as ethical dilemmas or knowledge controversies, seemingly emerge at an ever faster rate (e.g. Beck 2009). From developments in the biosciences, to wearable technologies or the ability to amass and manipulate increasingly large datasets, science and technology both respond to and influence democratic values, structures and practices. These new public problems summon new publics (Dewey

1927; Marres 2007) produced alongside new policies, procedures and even institutions.

The modern liberal state consists not only of democratic processes and structures but is also increasingly tied up with and defined by forms of knowledge-making about, for and with its citizens. From the first population-wide census to the focus groups and public opinion polls which play an important role in contemporary politics, governments have required procedures not only to facilitate the democratic participation of citizens but also to know about and therefore more effectively govern them (cf. Foucault 2007; 2008). It is common in empirical studies of publics to distinguish between the mini and macro publics produced by different forms of knowledge-making, where mini or micro publics are produced through small-scale deliberative methods (e.g. Rask et al. 2012; Tlili & Dawson 2010) and macro publics operate at the level of the national political system within what are often less formal deliberations and practices. There has been much discussion in theory and in practice about the relationships between these two categories, and a growing conviction that neither category should be studied or used to inform government policies in isolation. Whilst Goodin and Dryzek (2006) identify instances where mini publics have had a clear influence on formal macro political decisions, Hendriks (2006) envisages a messier and less formal macro political sphere which is constantly interacting with and influencing more formal micro publics, as well as hybrid micro/macro spaces. Hagendijk (2004) pushes this theorisation further by asserting the contextual importance of deliberations and narratives in the mass media as another way of knowing citizens and a further influence on formal or informal political processes. This creates a broader, more distributed sense of citizen participation in democracies, evoking a picture of multiple overlapping ecologies (Gehrke 2013), social worlds (Hagendijk, 2004), fora (Callon et al. 2009; Hendriks 2006) experiments (Gross & Krohn 2005; Latour 2004) or assemblages (Irwin & Michael 2003) of public participation and engagement.

In the context of formal decision-making processes, especially in instances where representative modes of democracy appear to have been unsuccessful, deliberative democracy has been held up by authorities and academics as an ideal of democratic practice, particularly from the 1990s onwards (Goodin & Dryzek 2006). The critical

theorist Jürgen Habermas has been a particularly important figure in this regard, with his notion of communicative action which, he claims, leads to perfect speech situations where citizens act as equals and are able to gain full understanding of each other's points of view (Habermas 1984). This for Habermas represents the ideal of the (deliberative) public sphere, which has featured significantly in the development, planning and science policy literatures. John Dewey's work has also been interpreted by some as endorsing similar proceduralised modes of involving citizens in the discussion of public problems. This growth of deliberative public participation presented a challenge to the authority held by decision-makers and experts in science policymaking (Munton 2003) and was justified as the most just and rational way to make decisions in context of great uncertainty, value conflicts and knowledge controversies (Baber & Bartlett 2005: chapter 1; Funtowicz & Ravetz 1993). However, ideals and models of deliberative democracy have been subjected to robust criticism in development studies (e.g. Cooke & Kothari 2001), planning (e.g. Tewdwr-Jones & Allmendinger 1998), sociology (e.g. Pellizzoni 2001), political science (e.g. Mouffe 2000) and STS (e.g. Laurent 2011a). These often Foucauldian critiques have centred on the practical impossibilities of the imagined perfect speech situation being achieved due to inevitably unequal power relations and other differences between participants, including gender, race and income. Furthermore, the deliberative democratic ideal of consensus as a democratic goal has been challenged due to its potential to mask genuine intractable disagreements (Machin 2013: chapter 4), to silence minority and marginalised dissenting voices (Cooke & Kothari 2001), and also because consensus is understood differently in different national (Horst & Irwin 2010) and social contexts (Hulme 2009: chapter 3).

The critique of deliberative democratic theory has been followed by more 'agonistic' accounts of democratic processes, which emphasise disagreement, debate and struggle. Drawing from the work of democratic theorists like Chantal Mouffe (e.g. 2000), as well as being influenced by perspectives from social movement studies and cultural studies, geographers and STS scholars have increasingly sought to draw attention to social protest and other instances of popular dissent as democratic acts (e.g. Hagendijk & Irwin, 2006; Pickerill & Chatterton, 2006). As well as arguing that difference and disagreement can provide

a productive basis for political settlements and action (e.g. Machin, 2013), such accounts also draw attention to the multiple informal or 'uninvited' (Leach et al. 2005) ways in which citizens engage with the democratic structures of the state, beyond the formal mechanisms orchestrated by government. Whilst agonistic accounts of public participation and engagement served as an important challenge to the primary role given to deliberative theories and processes, both agonistic and deliberative approaches represent an attempt to develop a finished model of democratic practice and participation. A co-productionist approach, like the one developed here, would instead seek to concentrate on current practices of and claims to democracy, to understand how certain arrangements and ways of doing things have become stabilised, and to follow the processes through which understandings and practices of democracy are changing.

Important to understanding the situated practices of democracy, science and science policymaking, is an appreciation of differences in national political culture. Comparative studies of emerging technologies and science policy problems have sought to empirically demonstrate this, in cases such as the development of new genomic medicines (Sunder Rajan 2011), practices of regional biodiversity management (Kaljonen 2008), the commercialisation of genetically modified organisms (Jasanoff 2005a), responses to disasters (Jasanoff 2005b), and visions of nuclear power (Jasanoff & Kim 2009). These studies illustrate how it is not only the content and specificities of the scientific issue under discussion, but also national histories of engagement with similar issues, and modes of authorising knowledge and relating to citizens, amongst other elements, which will determine the outcome of a policy decision. Sheila Jasanoff has termed these national differences in public ways of knowing and governing 'civic epistemologies', which shape relations between science, society and the state (Jasanoff 2005a: chapter 10). Jasanoff describes six primary analytic dimensions of civic epistemologies, namely: dominant participatory styles of public knowledge-making; methods of ensuring accountability; practices of the public demonstration of official 'facts'; preferred registers of 'objectivity'; the accepted bases for expertise; and the visibility of expert bodies in government. In comparison to the contentious US and consensus-seeking German civic epistemologies Jasanoff labels UK civic epistemology as communitarian (Jasanoff 2005a), emphasising its pluralist styles of public knowledge-making, the

need for practical demonstrations of official facts to a distrustful public, the preference for formal numerical reasoning as a register of objectivity, and the reverence for professional skills as a foundation for legitimate expertise.

As recognised in Jasanoff's theorizations of civic epistemology however, democracies are ever changing or 'in-the-making', and the pace of change is rarely linear or constant. Changes in governance arrangements and modes of democratic participation tend to be particularly mobile at moments of controversy (e.g. Beck 2012; Bingham 2008), when dealing with unexpected disasters or even conflict (e.g. Jasanoff 2005b), or in the event of surprising new information or technological developments (e.g. Jasanoff 2011b). On a longer timescale democratic and political structures respond to the changing social values and commitments of their citizens (Jasanoff 2011a) as well as the gradual diffusion and acceptance of new knowledge and ideas (e.g. Owens 2010), sometimes still leading to instances of relatively fast democratic change when the opportunities, skills, infrastructures and attitudes necessary for change are in place. Sheila Jasanoff has described such developments as 'constitutional moments' (Jasanoff 2011a), drawing on the work of the legal scholar Bruce Ackerman and aiming to situate changes in democratic practice in the context of longer historical developments, in her case in the US. Jasanoff defines constitutional moments as relatively brief periods in which the basic rules of political practice are rewritten, altering relations between citizens and the state. She identifies two such periods in the emergence of modes of public engagement in the US context: the first beginning in the 1940s with an increasing plurality of voices involved in political discourse, and the second beginning in the 1980s with the institutionalisation of a narrow set of participatory practices whilst the bases on which it was possible to challenge the state also simultaneously contracted. It is in this spirit that the institutionalisation of public participation in the UK context will be discussed in the next section, paying attention to the national historical and political contexts of these procedures and the popular attitudes they sought to address.

2.2 The institutionalisation of public participation

Societies often seek to engage with emergent challenges to democratic governance through the creation of new political and scientific institutions. Shapin and Schaffer's

(1985) account of the creation of the Royal Society in the seventeenth century illustrates well this relationship between the stabilisation of a set of institutional rules and norms and broader democratic challenges and shifts. In the high-profile debate between Thomas Hobbes and Robert Boyle which Shapin and Schaffer animate in their book, it was ultimately the more bounded and elitist vision of knowledge-making advocated by Boyle which was most appealing to a society seeking stability following the Civil War, Cromwell's Commonwealth and the subsequent Restoration of the monarchy. Hobbes vision was more politically challenging, rejecting attempts to draw distinctions between the study of nature and the study of human beings, or between matters of fact and value, while removing restrictions to what or whom could participate in the creation and legitimation of credible knowledge (ibid.). Boyle's nascent scientific experimental practice was much more controlled, requiring the elite public witnessing of his experiments with the air pump at the Royal Society for the establishment of matters of fact (ibid.). Thus it was judged to be more neutral and legitimate, and to be a sounder basis for the problem-solving mentality which many felt to be necessary during the Restoration.

The norms and rules established during the creation of the Royal Society and related institutions have been persistent both in what we now call scientific practice and in British political culture, which has been characterised as retaining the elitist and deferential tendencies of Boyle and his allies (e.g. Jasanoff 2005a). More broadly, it is evident that direct forms of public participation in science decision-making have not been a common feature historically of the governance of the modern liberal state, which has instead classically looked to science and scientific expertise both for an apparently objective and legitimate basis for policy decisions and for neutral and independent judgements of the consequences of state decision-making (e.g. Ezrahi 1992; Jasanoff 2012; Jasanoff & Wynne 1998). Throughout much of the twentieth century expert judgement and knowledge alone were generally considered to be an adequate basis for decision-making, with a particular reliance in the UK on methods like cost-benefit analysis and technology assessment in solving complex decisions, such as the development of nuclear power plants and associate infrastructures (Wynne 1982). This has sometimes been characterised as the 'Decide-Announce-Defend' approach to the making and retrospective public

justification of technical decisions (e.g. Webler et al. 1995). When it became clear through public protests and expressions of dissent across Northern Europe in the 1970s and 1980s – and the occurrence of several damaging nuclear accidents – that scientific reason alone could not definitively settle the issue of nuclear power and broader debates around energy policy (e.g. Irwin 1995; Wynne 1982), the UK Government attempted to tame public controversy through the orchestration of several high-profile, lengthy and costly public inquiries, such as those around the Windscale and Sizewell B power stations (e.g. O'Riordan et al. 1988; Wynne 1982). Yet these inquiries too failed to establish conclusive matters of fact or lasting and persuasive forms of public reason, and were criticised for foreclosing the political and normative dimensions of the controversy (e.g. Wynne 1982), excluding the voices of the ordinary public (e.g. O'Riordan et al. 1988) and symbolising a refusal to engage with public voices and reason through more 'routine political arrangements' (Wynne 1982: 14). Welsh and Wynne (2013) characterise the dominant imaginary of the public and its role in technoscience between the 1950s and early 1990s as being passive non-entities, unable to play any meaningful role in decision-making other than expressing grateful acceptance.

At the start of the twenty-first century many of the important institutional developments around science and science policy concerned the putative move towards initiating more of a two-way dialogue with citizens around scientific issues which affected their lives. In the UK this move was characterised as a shift from the focus on public understanding of science (PUS) towards an emerging approach which emphasised public engagement with science (PES) (Michael 2011; Pieczka & Escobar 2013). The PUS movement in the UK was stimulated, if not instigated, by the 'Bodmer report' authored by a committee overseen by Sir Walter Bodmer in 1985 (Royal Society 1985). The authors argued that the increasing public distrust of and disinterest in science which had been observed in the post-war period was due to a lack of scientific literacy amongst the majority of the population. This diagnosis spurred a vast programme of activities designed to test and improve the public understanding of science, from public surveys and social scientific research to book prizes and educational television (Miller 2001). Many of these activities were funded through the Committee on the Public Understanding of Science (CoPUS) which was run jointly by the Royal Society and the Royal Institution, until its dissolution in

2001. During the 1990s these activities were subject to robust academic critiques (in some cases from researchers who had been funded by CoPUS, e.g. Wynne 1996), labelling the PUS movement's way of engaging with citizens as the 'deficit model' which assumed citizens were empty vessels needing to filled with the correct information, in order to accept scientific advances and policy (e.g. Irwin 2001; Miller 2001; Owens 2000; Wynne 2006). A series of high profile public science controversies, including the BSE crisis and debates about the risks of using the MMR vaccine, also made it clear that the PUS movement had not succeeded in overcoming public distrust and dissent towards government science and scientists (Jasanoff 2005a: Chapter 10).

In the year 2000, in the wake of these controversies and the apparent failure of the PUS project, the House of Lords Science and Technology Committee produced the report 'Science and Society' (House of Lords 2000) – also sometimes referred to as the 'Jenkin report' – which called for direct dialogue with the public to become an integral part of science policymaking. At the time, as well as in later accounts, this report was viewed as a pivotal moment in democratic practice around science policy in the UK, setting in train the institutionalisation of a more dialogic form of public engagement with science and science policy (e.g. Bickerstaff et al. 2010; Miller 2001). Although some have argued that the shift between PUS and PES is far less distinct and complete than such accounts might suggest (e.g. Pieczka & Escobar 2013; Welsh & Wynne 2013), the House of Lords report stimulated a significant paper trail in the UK Government calling for public dialogue around science policy (e.g. H M Treasury 2004; POST 2002; POST 2001) and several of its recommendations have since been institutionalised. Perhaps most significantly, this call for direct public involvement in science policy-making resulted in the creation of Sciencewise as part of the 'Science & Innovation Investment Framework 2004-2014' (H M Treasury 2004), within what was then the Department for Trade and Industry. Created in the institutional space left behind by the dissolution of CoPUS, Sciencewise was also initially formed with the same small grant-giving structure, until a 2005 report from the Government's Council for Science and Technology recommended a new way of operating (Council for Science and Technology 2005).

Shortly before the creation of Sciencewise the UK Government launched a landmark public dialogue exercise in 2003 called 'GM Nation?' alongside an

economic assessment and farm-scale trials of genetically modified food crops. With government and civil service structures still reeling from the public reaction to the BSE controversy in the late 1990s, this dialogue was seen as a way to get the public conversation right around GMOs and to prevent the derailment of this emerging technology which ministers had already committed to supporting (Jasanoff 2005a; chapter 5). The 'GM Nation?' dialogue, which involved small-scale deliberative events across the country, as well as a web forum for discussion and survey methods, suggested that public attitudes towards GM crops were uneasy and that there was significant public distrust of government and the multi-national companies involved (Irwin 2006). Within Government the apparent failure of this exercise was seen as a problem of method, with many government actors citing a contemporaneous study which had found a much more even spread of public attitudes (Pidgeon et al. 2005). This perspective that 'GM Nation?' simply found the wrong public, despite efforts to avoid the exercise being hijacked by special interests (Irwin 2006), and was thus a failed dialogue has been strongly challenged by subsequent scholarship. Authors have challenged both the narrative of the exercise as a failed consultation (e.g. Stirling 2008)– the exercise did after all indirectly contribute towards the hiatus in the commercialisation of GM crops in the UK, which is arguably the outcome its findings best supported – and have also pointed out that the dialogue was relatively successful in involving a diverse group of citizens (Jasanoff 2005a: chapter 5) or even multiple publics from activist groups to disinterested or innocent citizens (e.g. Reynolds & Szerszynski 2006).

The narrative of the increasing turn to more deliberative and dialogic modes of public interaction in government science policy, in response to public knowledge controversies and distrust of government experts and policies is an oft-repeated one in government documents and in academic work. However, this story arguably obscures the labour of academic and political advocates and the broader political context around the time of the mooted shift from PUS to PES. Social scientists played an important role in advocating and developing deliberative approaches to public participation in the context of local planning conflicts (e.g. Arnstein 1969), development (e.g. Chambers 1983) and science policy issues (e.g. Irwin 1995; Wynne 1996a). This advocacy work involved making the case for the substantive, instrumental and normative benefits of deliberative participation (Fiorino 1990), and

was then later supported by work designing deliberative methods, such as participatory technology assessment (e.g. Schot & Rip 1997), citizens juries or deliberative mapping (e.g. Davies 2006). In the UK, the institutional move from PUS to PES was supported by establishment figures who had long been involved in supporting government PUS projects, such as the historian of science John Durant, and prominent critics of the PUS approach, such as the STS scholar Brian Wynne, both of whom acted as witnesses for the 'Science and Society' report (House of Lords 2000). Social scientists formed part of a broader 'epistemic community' (Chilvers 2008b; cf. Haas 1992) or community of practice (cf. Lave & Wenger 1991) around public participation, which also encompassed independent practitioners, some think tank and NGO workers, a small group of civil servants, and market researchers. This loosely defined community was important in the development, introduction and narrowing of accepted methods for public participation, and also in the inculcation of certain unspoken assumptions about the conduct of public participation and the nature of the public (Chilvers 2008b).

In a challenge to narratives which foreground the role played by the scientific controversies of the 1990s or the labour of social scientists, STS scholar Charles Thorpe (Thorpe 2010; Thorpe & Gregory 2010) has argued that the turn towards public deliberation, and particularly the focus on reaching consensus as a key aim in these processes, is part of the broader development of the post-Fordist public in post-industrial British politics. Thorpe particularly highlights the role of the prominent sociologist Anthony Giddens and the left-wing think tank Demos in laying the groundwork and working with the New Labour project, to bring consensus politics and participatory democracy to centre stage (Thorpe 2010). Alongside the public controversies and academic advocacy of the 1990s, the need for a participatory democratic politics was also axiomatic within Demos work and thinking, around science policy but also more broadly (ibid.). Demos' then director Geoff Mulgan moved on to become director of policy at 10 Downing Street when Labour won the 1997 general election, interacting both formally and informally with intellectuals of the 'Third way', in particular Anthony Giddens.

According to Thorpe, the values underlying the development of participatory practices in Government included a commitment to the value of culture, a vision of free individuals held together through trust rather than hierarchy, and the importing

of private sector logics into the public sector, otherwise known as the new public management (cf. Hood 1991; Power 1997). Alongside the development of deliberative modes of science policymaking this conceptual and normative agenda also underpinned other aspects of New Labour governance, such as the increasing reliance on market research methods in policy development. Throughout the 2000s, Demos remained an important site for the development and promotion of ideas around public participation, involving both STS scholars and concepts, and in some cases the translation or transformation of ideas from social science (e.g. Stilgoe et al. 2006; Wilsdon & Willis 2004; Wilsdon et al. 2005). 'Public dialogue' and 'upstream engagement' are two ideas which were particularly strongly promoted in Demos publications, somewhat removed from their initial academic context, which have had a clear influence on the structures and activities of Sciencewise.

The institutionalisation of deliberative approaches to public engagement with science policy in the UK during the 2000s, or the 'new scientific governance' (Irwin 2006), raised new challenges for academic inquiry and analysis. Whilst many social scientists in this area have continued to work on developing and evaluating new methods for public participation (Chilvers 2009), a small group of mainly STS scholars has sought to engage more constructively with the form and effects of participation's institutionalisation. In many cases these scholars have done so by turning the tools of STS, originally developed to study the development and use of scientific knowledges and technologies, onto the use of social scientific concepts, knowledges and 'technologies' in the public participation context. The topic of issue framing has long been of concern in academic work on environmental policy, where authors have argued that the initial framing of a policy problem or question has a strong effect on the outcome (e.g. Rein & Schön 1991). In the context of deliberative public participation authors have argued that the onus on reaching consensus potentially magnifies these framing effects further, meaning that pre-existing power relations and social structures will heavily influence what appears to be an open process (e.g. Chilvers & Burgess 2008; Stirling 2008; Tewdwr-Jones & Allmendinger 1998).

Furthermore, STS scholars have argued that the framing of the scientific issues under discussion in participatory processes also has implications for the kinds of

citizens or publics which are imagined and brought into being through the process (e.g. Marres 2007; Irwin 2001). Constructions of publics within participation processes as variously 'innocent citizens' (Irwin 2001) or 'general', 'affected', 'pure' and 'partisan' publics (Braun & Schultz 2010), to cite a few examples, actively constrain action and discourse, and can even tacitly exclude certain groups from the process. Furthermore, Brian Wynne (2006) argues that many of the assumptions held by those commissioning and drawing on public participation exercises are highly persistent. Consequently, deficit model assumptions are being continually projected onto citizens in new formulations, from a lack of scientific literacy to a lack of trust or little understanding of scientific methods, with implications for how participation processes play out (Wynne 2006). Furthermore, Welsh and Wynne (2013) have identified a persistent but more diffuse imaginary of the public in decisions related to technoscience from the 1990s onwards as a threat to reason and increasingly to state security. However, others have been at pains to stress that participants in such processes are rarely passive, and frequently refuse to perform the roles allotted to them, in some cases successfully reframing or undermining the initial process (Felt & Fochler 2010).

Another key focus for STS work seeking to engage with the incipient institutionalisation of public participation has been its concurrent professionalisation and commercialisation. This trend has been characterised by a narrowing set of methods which are considered to be 'best practice' in public participation (Chilvers 2008a; cf. Cooke & Kothari 2001), leading some to analyse the development and effects of these methods or 'technologies of participation' (e.g. Lezaun & Soneryd 2007; Lezaun 2007). This narrowing of methods also creates an increasingly exclusive group of participation experts or mediators, with the power not only to define what constitutes good and bad participation, but to design and carry out participation processes, and to speak on behalf of citizens in the context of science policy (e.g Chilvers 2008b; Gisler & Schicktanz 2009; Osborne 2004). Thus the mediation of participation processes not only has implications for how citizens are engaged and constructed, but also what is considered a legitimate object for participation in the first place, what outcomes of a participation process will be made public, and how they will be made public (Elam et al. 2007).

A final strand to the attempts of social scientists to engage with what Alan Irwin (2006) terms the 'new scientific governance' has been to pay attention to the institutional or organisational dimensions of public participation, in contrast to the conventional focus of much participation research on single events. Brian Wynne has argued that the continual reinvention of deficit model assumptions within powerful institutions commissioning and responding to public participation processes shows the impacts of entrenched power relations as well as the need for improved institutional reflexivity (Wynne 2005; 2006; 2008; 2011). Wynne's position is supported by Andy Stirling's argument that all policy assessment instruments, whether apparently analytic or deliberative, have the potential to close down as well as open up potential policy options (Stirling 2008). Thus it is institutional and political dimensions which largely determine the democratic (or undemocratic) effects of public participation processes. Both Wynne and Irwin have engaged with the Biotechnology and Biological Sciences Research Council (BBSRC) as analysts and advocates (e.g. Doubleday & Wynne 2011; Irwin 2001; Irwin 2006), concluding that emerging approaches to public engagement in the body and more broadly in Government represent an uneasy mix of old and new assumptions about the public, and the appropriate modes of engagement. So whilst government bodies have had the capacity to tacitly respond to multiple instances of public participation around science policy, from formally orchestrated public participation processes to 'uninvited' instances of social protest and dissent, entrenched assumptions about public beliefs and capacities remain. Karen Bickerstaff and colleagues found a similar institutional intransigence in their study of the Royal Society's public engagement activities, where they concluded that limited attempts at innovative forms of public engagement were undermined by tacit assumptions and cultural orderings of different knowledges within the organisation (Bickerstaff et al. 2010).

2.3 Understanding organisations in science policy

[*Parts of this section develop ideas which were originally expressed in a recently published review paper* (Pallett & Chilvers 2014)]

Geographers and STS scholars have long been interested in understanding science policy organisations, or those operating at what has been characterised as the 'science-policy interface' (e.g. Chilvers & Evans 2009; Demeritt 2010; Doubleday &

Wynne 2011; Hinchliffe 2001; Kearnes & Wienroth 2011; Mahony 2013; Owens 2011). As discussed in section 2.1, in the latter decades of the twentieth century science policy organisations were confronted with the related challenges of addressing issues of uncertainty, risk, ignorance and ambiguity, in their everyday routines and working practices. Furthermore, during this time such organisations, like research councils, scientific advisory bodies or environmental activist groups, experienced a growing intertwining of science and society (Chilvers 2013). This is manifested, for example, in: ever more frequent knowledge controversies over objects of governance like diseases, emerging technologies or climate change, as discussed in section 2.2; the growing difficulties of containing 'scientific' issues within institutional boundaries and scientific definitions of the problem (e.g. Gottweis et al. 2007); and the enrolment of an increasingly diverse set of actors in science policy processes (e.g. Funtowicz & Ravetz 1993; Fiorino 1990). Such developments have unsettled and therefore reconfigured entrenched relations between state, science and citizens (Doubleday & Wynne 2011; Irwin & Michael 2003; Jasanoff 2005b), suggesting that conventional models and understandings of the role of the organisations mediating between science and society might no longer be relevant or useful. The emergence and institutionalisation of more participatory modes of decision-making in science policy are one such innovation proposed in order to deal with these organisational challenges, and have also resulted in the creation of new organisational structures in science policy, such as Sciencewise.

Since Weber, empirical accounts and theorisations of organisations and organisation have oscillated across a spectrum between machine-like and organic metaphors for organisational structures and change (Jones & Munro 2005). Machine-like metaphors emphasise internal organisational processes and structures, and tend to assume change is stimulated from the top of the organisational hierarchy, whereas organic metaphors highlight external influences on organisational forms and focus on processes which blur or transform organisational structures and hierarchies. Important innovations in organization theory, such as systems or complexity theory from the 1960s, were frequently adopted and interpreted by those from contrasting positions across this spectrum, for example Weick's (Weick 1995; cf. Czarniawska et al. 2005) organic rendering of systems

theory in his concept of organisational sense-making as compared to Senge's (2006) more structured and machine-like account of organisational systems. The understanding of organisations and organisational change advanced here takes inspiration from earlier organic approaches which emphasised the role of contingency (e.g. Child 1984) and the incomplete and dynamic nature of organisational processes (e.g. Cooper 1986; cf. Spoelstra 2005). Drawing from more recent developments in geography and STS, the model developed here also stresses the relational nature of organisational structures and activities.

Long-standing conventional perspectives on organisations and organisational change in science policy, from both academics and policy-makers, have tended to draw upon machine-like metaphors and have emphasized the stability, coherence, and boundedness of organisational structures. Here change is conceptualised as the result of a mode switch, from one steady state to another, through rational hierarchical management, and the creation of new organisations from the IPCC to Sciencewise is viewed as a potentially lasting solution to current challenges. It is often implicitly assumed that organisational change comes from inside organisational structures, and will normally be driven from the top down by leaders and managers. Such embedded and often tacit assumptions about the nature of organisations are evident in parts of the grey literature on the practice and promotion of public participation (e.g. Lindsey Colbourne Associates 2010; Wilsdon & Willis 2004; Council for Science and Technology 2005). By ignoring the organisational contexts of participation events many academic accounts and evaluations of participation processes arguably also reinforce such a view of science policy organisations. Furthermore, recent debates about academic policy engagements and impacts (e.g. Webster 2007; cf. Nowotny 2007; Wynne 2007), and attempts by academics to intervene in and influence science policy organisations (e.g. Rotmans & Loorbach 2008; Owen et al. 2012; Stilgoe et al. 2013), have been influenced by similar ideas about organisations.

Recent work concerning organisations in geography, STS and beyond, has drawn on more organic metaphors of organisational structures, seeking to promote a vision of organisations in science policy and elsewhere as much more dynamic entities with more porous boundaries. Drawing on the work of STS scholars Latour, Callon, Law and others in developing Actor-Network Theory (ANT), there has

been a shift in focus in geography and related disciplines from fixed and predefined entities to looser and more flexible networks, which contain both human and non-human elements (e.g. Callon et al. 2009; Hinchliffe et al. 2005). In studies of organisations this has motivated a shift away from a focus on purely internal organisational trends and changes to an awareness of broader trends and influences, external to any given organisation (e.g. Irwin & Michael 2003; Hinchliffe et al. 2013). Furthermore, this conceptual work helps to explain empirical observations of how issues and actors often transcend what are assumed to be stable organisational boundaries and definitions (cf. Doubleday & Wynne 2011). This also highlights the importance of informal networks within and around organisations in influencing organisational processes (e.g. Pelling et al. 2008; Owens 2010), in contrast to assumed rational and problem-solution oriented organisational management. These conceptual innovations have also been linked to empirical observations in science policy contexts where civil society actors, publics and other stakeholders have increasingly been part of the production of organisational knowledge, as described in sections 2.1 and 2.2. Environmental politics also increasingly takes place outside formal political institutions, through new articulations of and struggles over meaning and morals (Jasanoff 2010). As actors and ideas become more mobile, and organisational boundaries more porous, understanding cross-learning and influences between organisations and different groups or networks operating at multiple scales becomes significant (cf. Bulkeley 2005).

However, scholars have encountered limitations in using ANT and related approaches to understand organisations in science policy. Organisations not only operate within and as networks connected to diverse elements – including other organisations – apparently outside of formal organisational structures, but they also respond to and take part in shaping these other entities, changing the nature and form of their different connections and networks. Studying just the networks themselves reduces the potential for an in depth empirical consideration of the processes creating, maintaining and resulting from them, and may also detract from an exploration of the different form and character which different connections and alliances take. Furthermore, organisational networks exist not in a vacuum but are set against complex topographies encompassing broader institutional arrangements, civic epistemologies and situated practices and characteristics. Whilst ANT

encourages a consideration of an organisation's material components and their relationship to social actors and practices, it has not adequately dealt with the space or spaces of organisations or provided ways to conceptualise their character and effects. These multiple dimensions of organisational space and spaces encompass power and politics at multiple scales (Béland 2006; Jasanoff 2005b), emotive, affective or even atmospheric elements (Conradson 2003; Lorino et al. 2011; Schatzki 2006), as well as different functions of space itself (Dale 2005; Beyes & Steyaert 2012).

The study of organisations in science policy has been further influenced by a move in geography, STS and related disciplines towards a focus on procedures and dispositions over outcomes, and a conviction that the phenomena studied should be conceived of as being in a constant process of becoming rather than as fixed entities (Gieryn 1995). This development has supported and enabled the more specific turn towards processes and practices, strongly displayed in work in STS and geography, and in the development of conceptual approaches such as social practice theory which are being more widely adopted (e.g. Shove 2010). The notion of 'co-production' has played a particularly significant role in this body of work, elaborating how identities, institutions, discourses and representations can be mutually constructed. The new attention to processes and contingency in STS and beyond (e.g. Irwin 2008; Owens 2010; Stirling 2006) suggests a way of viewing organisations as objects constantly in the process of becoming – dynamic, multiple, performative and open-ended – resulting from networks of different practices of organising and knowing (Beyes & Steyaert 2012; Jasanoff 2004b). By recognising the practised and performative nature of organisational routines, structures and objectives social scientists have been able to capture not only the potential for dynamic and sudden organisational change, but also the apparent solidity and stability of such forms as part of the everyday (e.g. Gherardi 2009; Jasanoff 2005c).

Theorisations of organisational space and spaces strongly challenge traditional conceptions of clearly bounded spaces and entities (cf. Bulkeley 2005; Callon & Law 2004), and the conventional casting of space as a passive backdrop upon which societal events are played out (Soja 1989). Organisational practices both create and are shaped by organisational spaces, in what could be described as a co-productive relationship. As they are neither stable nor passive it is appropriate to focus mostly

on the doing or practising of organisational space (Conradson 2003). Organisational spaces can cut across and reach beyond formal organisational structures (Pelling et al. 2008), containing material, social and affective elements. Pelling and colleagues' (2008) study of networks around UK Government climate change policy drew upon the concept of organisational spaces to theorise the existence of so-called 'shadow spaces' within and around formal organisational structures. These spaces form around the development of private, informal relationships between organisational actors, allowing these individuals and subgroups to experiment, imitate, communicate, learn and reflect on their actions, in a way that is not permitted within more formal spaces (ibid.). Consequently such spaces offer a place of bounded instability where novelty can emerge but with a sense of continuity with earlier institutional innovations (ibid.).

This section has moved towards a theorisation of organisations as dynamic and porous entities, formed and performed through patterns of practices and networked organisational spaces. This approach offers one way in which geographers can engage actively and empirically with the spatial dimensions of organisations in the making without taking organisational structures or their spaces for granted. This conceptualisation is complemented by emerging methodological approaches to studying organisations or networked forms, namely the idea of multi-sited ethnography (e.g. Ellis & Waterton 2005; Marcus 2007; cf. Kostera 2007; Law 2004), which is discussed further in chapter 3. This approach also draws inspiration from comparative research which has tended to draw comparisons between entire organisations or national contexts (e.g. Gottweis et al. 2007; Jasanoff 2005b), but also shows the analytic benefits of drawing comparisons at a smaller scale of analysis, for example between different organisational spaces.

2.4 Learning, knowledge and non-knowledge

The concept of organisational learning is one way of narrating processes of organisational change. Whilst other accounts refer, for example, to processes of sensemaking (e.g. Weick 1995), domestication (e.g. Rothstein 2013), standardisation (e.g. Star & Lampland 2009), innovation (e.g. Pieczka & Escobar 20123, transition (e.g. Rotmans & Loorbach 2008), co-production (e.g. Jasanoff 2011), adaptation (RCEP 2010; Voβ & Bornemann 2011), risk management (e.g. Huber & Rothstein

2013; Power 2007) or community formation (e.g. Lave & Wenger 1991), the metaphor of organisational learning has become a central tool in attempts to describe and explain organisational change (e.g. Argyris & Schön 1996; Senge 2006). The focus in this study on learning over other processes indicates a specific concern with knowledge and its role in organisational structures, activities and change, an element which might be down-played in some of the other approaches. Implicit in many theorisations of organisational learning is also a dimension of moral judgement, underlying the assumption that the label 'learning' denotes 'good' organisational change which is going in the 'right' direction, and other concepts such as 'unlearning', 'forgetting' or simply 'failure' are used when change processes are judged to be going in the 'wrong' direction. This is an assumption which I will try to avoid making in the following account, adopting instead a Bloorian symmetry (Bloor 1976) which attempts to provide social rather than cognitive explanations of organisational learning processes regardless of how their outcomes are judged.

Theorisations and definitions of organisational learning or social learning more generally abound (e.g. Argote & Miron-Spektor 2011; Argyris & Schön 1996; Bandura 1977; Fiol & Lyles 1985; Levitt & March 1988; Nicolini & Meznar 1995), yet a common criticism is that the terms are often too broadly applied – after all some sort of learning will occur as a result of almost every activity – with little specificity about the actual processes at play (e.g. Reed et al. 2010). In line with the understanding of organisations advanced in section 2.3 and the situating of this project more generally within the idiom of co-production, this section develops a relational or co-productionist understanding of learning, which draws on aspects of the organisational learning literature but presents an STS interpretation (cf. Pallett & Chilvers 2014). This approach focuses on situated practices as the locus of learning, through which skills, routines, assumptions, working understandings and problem definitions are co-produced with organisational structures, in particular organisational spaces. As an alternative to approaches which take for granted existing analytical categories of learning – such as single and double-loop learning (Argyris & Schön 1996), instrumental learning (e.g. Petts 2007) and transformative learning (Mezirow 1997) – this approach will first require detailed empirical descriptions of situated learning processes (chapter 3) before higher level analysis about the nature and qualities of learning processes can be ventured (chapters 4-6).

Organisational learning is frequently equated with 'knowledge management'; the production, ordering and storing of knowledge (Amin & Roberts 2008; Cook & Brown 1999). While this approach provides greater specificity about different learning processes, it has been criticised for taking for granted or conceiving too narrowly of knowledge, its production, movement and mutation (e.g. Hellström & Raman 2001; Cook & Brown 1999). Discussions about the nature of knowledge have been central to the STS literature, highlighting its diversity and situatedness (e.g. Haraway 1989; Scott & Du Plessis 2008), its socially distributed nature (e.g. Gibbons et al. 1994; Nowotny et al. 2001), its tacit as well as explicit parts (e.g. Ray 2009), its conditioning through existing structures and power relations (e.g. Jasanoff 2004a; cf. Foucault 1991), and its position as an object of political contestation in its own right (e.g. Hulme 2009; Wynne 1996a). In the co-productionist idiom it is emphasised that knowledge does not emerge independently from isolated organisational processes, but rather is produced alongside organisational, material and embodied elements, and is inseparable from ways of being in and governing the world (Jasanoff 2004a).

With regards to the management, movement and storage of knowledge, approaches inspired by Actor-Network Theory (ANT) have been particularly instructive. Latour (1990) has described 'practices of inscription', which could be equated with the production of explicit knowledge, such as the creation of visualisations or numerical results from laboratory experiments. The resultant inscriptions are attempts to synthesise and make universal the situated knowledge which has been produced, and if successful, Latour argues, they become 'immutable mobiles', able to unproblematically travel to and have meaning in different contexts, within or outside a given organisational network (ibid.). However, other work in STS suggests that such mobiles (or travelling knowledge) will be highly mutable and open to contrasting responses and interpretations in different domains (e.g. Guston 1999), nation-states (e.g. Jasanoff 2005a) and ethno-epistemic assemblages (e.g. Irwin & Michael 2003). Precisely because knowledge is produced and located within and through situated practices it rarely straightforwardly travels, but rather is constantly translated and transformed (e.g. Livingstone 2003; Star & Griesemer 1989).

Processes of classification and standardisation, a central concern of much work in STS, are strongly related to processes of both organising and learning, and therefore important to an understanding of organisational learning. The work of classification and the continual renegotiation of categories for understanding the world and organisational problems are central to organisational practices and change, and to the management and movement of knowledge through organisational structures (e.g. Bowker & Star 1999; Desrosières 1991; Douglas 1986; Epstein 2007; Hacking 1995; Jasanoff 2011b). Similarly the creation of standards is an attempt to make sense of messy organisational realities through the creation of often apparently trivial rules, benchmarks and ways of doing things, which might nonetheless have important ramifications for the conduct of everyday tasks (Star & Lampland 2009). Classificatory systems and standards change and are renegotiated sometimes as a result of external developments which transcend or challenge existing classifications, such as advances in biological sciences which raise new legal questions about what can be categorised as human (Jasanoff 2011b). Change and reordering might also be the result of internal renegotiations in response to perceived organisational failures or new visions of organisational aims (e.g. Power 1997). Organisational categorisations and modes of classifying (and therefore managing) knowledge might also be influenced by the existence of boundary objects (Star & Griesemer 1989) or standardised packages (Fujimura 1992; Guston 2001), which, not unlike Latour's immutable mobiles are objects or ideas which do important work within different domains through divergent interpretations of their meaning. Boundary objects can therefore foster productive discussions and mediated exchanges of knowledge between different domains or organisational structures, and in some cases when they become standardised packages have the effect of changing key assumptions and understandings and even modes of classifying knowledges in multiple domains.

Story-telling and narratives within organisations offer an alternative way of understanding the storage, transmission and translation of organisational knowledges. In keeping with the relational and organic vision of organisational structures developed in section 2.3 organisational story-telling has been described as a way of capturing the fluid and often fleeting way in which knowledge travels through organisations (Brown et al. 2005). Story-telling or the development of

collective organisational narratives may also be generative of knowledge (e.g. Cook & Brown 1999; Garud et al. 2011), and form a way in which such organisational knowledge can be stored, accessed and transmitted (Linde 2009). Stories or narratives themselves may function like Latour's mobiles, persuasive and flat representations of the knowledge generated by a particular organisational event or process which can travel into other contexts. However, as they are mostly transmitted verbally and rest on highly contextualised or even embodied understandings and assumptions, and therefore contain arguably more interpretive flexibility, stories will be mutable to an even greater extent (cf. Miller 2004). An approach focussed on narrative can also help to capture the multi-vocality of learning, showing the presence of multiple, often competing narratives and ways of explaining or connecting certain chains of events, both organising and making sense of organisational knowledges (cf. Weick 1995). Maarten Hajer's concept of storylines (cf. Hajer 1993) has been used, for example, by Lovell et al (2009) to describe the coexistence of different narratives (different ways of interpreting and ordering organisational knowledges) around energy and climate change in the UK government and to examine the tensions which emerged when some of these narratives began to be translated into policy actions.

Concepts from the policy learning and urban learning literatures also have relevance to understandings of organisational learning, concerning as they do relationships between knowledge and material action, and the role played by certain organisational or organising structures. Mirroring some of the conversations in the STS literature, much work has attempted to describe processes of policy or knowledge transfer, to understand its components and explain why some attempts at translation are more successful than others (e.g. Dunlop 2009; Owens 2010; Owens 2011). For example, Kingdon (2003) describes the occasional emergence of policy windows allowing policy change to happen as the result of alignment between problems, policies and politics. Owens (2005) evokes a much messier picture of the processes by which knowledge influences policy making (or through which the production and organisation of knowledge leads to organisational changes), suggesting a more dialectic relationship between knowledge and power where knowledge is neither central nor irrelevant. She proposes that the potential for influence and learning is highly context-specific and dependent on a complex range

of factors which are hard to predict, also operating at different temporal scales from short term problem-shooting to long term change in cultural expectations (ibid.).

Another central concept used in the policy learning literature is the idea of a community of practice (Lave & Wenger 1991), which describes the often tacit and practice-based nature of learning in particular contexts, and helps to explain how certain ideas and assumptions can come to be shared amongst a particular community around an organisational network or organisational space (e.g. Amin & Roberts 2008). Along similar lines the urban geographer McFarlane (2011a) develops the idea of learning assemblages, which also highlights the spatial and material elements of learning. McFarlane's assemblages have not only the potential to include multiple actors and spaces in their learning processes, but also political and ideological elements. McFarlane's model of the city as a 'machine for learning' (McFarlane 2011b) is relational, like the model of the organisation described in section 2.3, and draws on elements of the STS literature among others to describe learning as a process of translation, co-ordination or ordering, and shifting not only knowledge but ways of seeing and being (McFarlane 2011a).

The storage and accessing of knowledge within organisations is often referred to as organisational or institutional memory and can take many different forms. On the most basic level organisational memory can be stored and accessed through inscriptions in the form of documents containing, for example, project outputs and lessons learned. The memories of individuals within an organisation are also a component of this broader memory (e.g. Gherardi 2009; Argote & Miron-Spektor 2011), and can be accessed through more informal discussions, anecdote and the travelling of certain narratives. Organisational routines and practices are a further locus of organisational memory (e.g. Levitt & March 1988; Schatzki 2006), incrementally incorporating new knowledge, skills, assumptions and problem definitions, and being constantly re-accessed through their repetition. A final and arguably more generative form of organisational memory is the organisational narratives and stories discussed above (e.g. Garud et al. 2011; Linde 2009), which simultaneously store and transmit past knowledge and assumptions. Organisational memory in all of these different forms is never a fixed object, but rather is mediated through the ways it is stored and accessed, and will be also be constantly reworked

for different purposes in the present (cf. Linde 2009: chapter 1). Furthermore, in a challenge to the linear temporality often imagined in accounts of organisational learning, Schatzki (2006) describes the co-occurrence of organisational pasts, presents and futures through the way memories and imaginaries of the future are co-constructed in actions in the present. Similarly, Cook and Wagenaar (2011) see organisational memory not as something from the past, but something called into being in the present when organisational actors draw upon it.

Learning processes are shaped both by memories and by imaginaries or visions of the future. Such imaginaries provide a sense of direction for learning processes, but not one which is fixed and absolute as imaginaries are also open-ended and mutable, changing as a result of external events and learning processes. Jasanoff and Kim (2009) define socio-technical imaginaries as collectively imagined forms of social life and order, usually operating at the state level, which are reflected in the design and fulfilment of scientific and technological projects. Taylor's (2002) definition of social imaginaries is broader and could potentially apply to multiple scales, describing them as the ways in which people imagine their social existence, incorporating relationships to others, normative expectations and other elements. Thus imaginaries at the level of the organisational network or the organisational space could be described as being co-produced with other elements, such as identities (e.g. Horst 2007), working understandings of and approaches to the task in hand (e.g. Davies 2010; Ellis & Waterton 2005), and interpretations of organisational memory (cf. Linde 2009; Schatzki 2006).

While ignorance and non-knowledge are often viewed as the direct opposite of learning, an emerging body of literature argues rather that ignorance is an essential and intrinsic part of processes producing and organising knowledge (e.g. McGoey 2012; Smithson 2008; Beck 2009). If the production, ordering and application of knowledge are highly situated processes, shaped by existing power relations as well as surprise events (as argued above), the so-called agnotology literature argues that this is also the case for the production, ordering and application of ignorance, uncertainty and ambiguity (e.g. Driver 2003; Gross 2010; McGoey 2012). This argument encompasses the claim that what is known will always be co-produced with what is not known, and that the act of applying the label of ignorance to a phenomenon or group simultaneously represents a claim to knowledge (Smithson

2008). A second element of this emerging sociology of ignorance is the proposition that non-knowledge is a normal, expected outcome of organisational processes, which for example produce an increasingly specialised workforce ignorant of skills and activities in other parts of the organisational structure (Smithson 2008), highlight uncertainties or ambiguities in knowledge claims produced (Gross 2010a), create ambiguities where organisational systems of ordering or categorisation fail to sufficiently take account of the realities they attempt to map (e.g Bowker & Star 1999; Best 2012) or even require ignorance in certain instances, such as to aid unbiased decision-making (McGoey 2012). A third element of this literature highlights cases in which ignorance, ambiguity and uncertainty are strategically used or even magnified for certain organisational purposes, such as the avoidance of blame or controversy (e.g. Davies & McGoey 2012; Rappert 2012), to silence competing or contradictory accounts (e.g. Driver 2003), to avoid engaging with uncomfortable or inconvenient knowledges (e.g. Rayner 2012; Heimer 2012), or to aid the fulfilment of particular individual or group aims (e.g. Mitchell 2011: chapter 2).

2.5 Reflexivity and experimentation in organisations and democracy

[*Parts of this section develop ideas which were originally expressed in a recently published review paper* (Pallett & Chilvers 2014)]

Calls for greater institutional reflexivity have both stimulated and followed the institutionalisation of deliberative modes of public participation in science policy organisations. It was initially hoped that the inclusion of a greater number and diversity of voices in debates around science policy would itself promote institutional reflexivity (e.g. Wynne 1993; Schot & Rip 1997). The institutionalisation of deliberative modes of public participation has not only failed to instil institutional reflexivity, but has arguably also fallen victim to this lack of reflexivity. For example, as Brian Wynne argues prominent science policy organisations have consistently and unreflexively failed to let go of their entrenched assumptions about the nature of the public and public views on science policy issues, leading to what he describes as the continual reinvention of the deficit model (Wynne 2006). This has arguably

limited the potential for public participation processes to have a genuine influence on policy processes and organisational practices.

Within geography and STS there has been much debate over the precise definition of reflexivity and its implications for research and practice. A common approach to epistemic reflexivity in the social sciences has been to focus on the role and identity of the researcher, and to emphasize the need to pay attention to one's own position and assumptions (e.g. England 1994; Law 2004; Maxey 1999). In STS this perspective has developed into an argument for the recursive re-application of STS standards and modes of study to assess the epistemic, practical and moral dimensions of STS work itself (e.g. Hamlin 1992; Lynch & Cole 2005). Wynne has criticised this approach in the STS literature for being inward-looking and self-indulgent, advocating a more demanding conception of reflexivity defined as "systematic processes of exploration of the prior commitments framing knowledge" (Wynne 1993: 321). Reflexivity is therefore concerned with understanding the limitations of knowledge (Wynne 1992) and involves recognising the complex historical construction of knowledge and the interaction between scientific objects and society (Wynne 2005). Similar debates have also played out in the reflexive modernisation literature concerning the definition of ontological reflexivity. 'Reflexive modernisation' was understood by some to refer to the recursion of processes of modernity back onto itself (e.g Beck 1994). Smith and Stirling (Smith & Stirling 2007; Stirling 2006) responded by arguing for the need to promote diversity of outcomes as well as inputs into decision-making processes, recognising the multitude of possible future worlds and pathways.

The arguments of Smith, Stirling and Wynne point away from a singular state or definition of reflexivity or the potential to create a model of the reflexive organisation, instead suggesting a broader set of characteristics or dispositions which might help academics identify *reflexiveness* or reflexive processes. Related to science policy organisations like Sciencewise, such tropes could include capacities to: address and express uncertainty and ambiguity; respond to public reason and discourse from diverse sources; attend to unexpected events or organisational failures; promote reflection on organisational assumptions; or connect organisational actors and practices to broader external processes. In the context of the conceptualisation of organisations and organisational change developed in

sections 2.3 and 2.4, it could be argued therefore that most science policy organisations are always already reflexive, as they are in a constant state of interacting with and responding to alternative practices, bodies and understandings. However, Stirling has argued that a truly reflexive system of governance requires intentionality and awareness that all bases for action are contingent and constructed, in part on the very commitments to the interventions which they inform (Stirling 2006: 230).

One possible reason for the lack of reflexivity in the way that public participation and related innovations such as upstream public engagement have been institutionalised is the seemingly inherent contradiction between processes of institutionalisation and processes which promote reflexivity. For example, Mary Douglas (1986) describes the creation of institutions as a gradual hardening and stabilisation of certain patterns, performing the function of controlling uncertainty, disorder and confusion. Furthermore, she argues that the most successful institutions often deliberately obfuscate the manner of their making, appearing natural and being taken for granted rather than being exposed to critique and questioning (ibid.). In contrast, accounts of reflexivity describe it variously as necessarily destabilising (Lash 2003) and inherently pluralist (Bastrup-Birk & Wildemeersch 2011; Smith & Stirling 2007) on an ontological level, and requiring subjects to be self-aware about the conditioning effects they enact on objects and their forms of knowledge-making and assumptions (Stirling 2006; Wynne 1993; Braun & Kropp 2010) on an epistemic level.

However, the relational model of organisations and organisational networks developed in section 2.3 suggests that there might not be as much distance between processes of reflexivity and institutionalisation as is often assumed. For example, apparently stable organisational structures and routines are viewed as the contingent products of certain organisational arrangements and repeated actions, and thus are potentially open to alteration through external events or surprises, mistakes in repeated action or even organisational reflection on the bases of certain assumptions and embedded ways of doing things. Furthermore, the suggestion that all organisations or organisational networks consist of often highly differentiated organisational spaces, also opens up the possibility that some organisational spaces, even in the context of a highly rigid and institutionalised organisation, may have the

capacities to support more reflexive processes such as reflection on embedded assumptions or being open about uncertainty and ambiguity.

This section is moving towards an account of reflexivity which has much in common with recent, more radical conceptualisations of experimentation, in particular the work of Matthias Gross (e.g. Gross 2005; Gross & Krohn 2005; Gross 2010) and the notion of 'collective experimentation' described by STS scholars in the European Commission report 'Taking the European Knowledge Society Seriously' (Felt & Wynne 2007). Both approaches echo the pragmatist philosophy (and democratic theory) of John Dewey where he argues that politics itself is made up of attempts to control, or be responsible for, the indirect consequences of collective behaviour (Dewey 1927). This work has strong resonances with emerging perspectives on the geographies of experimentation (e.g. Davies 2010; Last 2012; Kullman 2013; Powell & Vasudevan 2007) and accounts of the unboundedness and indeterminate nature of 'real-world' experiments (e.g. Hinchliffe et al. 2013; Hinchliffe et al. 2005; Lorimer & Driessen 2014; Schwartz & Krohn 2011). Both strands of work are informed by the history and philosophy of experimentation, and seek to productively challenge dualisms plaguing science policy making: nature/culture, material/conceptual, science/society. With much in common with the understanding of reflexiveness and reflexive process outlined above, this perspective on experimentation evokes a picture of a multiplicity of open-ended experiments playing out at multiple scales within a democratic regime, with varying degrees of intentionality by the actors involved.

The development of understandings of experimentation throughout this thesis is intended to complement both understandings of democracy and understandings of learning. In terms of democracy or democratic practice, Dewey (1927) argues that even the formation of the state is an experimental process, consisting of trials and accidents around new rules and organisations. Publics come into being and become organised in response to new policy problems which are made up of these unforeseen indirect consequences, leading to new political institutions and forms of organisation. Crucially, the experiment must constantly be retried as the state is continually discovered anew as novel challenges and publics arise. Similarly, in the European Commission report the authors argued for, and saw embryonic signs of, a shift from the current regime of 'the economics of techno-scientific promise'

towards a regime of 'the economics and socio-politics of collective experimentation' (Felt & Wynne 2007). Their vision of collective experimentation is characterised by the broad distribution of innovation across different actors and communities, trying out novel responses to societal challenges and learning from their repeated attempts or experiments both in innovation itself and in the governance of innovation.

Dewey (1938) also drew parallels between education and experimentation, describing learning in experimental terms as interaction between existing knowledge or education and empirical experience. Matthias Gross's account of experimentation is also primarily focussed towards describing learning processes. Gross (e.g. Gross 2010b; 2010c) argues that the proliferation of developments in science and technology in the 'knowledge society' causes ignorance and surprises to multiply, rather than be gradually reduced as is suggested by conventional models of knowledge-making. In contrast to other accounts of dealing with surprise and non-knowledge such as Ulrich Beck's (2009) however, Gross contends that the existence of sometimes irreducible ignorance and unpredictable surprises calls for an entirely new mode of policymaking, instead of operating within the current mode which relies on the relative certainty of 'the facts'. He proposes that a more productive and positive approach to these circumstances would be an experimental mode of practice which is based on constant iterative learning and is open to the possibility of surprises. Gross describes these characteristics with reference to case studies of ecological restoration in Europe, but his account has strong resonances with, for example, work on socio-technical and strategic experiments in climate governance at the sub-national level (Bulkeley & Castán Broto 2013). Thus the organisational spaces and structures discussed in 2.3 could be described as being constantly formed and reformed through experimental interventions in organisational processes and beyond the organisation's formal boundaries.

Conclusions

This chapter has described the co-productionist approach underlying this study, laying out its implications for the study of democracy, institutionalised forms of public participation, organisations, learning and reflexivity. Both democracy and organisations are understood as in-the-making, constantly practiced, redefined and

struggled over. Democracy, like public participation, then becomes an object of study in its own right, to be analysed as other STS scholars have analysed scientific knowledge claims or technologies. As such an understanding of contexts and histories of UK participation has been necessary to set the scene for the current study, and to suggest how current arrangements have come to be as they are. Organisational learning is again understood through the co-productionist lens, as a set of processes related to the production, ordering and translation of knowledge (understood broadly), non-knowledge and practices. Reflexivity is understood as an intentional process or disposition, similar to more radical understandings of continual experimentation and iteration.

A vision of organisations has been suggested which sees them as made up of different organisational spaces, co-produced with one another, external bodies, and the events or practices occurring within them. This approach will be developed in chapter 3 which lays out the four main organisational spaces studied, and considers the relationship between their characteristics and the kinds of learning processes which have occurred. The co-productionist relationship between processes of organisational learning and organisational spaces themselves will then be further developed. Chapter 4 describes in more detail the main features of and changes occurring within the Sciencewise organisational network as a whole during the period of study, exploring its knowledge making, ordering and translation processes. Chapter 5 will then re-contextualise my account of these micro and macro level organisational learning processes with regards to the institutionalisation of public participation and broader UK government developments, as introduced in section 2.2. Chapter 6 develops some of the broader themes introduced in this chapter, including reflexivity and experimentation, following a synthesis of insights on organisational learning processes from earlier chapters.

3

Spaces of situated learning: managing communities, horizons and policy agendas

Learning is a rich, complex and highly situated process. Generalised and decontextualized accounts of learning therefore offer at best a partial depiction of events. Learning processes are also contingent and often multi-vocal or multidirectional, meaning that a detailed description is necessary to capture this complexity (cf. Law 2004: chapter 1). Whilst it is impossible to give a 'full' or 'neutral' account of organisational learning processes in this chapter, close attention paid to detail and context helps to convey their richness, and at least somewhat reveals the complex of personal perspectives, ethnographic moments and collated data points which has produced each (partial) narrative. Organisational learning within Sciencewise cannot be understood simply on the basis of taken for granted organisation-wide narratives of change and learning; rather this chapter's attention to specificity attempts to unsettle such narratives, and through attention to particular neglected or uncommon specificities the chapter aims to tell new stories about Sciencewise's organisational learning.

Taking the place of a conventional methodology chapter, this chapter sketches out several situated and detailed accounts or stories (cf. Lorimer 2003) of learning in and around the Sciencewise organisational network, whilst avoiding the inducement to produce a singular grand narrative. Addressing research questions 1 and 2 – **'*What did Sciencewise actors learn from and about public participation in science policymaking in 2013?*'** and **'*Did different kinds of learning occur in different kinds of organisational spaces?*'** – these stories offer an introduction to

the four organisational spaces initially selected for close study and describe what happened in and around them during the period of research. The co-productionist approach taken in this study emphasises the importance of understanding the settings and material elements of learning processes, as well as the processes themselves. The specific context of each narrative of learning is considered not just to be a substantial influence on the character and outcomes of learning processes, but rather a fundamental constitutive element of learning processes. Furthermore learning processes, such as the development of new ideas and skills, the overturning of old assumptions, changing orderings of organisational knowledge or the development of new organisational routines, in turn influence and change their contexts, meaning that it is a reciprocal or co-productive relationship.

During the design and scoping stages of this research four organisational spaces within the Sciencewise network were selected for close empirical study. These spaces are:

1. the formal management space(s) of Sciencewise (section 3.1)
2. a Sciencewise-funded horizon scanning exercise including both expert elicitation and public dialogue (section 3.2)
3. a set of policy seminars run under the heading 'Future directions for scientific advice in Whitehall' which Sciencewise co-organised (section 3.3)
4. a new attempt by Sciencewise to create a 'Community of practice' for civil servants interested in public engagement and participation (section 3.4)

Guiding this selection was the aim of finding spaces with as great as possible diversity in characteristics, such as their level of novelty or longevity, how institutionalised and routinized they were, how highly planned or responsive the spaces were, and how apparently central or peripheral the spaces were to Sciencewise's daily work. The spaces were also selected to facilitate coverage of Sciencewise's main activities, including management procedures, public dialogue projects, advocacy work, networking and capacity building.

The approach of studying an organisation or organisational network through detailed empirical investigation of four different organisational spaces has much in common what has been referred to as multi-sited ethnography (Marcus 2007), a methodological approach increasingly drawn upon by STS scholars as they move

out of the laboratory to study the more diverse locations of science and science policy (Ellis & Waterton 2005; Gehrke 2013; Hess 2001; cf. Laurent 2011b; Scott & Du Plessis 2008; Thompson 2004). In the anthropological frame, multi-sited ethnography has been suggested as an alternative to conventional approaches to ethnography that require deep and long immersion in one space, in order to develop an understanding of the multiple and often contradictory processes feeding into and influencing any given organisation, group or situation and even constituting the spaces themselves (Marcus 2007). In their usage in STS scholarship multi-sited ethnography methods have typically been justified more pragmatically as a way to gain understanding of processes that are themselves multi-sited (e.g. Thompson 2004; Hinchliffe et al. 2013), and also to give the researcher rich and varied data in circumstances where a more conventional ethnography might not be possible or permitted.

In the case of Sciencewise the organisational network has no one physical location, with the staff spread between a number of different sites and organisations, including a sizeable proportion that are self-employed, and there is no Sciencewise staff member who works full time for Sciencewise. Thus a more conventional approach to organisational ethnography was not possible in this case, and would also have been frequently interrupted and curtailed by considerations of commercial confidentiality. On a conceptual level the multi-sited ethnography approach is justified in the light of the arguments made in Chapter 2 that there is no one organisational context or narrative to understand, rather Sciencewise should be understood through its multiple activities and multiple relationships with other organisations and groups, sometimes outside of the formal organisational structure. This could also be described as a 'flexible' research design (Robson 2002), as the definition and boundaries of each of the spaces were allowed to develop during the course of my research in response to data collection and my interactions with the spaces. Furthermore, I was also able to follow the emergence of new and unexpected organisational spaces and initiatives through interviews, documents, and in some cases, participant observation.

Another feature of multi-sited ethnography methods is that ethnographic understanding of the organisation is not assumed to only be a result of participant observation, but can also be gained through the use of other methods such as semi-

structured interviews and document analysis (Marcus 2007). Thus all of the organisational spaces studied around Sciencewise were explored through a combination of these methods. Participant observation was adopted when possible and permitted by Sciencewise actors, and was then followed up and enriched through semi-structured interviews with actors associated with each space, attempting to get good coverage of different kinds of roles within and around Sciencewise. In total 27 people were interviewed, some with relevance to and involvement in one or more of the organisational spaces studied. Through participant observation and interviews I came into contact with virtually every member of Sciencewise staff during the period of research.

Document collection and analysis, including official documents, internal documents, preparatory materials for events and online materials such as blog posts, were also used to supplement understanding of the spaces under study and to follow how certain ideas travelled and were refined. Documents were found through the websites of the organisations involved, including Sciencewise's own website, through their relationship to particular events studied, and through the use of less formal online methods, including following the main Sciencewise actors on Twitter and Linkedin and through following the Twitter hashtags for particular events. These online materials themselves also served as objects for analysis. Interviews, participant observation and document collection were used to develop a picture of learning processes and changes occurring in the four organisational spaces studied, but also to explore connections between these spaces and how they were influenced by other events and spaces not under study, as will be discussed in subsequent chapters.

In-keeping with the interpretivist and constructivist stance of work carried out in the co-productionist idiom, all of the data collected through the methods outlined above was analysed inductively using the qualitative data analysis software ATLAS.ti (cf. Bryman 2008). This inductive qualitative analysis was structured through the four organisational spaces and by several sensitising concepts (Blumer 1986), including learning, reflection and reflexivity. Beyond these loose structuring devices the coding of the data was iterative and inductive, responding to new patterns and issues emerging from the documents, such as the civil service reform agenda discussed in chapter 5, and creating sub-codes within the sensitising concepts. My

field notes and documents are listed in appendix I and referred to by number in the text. The interpretive coding of my data has driven the analysis in chapters 3-5, which I present where possible with supporting data from my field notes, interviews and document analysis. In order to protect the identity of my interview respondents as well as the status of a number of high-stakes processes which were underway during the period of research, my interview respondents are not listed or numbered. I have judged that it is not possible to provide an indicative list of interviewees, even by category, due to the level of cross-over between the different categories and because of the small number of people involved in the processes studied. Rather, where interview quotes appear the speaker will be identified in a way that is relevant to the themes and processes under discussion but is judged not to fully disclose their identity, for example as a Sciencewise management actor or a non-Sciencewise actor. This means that the same interview respondent may be identified differently at different points in the text.

This chapter will describe the characteristics of the four main organisational spaces studied, and give a sense of the main changes or learning processes observed within them during the period of research. The final section of the chapter will consider the ways in which these accounts show the situatedness of learning processes, and will explore whether and how the different characteristics of each space have influenced learning. The conclusion to the chapter returns to more methodological considerations, discussing my own role within the organisational spaces studied in the context of broader debates about 'engaged' research and the role of social science.

3.1 Spaces of management

At the time of study the Sciencewise management structure consisted of a number of oversight, decision-making and activity groups, involving employees of the three organisations running the programme – the private consultancy Ricardo-AEA, the 'think and do tank' Involve and the British Science Association (BSA) – as well as civil servants from the Department for Business Innovation and Skills (BIS), self-employed specialists, and a collection of individuals considered to be external to Sciencewise who made up the steering and citizen groups (see table 3.1, for the members and function of each management grouping). The programme board was

the ultimate decision-making body within Sciencewise, signing off on projects and funding and making strategic decisions. Meetings of the programme management team would always be held a week before the programme board meetings so that recommendations and issues for attention could be passed immediately through to the programme board. The programme board also responded to and fed information to the two oversight groups, the steering group and the newly created citizen group. The programme management team reviewed the progress of and gave instructions to the different activity groups within Sciencewise, including the communications team, the dialogue and engagement specialists (DES's), and advocacy work. Members of the programme management team also collectively reviewed their own work and progress and decided on monthly targets for individual work, for example the management of Sciencewise dialogue projects (James Tweed), Sciencewise evaluations (Diane Warburton) or Social Intelligence work (Sue Hordijenko/Monica Lobo).

Participant observation was possible at one of the meetings of the dialogue and engagement specialists (15th October 2013, field note 9), one citizen group meeting and one steering group meeting (both 24th October 2013, field notes 11 and 12), and the annual Sciencewise staff team day (17th December 2013, field note 15). The programme board and programme management team meetings were seen as too commercially sensitive for me to be allowed access; however eight Sciencewise actors involved in the direct management of the programme were interviewed and were asked specifically about the management structures and the relationships between different management groups. The majority of the other interviews carried out during the period of research also included some references to and reflections on the management structure. Documents related to the management structure mainly came from the Sciencewise website, which gives detailed description of the management and governance bodies as well as containing an archive of steering group meeting agendas, minutes and supporting materials since July 2012.

Group	Function	Members	Meetings
Steering group	Oversight, strategic advice & networking	16 academics, civil servants and business people with interests in public engagement, Joanne Hodges and Karen Folkes (***BIS*** civil servants), some members of the programme board & management team	Quarterly
Citizen group	Oversight, citizen input to governance structure	6 former public dialogue participants	Quarterly
Programme board	Ultimate decision-making body, in charge of budgets and strategic direction	Karen Folkes (***BIS*** civil servant & contract holder for Sciencewise), Alan Mercer (Sciencewise programme director, ***Ricardo-AEA***), Simon Burall (Sciencewise head of dialogue, ***Involve***), Sir Roland Jackson (executive chair of Sciencewise, formerly ***BSA***)	Monthly
Programme management team	Putting into practice the recommendations of the programme board, organising and carrying out core Sciencewise activities	Alan Mercer (representing the programme board), James Tweed (Sciencewise projects manager, ***Ricardo-AEA***), Beth Chesny-Evans (Sciencewise knowledge-sharing manager, ***Ricardo-AEA***), Edward Andersson (Sciencewise dialogue manager, ***Involve***), Diane Warburton (Sciencewise evaluation manager, ***independent***), Sue Hordijenko (Social intelligence manager, ***BSA*** – replaced by Monica Lobo, September 2013)	Monthly
Dialogue and Engagement Specialists	Stimulating and overseeing Sciencewise public dialogue projects	An unfixed group of independent facilitators. Core members: Alison Crowther, Daniel Start, Suzannah Landsell, Steve Robinson, Andrew Acland, Pippa Hyam	Every 4 months
Communications team	Overseeing and carrying-out communications activities	Beth Chesny-Evans (Sciencewise knowledge-sharing manager, ***Ricardo-AEA***), Alex Humphris-Bach (***Ricardo-AEA***), Edward Andersson (***Involve***), Jo Stevens (***independent***), Nanasha-Aishetu Oyofo (website manager), Sue Hordijenko/Monica Lobo (***BSA***)	Monthly
Advocacy activities	Promoting public dialogue in and around government	Ill-defined group, including: Involve employees overseeing thought-leadership activities (e.g. Tim Hughes, Ingrid Prikken), high-level networking of Simon Burall and Roland Jackson, networking and training activities of DES's, and community of practice overseen by Edward Andersson.	Informal

Table 3.1: Sciencewise management groupings

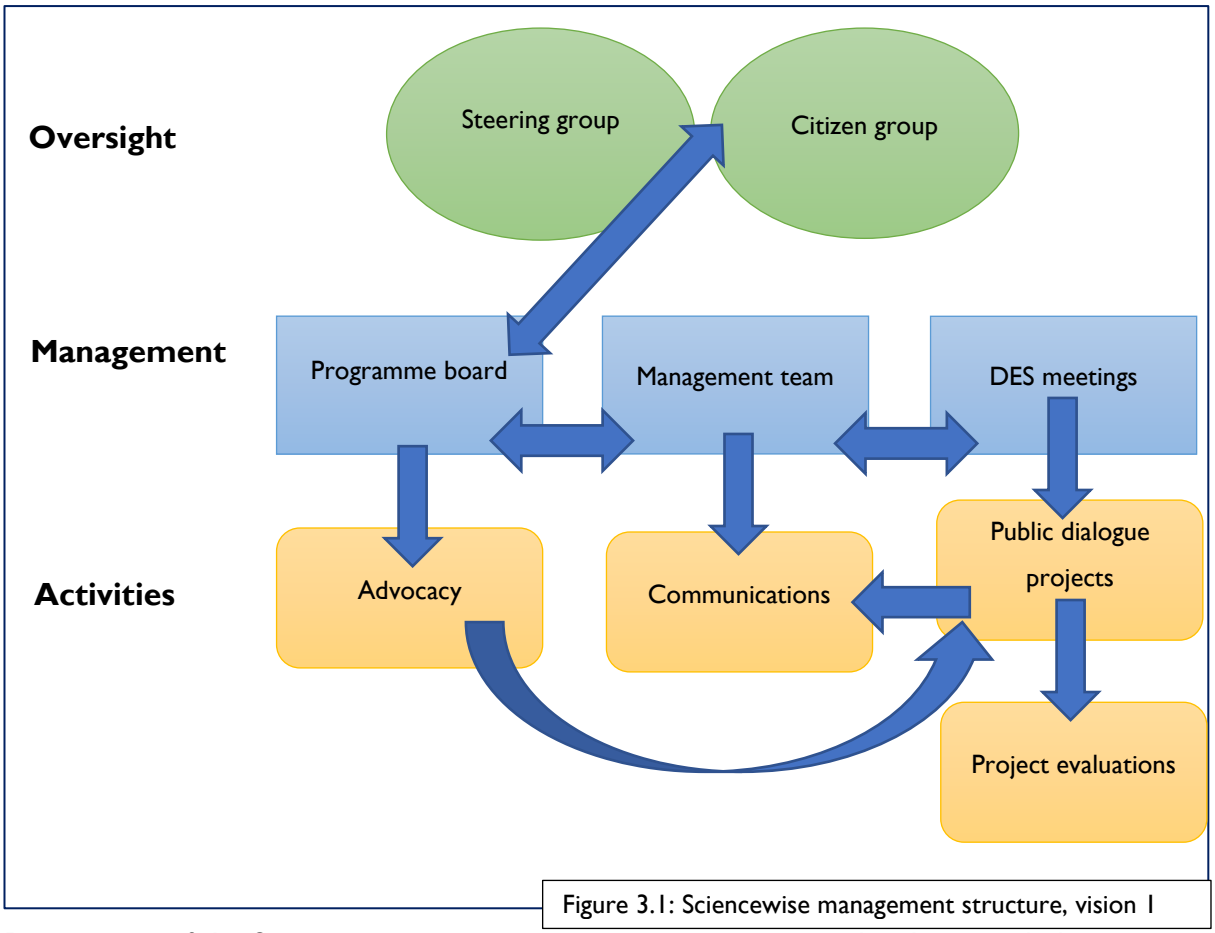

Figure 3.1: Sciencewise management structure, vision 1

Perceptions of the Sciencewise management structures, in particular the intended power relationships and knowledge flows, were a subject of contention in some of my interviews, and subtly shifted during the period of research and depending on a person's position within the management structures. Figures 3.1 and 3.2 represent the extremes of a broad spectrum of views on the Sciencewise management structure and functioning, where the blue arrows represent knowledge flows, the relative positioning of objects implies a chain of command, and the size of objects represent power differentials. Figure 3.1 illustrates the general view taken by individuals closer to the programme board and the overall running of the programme, and is also the vision closest to what was presented on the Sciencewise website at the time (documents 82 and 85). They tended to emphasise the flatness of the management structure, for example I was politely reprimanded by one actor for using the word 'hierarchy' (field note 11), and the mutual relationships of exchange between the three main groups organising Sciencewise activities. An exception to this is the diagrammatic representation of the programme's governance structure presented to the steering group members at

their first meeting following the programme's re-launch in July 2012 (document 5), which bears more resemblance to the vertical structure of figure 3.2.

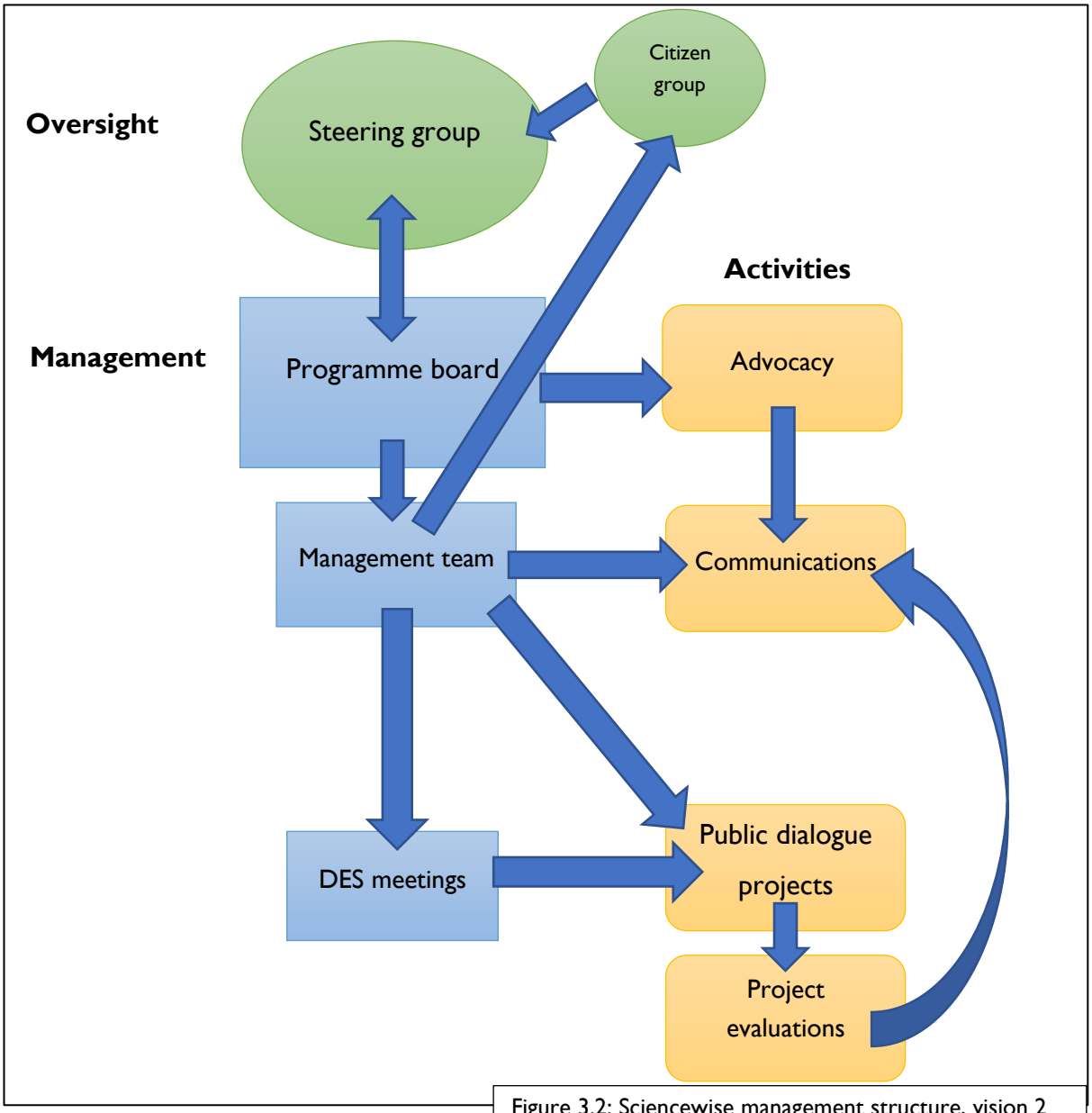

Figure 3.2: Sciencewise management structure, vision 2

Those further away from the overall management of the Sciencewise programme, as well as some core programme members, tended to describe a more vertical management structure resembling figure 3.2, for example *'in some ways it's ridiculously hierarchical for a programme of this size… so you've got… you know, the steering group which is off to one side and the citizen group which is off to one side and then you've got a sort of 3-tier thing: you've got programme board, management team, DES's… and then all of the contractors underneath that'* (Sciencewise actor). They also emphasised in particular how distant the work of the DES's was from other Sciencewise activities. For example, one non-DES said: '*there is definitely a sense that*

[…] the DES's are several steps removed from the decisions about which direction the programme goes, […] so yeah, there's definitely links where that kind of information can go missing. On the other hand I think that… a lot of the DES's, they're involvement with Sciencewise is a small… it's less than half of their time, […] so they're not kind of… it wouldn't make any sense for them to be more involved than they are, but the information needs, still needs to be available to them. I don't think we've figured that out yet'. Another Sciencewise actor said *'actually that reflection back from the DES's who are out there doing the work directly with… people in government departments or in research councils or whatever… never feeds back into the thinking of the programme board… it's just completely distant'*. Some of the DES's themselves expressed feelings of being distant from other Sciencewise actors, activities and decisions, and felt unaware of what was going on. The role played by the citizen group was also downplayed in many of these accounts, and other key relationships were also questioned, for example, several respondents expressed scepticism about whether high-level advocacy work had contributed to the initiation of any public dialogue projects.

For the majority of Sciencewise actors there were a number of persistent challenges to deal with in Sciencewise management spaces. For many, especially those whose vision of the management structures most closely resembled figure 3.2, there were some clear problems with the overall structure. For example: *'I think that the split in the way that things work between the DES's, the management team and the programme board really doesn't work… I think it's… I think it's hugely wasteful'* (Sciencewise actor). Others clearly saw the current structure as a necessary but not always effectual compromise between different interests and visions of the programme, also dictated by the need to involve members of the three partner organisations across the management structures.

The highly distributed organisation of the Sciencewise programme, between different organisations, geographical locations and activities, was consistently referred to by Sciencewise actors as a challenge to management, and to the flow and ordering of organisational knowledge: for example *'we're getting better at it… we found it a struggle at the beginning to have… with our internal team communications… you know, we're a team that's quite widely spread out'* (Sciencewise management actor). Though central Sciencewise management actors were in constant email and telephone contact with one another about operational issues and queries, many

rarely saw each other (apart from those working within the same partner organisation) outside of monthly Sciencewise meetings. Opportunities for informal interactions around these meetings were also minimal as management meetings were usually held at the relatively small Ricardo-AEA London offices, with participants often in a hurry to get back to their usual offices afterwards, and with some participants, especially the Ricardo-AEA employees based in the Harwell office joining meetings via Skype. This led to a feeling in many of the interviews and in informal discussions I witnessed that many Sciencewise staff members only had an awareness of the Sciencewise activities they were directly involved in, and that knowledge about other projects and even strategic priorities was quite vague. Again, the DES's were viewed as particularly cut off from the flow of knowledge and basic information around Sciencewise, as they met only every four months, were often based outside of London, conducted their work by holding various meetings and discussions around Whitehall, and mostly had contact only with other Sciencewise staff involved in the direct management of public dialogue projects, namely Edward Andersson and James Tweed. The dislocation of the DES's from management structures was justified at least partly as one of financial necessity; as skilled freelance consultants, it would be simply too expensive to involve the DES's in more Sciencewise meetings and activities. However, as one Sciencewise management actor put it, *'I think there are some issues about communication. And it's not… it's not about everybody talking to each other all the time, it's about… how things are decided and on what basis'*.

In an attempt to compensate for these apparent short-comings in the organisational structure, online knowledge management and contact relations management systems were instituted by Ricardo-AEA which Sciencewise actors were expected to consistently update with copies of documents they were working on and their networking activities. In practice, many Sciencewise actors reported in my interviews that they experienced technical difficulties in using the software, especially those using Apple Macs, or simply did not update the systems as often was expected. As a result, the documents which were shared were often shared instead through mass email, which did not always include every Sciencewise staff member, and details about contacts and networking were shared through word of mouth or not at all. For example: *'[w]e've got a CRM [contact relations management]*

system.. it's taken us a while to get that up and running, it's still not.. it's still not perfect. Actually capturing internal information and capturing actually external information as well… and… shepherding that into a usable form that we're getting the greatest benefit from has been a challenge' (Sciencewise management actor). Other attempts were made to create connections between different Sciencewise management and activity spaces, for example using key individuals as nodes to link between different groupings, sharing minutes from all meetings internally, and providing a buffet lunch in between the citizen group and steering group meetings to encourage people to meet and get to know each other. However, such initiatives were seen as having limited success, due to over-reliance on certain individuals, or people's lack of time and interest.

The Sciencewise management spaces underwent several important changes during the period of research. Firstly, there were a significant number of changes of personnel both during and shortly after my fieldwork, including: the replacement of Sue Hordijenko with Monica Lobo (both from the BSA), which also included some changes to the role itself to encompass work on the BSA blog as well as the 'social intelligence'[1] work; the replacement of Edward Andersson with Amy Pollard as deputy director of Involve and the Sciencewise dialogue manager; Beth Chesny-Evans' temporary withdrawal from the programme, resulting in her duties being taken on by Alex Humphris-Bach and Jo Harris (both also from Ricardo-AEA); several changes in the line-up of DES's which were often hard to follow as the DES's turning up to meetings I attended were often very different from the DES's formally listed on the Sciencewise website; and finally the recruitment of a new DES, Frazer Henderson, with expertise in digital engagement. Several Sciencewise activities underwent review during or shortly after my fieldwork resulting in further changes, including: the high-level networking and contact management system; the community of practice (discussed in section 3.4); and the citizen group.

During the period of research the Sciencewise management spaces embarked on a 'theory of change' process, culminating in the Sciencewise team day in December (field note 15). The idea of running a theory of change process was initially mentioned in the February 2013 steering group meeting during a discussion of the

[1] The social intelligence work will be described in more detail in 4.2 and 4.4.

approach to the whole-programme evaluation by a member of the steering group who felt that Sciencewise needed a more nuanced framework for understanding change and its own impact (document 31, and mentioned in several interviews). While some Sciencewise actors, including members of the steering group, mentioned in interviews and other encounters that they were sceptical about the use of such an instrumental procedure for defining programme aims and activities, the idea was enthusiastically taken up by some members of the management structure who saw it as a way of defining collective priorities for 2014, the final year of the programme contract, and even possibly setting an agenda for future iterations of the programme. The theory of change process was overseen by Diane Warburton, linked to her responsibilities for carrying out the annual programme evaluation. External practitioners were brought in to run a one-off theory of change workshop in October, involving most of the Sciencewise management team, two dialogue and engagement specialists, one member of the citizen group and two members of the steering group. The goals, objectives, activities and indicators developed in this workshop were then discussed in the subsequent meetings of the dialogue engagement specialists, the citizen group and the steering group during October (field notes 9, 11 and 12), and were then amended to include these additional perspectives. In the December team meeting (field note 15) these different goals and activities were again discussed and then prioritised in a process facilitated by former Sciencewise DES Penny Walker. This resulted in some significant changes in goals and emphasis and will be discussed further in 4.3.

3.2 Scanning the horizon

The second organisational space explored in this chapter is the horizon scanning process, which emerged from early discussions around the retendering of the Sciencewise programme during 2011. The three parties who put together the successful programme proposal based on BIS's tender – Ricardo-AEA, Involve and the BSA – were also in conversation with Dr Robert Doubleday, an STS scholar who at the time was based at the Department of Geography at the University of Cambridge, who had carried out some public dialogue and thought leadership work for Sciencewise previously. According to my interview respondents these conversations focussed on what all of the parties had mutually identified as a lack of clarity and systematisation around central government horizon scanning

procedures, and therefore a potential role for Sciencewise in experimenting with and promoting new methods for horizon scanning. As one actor involved in the process put it, the idea behind the initiative was that *'you know, could there be a more systematic way to think about what all the possible […], the space of possible public dialogues and then, […] you at least need to have a view of… what's not being done as well as what's being done'*. As a result the idea of funding some sort of expert workshop for government horizon scanning, in partnership with Doubleday, was written into the initial proposal document to BIS, and then put into action when the three partners were awarded the new contract in April 2012. The horizon scanning project later developed into a three-stage process taking place during 2013 (see figure 3.3), involving an expert workshop hosted by the Centre for Science and Policy (CSaP, where Doubleday took over as executive director in September 2012), a series of public dialogue workshops carried out by Ipsos-MORI on behalf of Sciencewise, and finally a workshop hosted by the Parliamentary Office of Science and Technology at the Houses of Parliament.

Participant observation was carried out during each of the stages of the horizon scanning process, at the CSaP expert workshop (27th March 2013, field note 4), at one of the three public dialogue workshop's run by Ipsos MORI (18th May 2013, field note 6), and at the POST workshop (22nd October 2013, field note 10). Interviews were conducted with key actors involved in each stage of the process, including both Sciencewise and non-Sciencewise actors, covering: the emergence and justification of the project; how each stage of the process played out; perceived successes and weaknesses; and next steps. Preparatory materials and outputs such as reports for each stage of the process were also collected and analysed, alongside online descriptions and accounts of the events written by the different organisations involved.

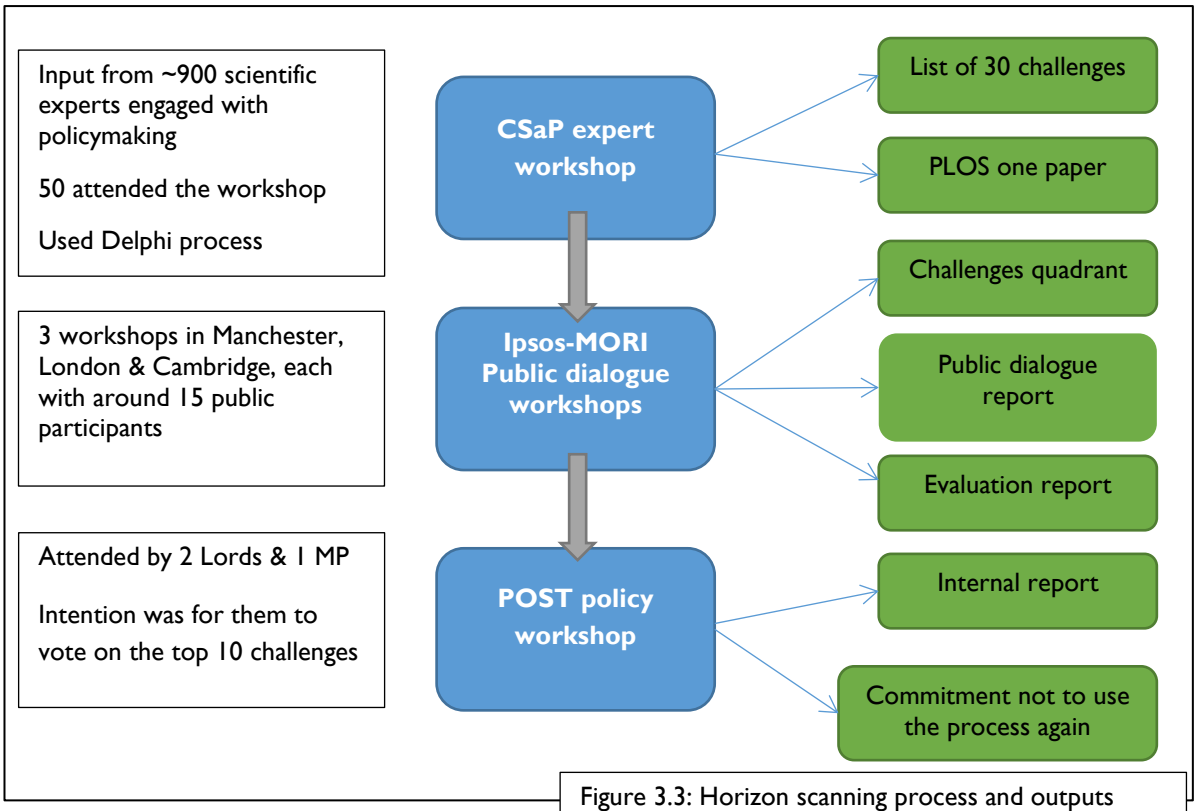

Figure 3.3: Horizon scanning process and outputs

Sciencewise had previously conducted a horizon scanning exercise in 2006-7 called Sciencehorizons (document 137), before it had been re-launched as an expert resource centre and before best practice guidance on public dialogue had been codified. The project was carried out by a consortium, headed up by the consultancy 'Dialogue by Design' run by two dialogue practitioners who have since become Sciencewise DES's. Sciencehorizons had three elements: a deliberative citizens' panel, which involved 30 citizens and invited expert speakers; facilitated public events in science centres and other community spaces; and self-managed small group discussions run by community bodies. The stimulus material was the same for all of these different elements, consisting of a set of stories looking at the potential impacts of developments in science and technology on people's lives in future. The project was wholly commissioned by Sciencewise and based on some earlier work carried out by the Government Horizon Scanning centre which was set up in 2005. Despite some of the similarities between Sciencehorizons and the 2013 horizon scanning process, including in the way both initiatives were commissioned and their links to the work of the Government Horizon Scanning centre (which was re-launched in 2013 following the civil service reform plan, document 122), all of the actors involved stressed the originality and exceptional

characteristics of the latter project. Only two of my interview respondents mentioned Sciencehorizons.

For the Sciencewise actors I interviewed this horizon scanning project had two main functions. The first was to systematically identify the *'hot topics'* (document 6) around which dialogue could be done. This would then help to indicate if there were any important science and technology policy issues that Sciencewise had not engaged with, as well as providing a potentially useful resource for other parties. During Sciencewise's previous contract, 2007-2011, it was felt that Sciencewise had worked with too narrow a range of parties, for example running several public dialogue projects with DECC, and thus the horizon scanning process was seen as a way to potentially broaden its scope. The second function of the exercise then, was to use the evidence set built up as a tool for starting conversations with hard to reach government departments and those that Sciencewise had not worked with before, potentially leading to high-profile public dialogue projects. By including a prominent public dialogue element in the horizon scanning process, Sciencewise actors hoped to also be able to demonstrate the value of public dialogue during these conversations and reinforce their own position as knowledge-brokers of public attitudes and views. It was also anticipated by many of the actors involved that the exercise could also fulfil a more straight forward advocacy and networking function, by introducing all of the participants in the CSaP and POST workshops, many of which were high profile policymakers unfamiliar with the concept of public dialogue, to Sciencewise and its work.

The CSaP workshop lasted a full day and involved around 50 policymakers and academics with expertise related to science and technology policy. I attended the workshop as a scribe and contributor. A list of around 200 emerging policy issues was identified before the workshop through interviews and email feedback from key CSaP stakeholders, including academics, industry representatives, science journalists and some civil servants. A vote on which were the most important of this list of issues was used to narrow down the list to 120 issues, which were discussed during the workshop itself, and eventually narrowed down to 30 key emerging policy issues through small group decisions and a plenary discussion at the end of the day. All of the sessions in the workshop were fast-paced requiring those involved to make quick decisions and compromises, often concerning issues falling

well outside their usual domain of work and expertise; furthermore, participants more regularly resorted to anecdotes and other narratives, than they did to more 'scientific' forms of evidence in order to justify their arguments. The workshop was strongly geared towards aiding the production of a publishable paper (eventually published in the journal PLOS one, document 138) outlining the 30 emerging policy issues chosen, with small sections written by different workshop participants.

The 30 emerging policy issues identified in the CSaP workshop were then used as the basis for a public dialogue exercise run by the market research company Ipsos-MORI, involving three six hour long public dialogue events in London, Manchester and Cambridge. I was present at the Cambridge workshop as an observer, alongside the evaluator of the process Richard Watermeyer and the Sciencewise projects manager James Tweed. The PLOS one paper was used to produce the stimulus materials and the participants' discussions were also structured around the same seven broad policy areas used in the CSaP workshop and paper. A short part of each workshop invited the participants to put forward their own ideas about future science and technology-related policy challenges. For the rest of the time in the public workshops, though the participant's views on the issues were openly elicited and they were encouraged to debate with one another, it was made clear by the facilitators that the information on the slides represented the expert view and there was little scope for participants to challenge their substantive content. The final part of the event involved the whole group of participants placing the issues they had chosen as most important on a large matrix which ranked them in terms of their importance as emerging policy issues, and to what extent there was a need for further public dialogue on them. This matrix ranking formed a central part of the report resulting from the public dialogue process (see figure 3.4), which some of the participants from the three events were invited to help with drafting over a three hour session in London (document 39).

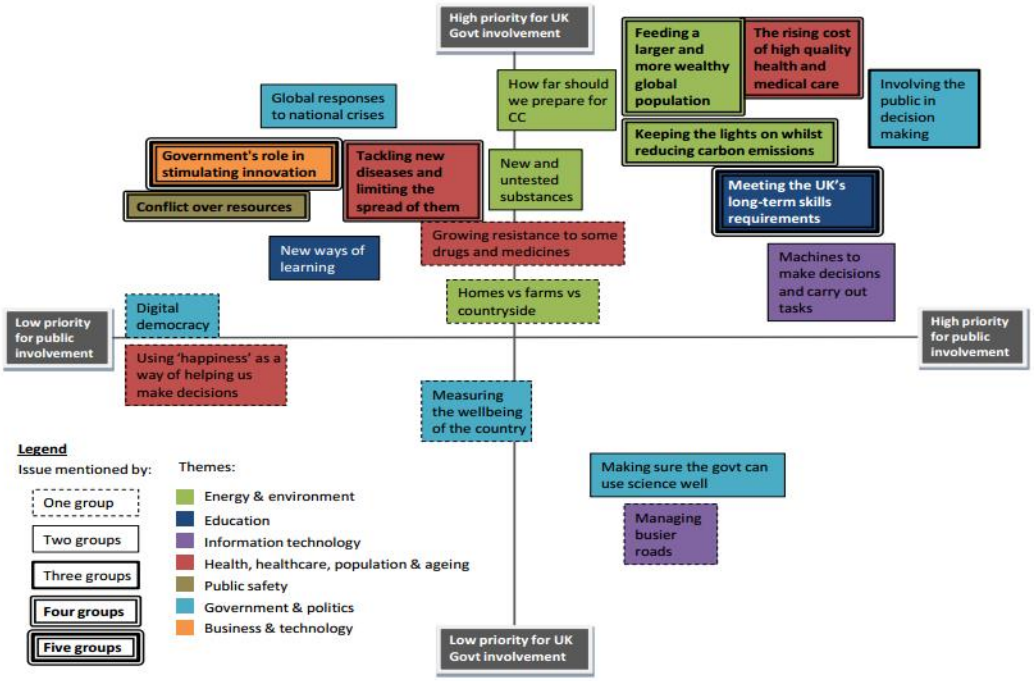

Figure 3.4: Quadrant of public views on the 30 emerging policy challenges, Ipsos MORI (document 39)

The POST horizon scanning meeting, held in a committee room in the House of Commons, lasted around one hour and had two Lords and one MP in attendance. I attended the meeting as an observer when a last-minute space became available. At the start of the session Jonny Wentworth, the deputy director of POST and a participant at the CSaP workshop, contextualised the event amidst the revival of government interest in horizon scanning exercises and presented the 30 emerging policy issues under discussion, categorising them in terms of how they fared in an initial polling of interested policymakers. Oliver Grant from the Cabinet Office laid out the government's approach to horizon scanning, citing a recent review by Jon Day which highlighted the need to get a full spectrum of inputs to horizon scanning and to run continuous horizon scanning activities. In the following discussion much attention was focussed on the quadrant of public views on the importance of the policy issues identified and their relevance to further public dialogue work. However, the bulk of the discussion focussed on the issue-ness of the issues presented. Some of the policymakers present felt that there was a lot of overlap between the issues, and that the issues were of different types meaning that they could not be easily compared; however they had not been provided with the full descriptions of each the issues from the CSaP process and paper. It was suggested that the issue of healthcare provision for an ageing population was an issue

requiring a Royal Commission, whilst it was asserted that many of the other issues were also inappropriate for a horizon scanning exercise given that they were current rather than future policy issues. Finally one of the Lords concluded that in future horizon scanning processes the selection of issues should be carried out by policymakers, rather than other experts and citizens, in order to ensure they were relevant and useable within policy processes. Following the meeting POST produced only an internal report on the horizon scanning exercise, which raised concerns about the methodology of the CSaP workshop and emphasised that POST's involvement in the whole exercise was purely experimental.

3.3 Setting policy agendas

The third organisational space studied was a set of policy seminars which Sciencewise was involved in as a partner. Like the horizon scanning project, the idea for the 'Future directions for scientific advice in Whitehall' seminars was under development during the retendering of the Sciencewise programme. These seminars were conceived by Rob Doubleday, in partnership with Professor James Wilsdon, an STS scholar now based at the Science Policy Research Unit (SPRU) at the University of Sussex who had previously been influential in science policy and public participation debates through his roles at Demos and later the Royal Society's policy unit. Wilsdon and Doubleday conceived of the seminars out of their mutual interest in how scientific advice is given and received in government (e.g. Doubleday & Wilsdon 2012), and a desire to reignite debates about the role and practice of scientific advice around government in the run-up to the inauguration of the new Government Chief Scientific Advisor Sir Mark Walport in 2013. As both Doubleday and Wilsdon had engaged with Sciencewise previously and were generally supportive of its work, Sciencewise was recruited as a partner and host for one of the seminars alongside the Institute for Government (IfG), the Alliance for Useful Evidence (run by the National Endowment for Science and the Arts, Nesta), and SPRU. Each organisation hosted a seminar between November 2012 and February 2013, followed up by the CSaP annual conference in April 2013 which shared the same name as the seminars, and where an edited collection including short contributions from academics and policymakers based on the seminars was launched (Doubleday & Wilsdon 2013, document 145). The IfG and the Alliance for

Useful Evidence had also collaborated the previous year on a seminar series entitled 'Making better policy'.

The first of the seminars, hosted by IfG and entitled 'Culture clash – bridging the divide between science and policy', occurred in November 2012, before the start of fieldwork for this project. However, a full video of the event was analysed (document 143) alongside relevant IfG documents and a record of the Twitter stream of the event created on the website Storify (document 144). Participant observation was carried out at the other three seminars, namely 'Broadening the evidence base: science and social science in social policy' hosted by the Alliance for Useful Evidence at Nesta (8th January 2013, field note 1), 'Experts, publics and open policy' hosted by Lord Krebs at the House of Lords on behalf of Sciencewise (15th January 2013, field note 2), and 'Credibility across cultures: the international politics of scientific advice' hosted by the STEPS Centre and SPRU at the University of Sussex (6th and 7th February 2013, field note 3). This was further supplemented by analysis of accompanying recordings, videos, documents and Twitter streams, as well as the relevant sections of the 'Future Directions for Scientific Advice in Whitehall' edited collection (Doubleday & Wilsdon 2013, document 145). Interviews were conducted with key Sciencewise actors who organised and attended the seminars, as well as some of the non-Sciencewise actors involved.

The IfG seminar focussed on the perceived divide between scientists and policymakers, stressing that the latter tend to have backgrounds in humanities and social sciences and with some speakers – such as *The Geek Manifesto* author Mark Henderson – suggesting that this was a direct and negative influence on the government's capacity to listen to scientific advice and evidence. Other speakers – such as the then shadow minister for Innovation and Science, Chi Onwurah – highlighted the roles and structures of science advisory bodies, and discussed the scope to include scientists in other departmental governance structures. The Alliance for Useful Evidence seminar was concerned with the use of social science in policymaking, and much of the conversation focussed on calls for more social scientists to be conversant with large-scale quantitative and quasi-experimental methods, which were perceived to be of most use to government. The general feeling from the panel and the audience, both dominated by those in the policy sphere, was that much of academic social science was irrelevant to the concerns of

government and that academics needed to get better at providing the required evidence in the right forms and at the right point in the policy process.

The STEPS Centre and SPRU seminar was the only seminar of the series to explicitly include perspectives from academics studying the relationship between science and policy, including a number of prominent STS scholars and geographers, alongside perspectives from policymakers and natural scientists, as had been involved in the previous seminars. There was an attempt as part of this seminar to stimulate dialogue between these different groups, for example bringing Professor Mike Hulme into conversation with Miles Parker, then director of science at DEFRA. However, some talks from science policy professionals, such as the keynote lecture from Professor Anne Glover, the Chief Scientific Advisor to the European Commission, actively but apparently unknowingly contradicted many of the arguments made by the social scientists, highlighting the challenge of making such conversations productive.

The Sciencewise seminar was therefore the only one in the series to explicitly discuss the role of citizens in policymaking, although there were several conversations about citizen engagement during the STEPS Centre and SPRU seminar. The speakers were: Gemma Harper, chief social researcher for DEFRA; Roland Jackson from Sciencewise; and Lord Krebs, former chairman of the Food Standards Authority (later known as the Food Standards Agency). The event was chaired by the STS scholar Jack Stilgoe, a member of the Sciencewise steering group, who had formerly worked with James Wilsdon at Demos and at the Royal Society. Roland Jackson (the Sciencewise chair), representing Sciencewise, used his talk to link public dialogue to the prominent policy idea of open policymaking, explaining how he saw the two as complementary concepts, and arguing that policy could only be truly open if it involved dialogue with citizens. Gemma Harper and Lord Krebs struck a much more sceptical tone about public engagement and participation, with Harper highlighting what she saw as problems with assessing the 'anecdotal evidence' produced by public dialogue projects, alongside other forms of quantifiable evidence. Lord Krebs talked through the example of the 'GM Nation?' public dialogue in 2004 which he saw as emblematic of the potential pitfalls and dangers of inviting public participation. Audience discussion was once again lively, with many public participation practitioners and academics represented, but I got

the impression from the policy representatives at the seminar that little had changed in their attitudes towards public participation since the creation of Sciencewise in 2004.

A number of publications were produced in the direct aftermath of the seminar series, developing or restating some of its key themes. Doubleday and Wilsdon's edited collection included contributions from some of the seminar speakers, including Geoff Mulgan, Alice Bell, Miles Parker and Mike Hulme, but also brought some further high profile voices into the conversation, including Sir John Beddington – the outgoing Government Chief Scientific Adviser – and the STS scholar Professor Sheila Jasanoff. Many of the pieces from the collection were also trailed in the week leading up to the launch in mini pieces on the Guardian Political Science blog, run by Jack Stilgoe and James Wilsdon along with other colleagues. In their contribution to the collection (document 102; also posted on the Guardian blog, document 140) Simon Burall (Sciencewise head of dialogue, and director of Involve), Tim Hughes (Involve researcher) and Jack Stilgoe further developed the argument Roland Jackson had made in the Sciencewise seminar (after Jackson himself had published his notes from the talk on the Sciencewise blog, document 141), restating earlier justifications for public dialogue but with the language of open policy, and suggesting that open policy required open collaboration and engagement with citizens, as well as a spirit of open-mindedness about outcomes. This piece was also reprinted as a Sciencewise thought leadership report (document 102), promoted through the Sciencewise website, and launched as part of the Civil Service Live event in July 2013. More loosely related to the seminars, the Institute for Government's director of policy, Jill Rutter – also a former civil servant – contributed a chapter to the Sciencewise anthology publication 'Mapping the New Terrain' (document 100) on the opportunities and threats of civil service reform for public dialogue.

Although the policy seminars were largely built around an existing set of personal relationships, there is some evidence that they were also useful to Sciencewise and Sciencewise actors in helping them to develop new and productive relationships, or to build on existing ones. Alongside writing a chapter for the most recent Sciencewise anthology, Jill Rutter also gave a presentation at the first face-to-face meeting of Sciencewise's community of practice (see section 3.4). Though Rutter

had been an Involve board member since 2011, she had had no direct dealings with Sciencewise until 2013. Sciencewise were also keen to retain a relationship with Gemma Harper, by seeking her advice on policy evaluations (document 26), and also through steering group chair Professor Judith Petts' role on DEFRA's science advisory council. According to some of my interview participants following the seminars, Sciencewise actors had a number of private meetings with some of the other seminar partners on possible follow up projects, leading for example to Simon Burall writing a guest blog post for the Alliance for Useful Evidence (document 139), but at the time of writing no further projects had come to fruition.

For Sciencewise actors the programme's participation in this seminar series was part of its advocacy work, raising the profile of public dialogue and attempting to get Sciencewise involved in agenda setting and debates around evidence-based policy, science advice and civil service reform. For one Sciencewise management actor: *'that was very much about profile raising. It was very much about getting the public aspect in amongst that agenda'*. As another management actor put it, the justification was *'[t]wo-fold I suppose, one to um… you know, get our ideas into a form of policy box if you like, and secondly to be seen to be a part of that, and promote what we're doing a bit more. So raise awareness and contribute some ideas'*. Through the seminars and the subsequent publications and blog posts Sciencewise advocates attempted to position public dialogue as an importance source of evidence for good policymaking, and continually aligned the practice of public dialogue with open policymaking, sometimes drawing on specific examples of Sciencewise dialogue projects as examples of best practice in open policy. This work was followed up by private meetings involving Sciencewise actors and key policymakers, such as those in the Cabinet Office or those with interests in science advice and the use of evidence in policy, throughout 2013. In February 2014 Sciencewise co-hosted an event for civil servants on open policymaking with the open policy team from the Cabinet Office, further reinforcing their position as practitioners of open policy and potential knowledge brokers around open policy and broader citizen engagement. Sciencewise's position in the evidence-based policy debate remained much more ambiguous, in part due to the kinds of attitudes expressed during the Sciencewise seminar which were sceptical about the robustness of evidence produced by public dialogue processes, but also due to debate within Sciencewise about whether or

not public dialogue was social research. There is a more in-depth discussion of these learning processes in the context of broader Government debates in sections 5.2 and 5.3.

The Sciencewise and non-Sciencewise actors interviewed were generally positive about how the seminars had gone and the kinds of discussions they had engendered. There was less certainty, however, about what changes or new initiatives the seminars might have led to or influenced, with many pointing out that such lines of direct influence were difficult to draw. Most interview participants expressed some scepticism about the potential for a seminar series alone to achieve the necessary depth in discussions around important concepts like open policy, or to give enough time for participants to absorb alternative perspectives. Linked to the Sciencewise seminar especially, there was a feeling that much of the discussions had mostly replayed old debates around evidence and public engagement in policy and that little had substantively changed, for example one of the Sciencewise actors involved said, *'I remember thinking that that was… that was sort of business as usual in that it was the rehearsing of a discussion that we've had a lot of times before but there's… you know I think in politics you do that all the time… you have the same discussion again and hope that there are different audiences or that you're keeping agendas going or… or whatever'.* This led some to feel that the Sciencewise seminar had been the least successful, getting bogged down in debate about the appropriateness of public participation, rather than addressing more contemporary questions about the role of citizens in open policy, or the relationship between expert advice and citizen involvement, as had been laid out before the seminar. However, other interview participants felt that it was sometimes necessary to rehearse older debates, and that there was still potential for the conversations to be interpreted in different ways or take new directions.

3.4 An emerging community of practice?

The fourth organisational space studied was the Sciencewise community of practice, which was proposed by the three Sciencewise programme partners – Ricardo-AEA, Involve and the BSA – as part of their proposal document to BIS in 2011 as a key part of the Sciencewise programme's advocacy work and capacity building with policymakers. This built on the use of the community of practice concept in a

number of government department and government initiative contexts, as well the existence of a number of free to use online packages to support such communities. The original idea was for the community of practice to provide a private, easily-accessible and sustained environment for civil servants to seek advice and information about public dialogue from Sciencewise staff, and to share skills and lessons learned between themselves, without being worried about disclosing sensitive policy information. After discussions and planning within Sciencewise about the precise form the community of practice would take, the community was launched at the start of 2013 using a Yammer platform – a social networking site similar to Facebook in layout, often used in universities and other public sector organisations, which allowed for the creation of private networks where discussions could only been seen by network members.

Participant observation was carried out on the Yammer community of practice site, which I was allowed to join as a 'Sciencewise affiliated researcher', observing discussions and posts (field note 16). This affiliation to the community of practice also permitted me to attend two face-to-face community of practice meetings as a participant, held in the BIS conference centre in September and November 2013 (field notes 8 and14). During the last six months of 2013 the community of practice hosted approximately one webinar per month on topics relevant to public dialogue. Participant observation was carried out at the 'Which publics? When?' and at the 'Open data and public dialogue' webinars (field notes 7 and 13), whilst recordings and blog posts associated with the other webinars were analysed. I was also given access to some of the initial documentation around the community in the planning stages. Interviews were carried out with key members of Sciencewise staff involved in setting up and developing the community of practice, as well as several community members, and some of the webinar presenters.

As part of Sciencewise's advocacy work with civil servants the community of practice was intended as a tool to raise awareness among civil servants and give them access to information about public dialogue, as well as allowing them to ask questions of Sciencewise actors. As one Sciencewise management actor put it: *'the idea there was that Sciencewise is… in its previous model only supported people when they were doing dialogue, and actually often came in a bit too late in the day even for that, umm… So the idea is that the community of practice, much like the mentoring which is*

also a new addition, is something that we can do earlier, or at different times than we have traditionally supported people'. It was also hoped that as the community and the online space developed that civil servants would be able to learn from each other, sharing their experiences of running public engagement events or problems they were encountering in their departments. Some within Sciencewise however, felt the rationale had not been fully thought-through, or were unclear on the main purposes of the community. As one Sciencewise actor put it *'why are we doing this? What are we trying to achieve? No answers at all, nobody had any concept of what we were trying to achieve'*.

Actors employed by Involve in particular had experience of working with other online communities of practice in their other work with government and civil society organisations, so it was viewed by them as an 'off-the-shelf' tool enabling knowledge-sharing and frank discussion. It was also viewed as an appropriate tool for engaging with civil servants, who were seen as very busy and unlikely to give time to meetings or other formalised activities, and who often did not have access to more conventional social media sites when at work. However, from the inception of the community of practice Sciencewise actors explicitly referred to it as an experiment and were open to the possibility that the online space would not work. For example one steering group document reads *'[a] key question is if there is enough interest in a Community of Practice to make it self-sustaining. The only way to truly find out is to set it up and see what response we get'* (document 3). Similarly, one management actor described it as *'another experiment on behalf of Sciencewise, you know, to see whether something like that could be developed, could be worthwhile'*. This led to the decision to use Yammer as the host for the community as it was a free programme, and therefore would reduce the costs of potentially abandoning the venture.

Launched in December 2012 and officially open to government employees from March 2013 onwards, the online community of practice remained extremely quiet and underused for the whole period of research. Initial recruitment for the community was supposed to happen through the steering group and existing policy networks, but in practice mostly occurred at events like Civil Service Live, perhaps meaning that the initial community members felt less of a strong connection to the community. For most of 2013 core Sciencewise staff members (usually from the

management team) gradually built up the resources available on the site, largely drawing from the Sciencewise website but also from related sources, posting Sciencewise guidance documents and project reports, as well as giving links to relevant news stories on science policy challenges, and asking general questions to the other community members. Virtually none of the civil servants and research council staff registered on the Yammer site ever directly engaged with this material, and the only people unconnected to Sciencewise or BIS who attempted to engage as part of this online community were people who already had strong relationships with Sciencewise and Sciencewise staff. My interview respondents felt that the low levels of use of the online community were caused in part by technical barriers, with some government departments actively blocking the use of social media sites by their staff. Some also commented that it had been hard to hold the interest of civil servants for whom public dialogue is not an essential or everyday task, and some members of the community themselves described feeling a lack of connectedness to the community and online space. Sciencewise staff who were not part of the management structures, such as DES's, steering group members or BSA and Involve employees who occasionally worked on Sciencewise projects also almost never contributed to the site.

The introduction of Sciencewise webinars as part of the Community of Practice's activities in August 2013, and the start of the face-to-face meetings in September 2013 were both initially intended at least partially as a supplement to the online community, and it was hoped that they would help to boost participation in the online space. When it became clear to Sciencewise actors towards the end of 2013 that this was not the case, the face-to-face meetings and webinars became a more central part of the community of practice's activities, and the staff use of the online space was consciously scaled back towards the end of 2013 in favour of focussing on other advocacy activities. I had discussions via email and face-to-face with some of the main actors involved in maintaining this community throughout this time, keeping me updated with its changing status and use. During the period of research the community of practice hosted webinars on the topics of: current Sciencewise projects; digital engagement (linked to a thought leadership piece); Which publics? When? (linked to a thought leadership piece); energy and its storage (linked to a social intelligence piece); and the relationship between open data and public

dialogue. These webinars generally lasted 90 minutes and were held at around midday to enable civil servants to tune in at their desks during their lunch breaks. As with face-to-face seminars, questioning and discussion was quite often dominated by a few participants, with the list of people present in the webinar sometimes notably fluctuating during the 90 minute run.

The two face-to-face meetings of the community of practice were held in a small windowless room in the underground BIS conference centre, and each lasted for around 90 minutes. The first meeting centred on a talk from Jill Rutter of the Institute for Government about civil service reform and what it meant for public dialogue. After a plenary discussion on the threats, opportunities and actions related to open policy, the event moved onto what had been advertised as the 'closed' half of the session, for community of practice members only. At this point all of the civil servants and learned society representatives (of which there had been around 15 at the meeting) left, leaving only myself, one BBSRC representative and several Sciencewise actors for the remainder of the session, where we discussed how civil servants could become more engaged with social media. The second face-to-face meeting achieved a higher turnout (and almost all people who had not attended the previous session) and abandoned the previous separation between public and private parts of the session. Case studies of two current Sciencewise dialogue projects were presented, and both presentations elicited generally positive questions and discussion from the audience. In the second half of the session former Sciencewise DES Penny Walker demonstrated how to run a public dialogue session by facilitating a session with the participants on how they would plan a hypothetical public dialogue project.

Throughout 2013 the community of practice space developed increasingly strong links with Sciencewise's thought leadership activities, another element of the programme's advocacy work in Whitehall. Several thought leadership papers formed the basis of the first community of practice webinars, and Jill Rutter's presentation at the first face-to-face meeting of the community of practice was based on her contribution to an earlier Sciencewise anthology document. Both initiatives were managed largely by Involve employees, which may have contributed to this cross-over. According to conversations I had with Sciencewise actors after the period of research, by the start of 2014 it was generally agreed within

Sciencewise that the online community of practice had not worked, so the use of the Yammer site was scaled back and resources for the community were reallocated to activities like the social intelligence work, other events in Whitehall and occasional webinars.

Throughout its lifetime the intended membership of the community of practice swung between being ambiguous and being exclusive, though precisely who could and could not become a member of the community was supposed to be the first decision taken in the development of the project (document 136). In the initial development of the community Sciencewise actors sought to avoid it overlapping with or tapping into any pre-existing communities, in order to prevent replication of effort (documents 6 and 9). This actively prevented Sciencewise from benefitting from existing communities of practitioners, for example around its DES's, contractors or individual projects, which would have had pre-established shared practices and frames of reference. There was ambiguity about whether dialogue practitioners who were not part of Sciencewise or public bodies were permitted to join the community. For example it was stated in some of the initial documentation (document 136) that they would be permitted, but in practice there were few in the Yammer community. On the webpage introducing the Community of Practice it was stated that *'[t]he Community of Practice will* ***eventually*** *also be open to everyone who researches or delivers public dialogue – whether in government, academia or through project delivery'* (document 80, my emphasis). This ambiguity was in part due to internal Sciencewise worries that civil servants would only be willing to participate and share openly in the community if they could be assured of privacy and non-disclosure. The exclusive definition of the community of practice adopted in the first community of practice meeting resulted in the extremely low attendance at the closed part of the meeting as many civil servants left the room either wanting to get back to their desks or assuming that the real community of practice was not for them. When a more open attitude was taken at the second community of practice meeting, the majority of those in attendance were dialogue practitioners or representatives of learned societies, and even some curious university students, none of whom were members of the online community or the intended audience for the session.

3.5 Situated knowledges, situated learning

These four stories have situated various learning processes within the specificities of certain organisational spaces, characterised by particular atmospheres, ways of doing, working assumptions and more. In some cases the narratives also hint at how learning processes, whether formal processes like the theory of change or more dispersed engagements like Sciencewise's attempts to become part of discussions around evidence and advice in policy, have begun to alter and transform their organisational spaces or even create new spaces. The learning processes described have variously been articulated as reformulations of organisational goals and objectives, the creation of new rules and principles, incremental changes in routines and procedures, the development of new working relationships, the adoption of new discourses, changing dispositions, and acknowledgements of failure. This final section of the chapter explores the connection between the characteristics of these organisational spaces and the learning processes which took place.

Table 3.2 summarises the characteristics of the spaces described above, as a heuristic to aid the following discussion. The dimensions covered in the table are suggested as potential influences on learning processes, to be further explored.

	Management spaces	**Horizon scanning**	**Policy seminars**	**Community of practice**
Relationship to Sciencewise	Core business	Funded project	Peripheral	New/experimental initiative
Duration	Permanent	Temporary/ 1 year	Temporary/ 3 months	Recent/ potentially permanent
Key features	Regular meetings; formally defined roles; project tendering, management and evaluation routines	Three formalised workshops and reports	Five open meetings; high profile publications	Online community space; closed meetings; open webinars
Who involved	Permanent Sciencewise staff members; those with formal invited governance roles; limited invited guests & observers	Sciencewise programme board actors; invited participants in workshops & public dialogue	High profile science policy actors; those interested in debates around scientific advice/evidence in policy	Sciencewise programme management actors; government employees; thought leadership contributors
Extent routinized	Highly routinized	Routinized elements	Open	Open but using set models
Response to failure	Evaluation/repression	None	Debate/discussion	Adaptation
Connected spaces	Formal Sciencewise spaces	Sciencewise advocacy; government horizon scanning	Civil service reform; Sciencewise advocacy	Sciencewise thought leadership; Sciencewise advocacy
Responsiveness to other spaces	Constrained	Constrained	Highly responsive	Responsive

Table 3.2: Characteristics of organisational spaces

The centralised and routinized nature of the management space(s) meant that mainly superficial knowledge creation and management occurred, with few opportunities for broader reflection on assumptions and modes of categorising organisational knowledge. Information was passed between formalised groupings in a routinized and standardised manner, while problems, such as failed projects, were either repressed or made legible and understandable through existing evaluation and review mechanisms. This rigidity also fed into a lack of responsiveness to other organisational spaces, for example not responding to changes in BIS's strategic vision, insights from thought leadership or social intelligence work, or new models developed as part of individual projects. Institutionally inscribed power relations were also central in defining which organisational knowledge could travel and how, both in terms of knowledge-sharing with apparently distant groups like DES's or contractors, but also the kinds of information made openly available through the Sciencewise website. However, the fleeting and experimental theory of change process opened up a temporary, less rigid subspace which enabled some franker and deeper discussion, leading to potentially significant changes in aims and emphasis, and offered a potential challenge to embedded power relations (as discussed in section 4.2).

The horizon scanning process constituted a much less rigid organisational space for study, in its novelty and temporary nature, and in its positioning slightly outside of or in between Sciencewise and other bodies. However, those in charge of the constituent parts of the process opted to use pre-formulated models with little adjustment for context, in particular the 'Delphi process' on which the CSaP workshop was based, and the public dialogue format in the Ipsos MORI workshops. The unreflective use of these models, coupled with a strong power differential between Government insiders and members of relatively precarious bodies like Sciencewise and CSaP, meant that this organisational space was generally unresponsive to external events and spaces, and again few transformative changes in assumptions or frames of reference were possible. In fact these power relations, expressed in the strength of dominant policy discourses at the CSaP workshop, the privileging of expert positions and opinions in the public dialogue workshops, and in the dismissive tone taken by policymakers in the POST workshop, threatened to prevent even basic information about the process and findings from spreading more

broadly through Government. Whilst it seems that the process had no impact on broader Government horizon scanning processes, it remains unclear whether it has proved useful as a more general advocacy tool for Sciencewise or as a way to initiate conversations with particular groupings and departments. However, at the time of writing there were no identifiable Sciencewise public dialogue projects which had directly emerged from the horizon scanning process outputs.

There was a shared sense among Sciencewise actors, spread through the Sciencewise management spaces and through more informal relationships, that a crucial mistake made in the process was that they should not have allowed the public dialogue to take place after the expert workshop. This was not just a response in the aftermath of the process following the disappointing POST workshop, but rather was identified much earlier as being in conflict with the Sciencewise principles – seen as a central organisational tenet, and which stated that citizens and experts should be treated equally – and a product as much of unfortunate timing as mistaken process design. This led Sciencewise to re-label the project in its online record and in the case study they produced as 'Dialogue on outputs from a workshop on science, policy-making and public dialogue: new and emerging issues in the UK', as they felt it no longer merited the 'horizon scanning' descriptor. Interestingly, while this was a universally shared attitude between often quite disparate Sciencewise actors, it was not one shared by the other actors involved in the process, who had clearly not been party to the same discussions and were not as attached to or even aware of the Sciencewise principles.

The policy seminars were the freest and most fleeting of the organisational spaces studied, and were also the ones most peripheral to everyday Sciencewise activities and management. Because of this, they were also able to be highly responsive to other events and spaces, in particular to the Government's civil service reform agenda and to emergent debates about evidence-based policy and open policy. Whilst the seminars produced an impressive paper trail and elicited a strong immediate online response, it is less clear what broader or more enduring learning they engendered. It seems that in particular the discussions around public participation and engagement did not succeed in challenging existing assumptions and ways of doing things within Government, and it was felt by many that the conversation had not been advanced. However, this more open and responsive

space allowed Sciencewise to become part of a broader conversation and debate about open policy, which did have broader effects and implications, as discussed in chapter 5. The distant nature of the seminar series limited the number of core Sciencewise actors who were involved in or even aware of it. So whilst programme board and management team members could generally talk about the seminar series and its rationales and implications at length, there is only one mention of the seminar series in a steering group document (document 9, and this was before the event), and some of the DES's I spoke to had no memory of the seminar series taking place.

The community of practice was explicitly set up and monitored as an experimental Sciencewise project, with those involved trying to keep an open mind about whether there was a need for the community or what form it might take. The experimental nature of the project meant that key actors were keen to reflect on its successes and failures at various stages, and to attempt to act on these by changing the design of aspects of the community. The project's design was also deliberately flexible, for example using an already existing and free online platform, and keeping resources back which could be used on initiatives like webinars or face-to-face meetings, depending on what was needed. This capacity for reflection and flexibility in those orchestrating this organisational space arguably did not extend to the membership of the community of practice however, where Sciencewise actors held on to a rigid set of ideas about what civil servants would want in the community (namely privacy) and were not open to the community being used productively by other relevant groups such as dialogue contractors or practitioners. This is at least partly down to the project's original justification as an advocacy and capacity building initiative, meaning that it had to include policymakers to be successful. In contrast to the horizon scanning exercise, there was no singular consensual narrative of the community of practice within Sciencewise, with some actors objecting to the use of an online platform, some feeling they simply did not have enough time or resources to make it work, and some feeling that it was a worthwhile experiment in relations with civil servants.

Conclusions

As is generally acknowledged in qualitative social science, the researcher can never be completely detached from the phenomena being studied, but rather will have effects through the kinds of questions asked, the relationships formed, methods used and even the fact of research itself (e.g. England 1994; Bryman 2008). By developing a networked and relational perspective on the organisation under study, and also by introducing my empirical work in this way, I am drawing attention to the potential effects of my own role within and around Sciencewise, and the potentially arbitrary way in which I might have to create boundaries around or ascribe coherence to particular organisational processes in order to present a readable and credible account. The organisational spaces identified are in this sense mine – another researcher or actor might have chosen differently – and the stories I have begun to tell in this chapter are as much a reflection of me as they are my experiences of Sciencewise and my data collection (e.g. Cameron 2012) – any number of things could have been done or interpreted differently.

I also had more material impacts on these narratives, through my physical presence at many of these events as an ethnographer and through my active participation – as scribe at the CSaP horizon scanning workshop, a member of the community of practice, and an honorary Sciencewise actor during the team day in December 2013. In several interview encounters it also felt appropriate to volunteer my own perspectives on particular events and issues, in order to develop trust with participants, elicit further reflections from them, or to jog their memories. I also engaged in a number of deliberate if small-scale experimental interventions around Sciencewise, including writing several research blog posts reflecting on the future directions workshops, writing two commissioned blog posts for third parties on the future of public participation and the story of Sciencewise, and giving several initial recommendations to Sciencewise during the team day.

This chapter then draws out a further key feature of my research approach, namely the attempt to carry out 'engaged' research as part of the organisational ethnography, acknowledging and supporting Sciencewise actors own interests in organisational learning processes, and trying to recognise my own role in the processes under study. This might be labelled as ction research or even the use of

participatory methods, influenced both by the deliberate use of real-world interventions to build theoretical insights – a commonly used method in business schools (e.g. Burnes 2012; Styhre & Sundgren 2005) – and the more normative motivations of feminist researchers and others for including others as active research partners rather than subjects (e.g. Cahill 2007; England 1994; Kemmis & McTaggart 2005). My approach takes inspiration from interventionist strands of STS work which emphasise the normative and substantive value to researchers of developing relationships with research subjects and making informed interventions into the processes being studied (e.g. Rip 2006; Rotmans & Loorbach 2008; Stirling 2010; Voβ & Bornemann 2011). Furthermore, the approach was also taken due to practical considerations, in particular, the need to gain access to Sciencewise events and meetings and to retain good relationships with key organisational 'gatekeepers'.

In my research design I also considered the experiences and approaches of other researchers in recent ethnographic and engaged studies of policy organisations. Bickerstaff et al's (2010) study of a Royal Society dialogue process drew on an independent review which some of the authors had been commissioned to do by the Royal Society. This consultancy role gave the authors a high level of access to the process itself and the actors commissioning and conducting it, but also made the process of publicly reflecting on and analysing the process more challenging. The authors also reflect that their focus solely on discrete organisational process meant that they were unable to account for the broader effects of the process or other related changes which occurred soon after the period of research, concluding that there was a need for more sustained work with such organisations. Rothstein's relationship with the UK Food Standards Agency, which he has continued through various research projects from the early 1990s until the time of writing offers perhaps an exemplar of this kind of sustained organisational relationship. This long-term research project culminated in a review paper (Rothstein 2013) drawing on his earlier work and extensive data sets which identifies persistent tendencies and gradual changes in FSA processes and modes of public engagement. However, Rothstein's own impact on FSA actors and processes is more ambiguous in his work. The role I assumed, which sits somewhere in between theoretically-driven action research and consultancy, has been described by Styhre and Sundgren (2005) as a form of experimentation, entailing constant interventions (cf. Hacking 1983) in

real-world organisational processes. Due to the unpredictable nature of such experiments the authors argue that the experimental mind-set of the research should be characterised by constant doubt and reflective thinking.

The complicated and challenging nature of engaging with policy processes in particular has been highlighted in a number of notable debates in geography and STS. For example, in the pages of the journal *Science, Technology & Human Values* in 2007 leading STS scholars debated the relative merits and pitfalls of policy engagement. This discussion illustrated tensions between policy prescriptive approaches which align themselves with dominant policy logics (Webster 2007) and approaches which, whilst still being engaged with policy attempt to take a more critical and interpretive stance (Wynne 2007). This issue of attempting to speak to current concerns and issues in policy whilst also keeping a critical distance has also been raised by several geographers (e.g. Owens 2005; Woods & Gardner 2011). Sheila Jasanoff (2011a) has also discussed the need to balance instrumental, interpretive and normative obligations in all STS work, highlighting the need to carry out more instrumental or interventionist research approaches in a way which also informs and draws from the interpretive insights of the work and the normative commitments of the researcher.

My adoption of the co-productionist idiom helps to further explain and justify this engaged approach, as it entails an explicit recognition that processes of knowledge-making, like this PhD, always have effects on action, though they might be diffuse and indirect. Thus, by initiating a formal relationship with Sciencewise actors, and creating opportunities for explicit, if modest, interventions in organisational processes, I was also trying to account for and monitor my own role in the processes under study. These considered interventions also necessitated the doubtful and reflective experimental mind-set advocated by Styhre and Sundgren (2005), contributing to the theme of organisational experiments which runs through the thesis.

I initiated the partnership with Sciencewise by approaching two Sciencewise management actors (Diane Warburton and Edward Andersson) who I had gotten to know during my masters research project and who I knew were sympathetic to arguments about the need for broader learning and reflection in organisations like

Sciencewise. Through initial discussions with them about current Sciencewise interests and challenges towards the end of 2012 and the start of 2013, I developed a research proposal (see appendix II) which was submitted to the Sciencewise programme board in February 2013, laying out my embryonic research plans and questions, and outlining the potential benefits to Sciencewise of this work. This proposal was approved in April 2013 with the addition of an extra agreement concerning commercial confidentiality (see appendix III). Throughout the period of research I was in regular contact with Edward and Diane about my progress with data collection and initial reflections and findings, as well as discussing with Diane how my work could be differentiated from but still feed into Sciencewise evaluation processes. At the annual whole-team meeting in December 2013, I gave a short presentation on my initial findings and reflections from the research along with a hand-out (see appendix IV), followed by a brief discussion with the team. Then in November 2014 I submitted a report to Sciencewise actors and the external whole-programme evaluators based on more in-depth analysis of my material (see appendix V).

This chapter presents the narratives of four of the organisational spaces studied, offering a partial introduction to important changes and processes of learning observed during the period of research. The stories both situate me and my research, and also start to situate Sciencewise and British science policy at the time of study. I have tried to present organisational learning as the co-production of organisational knowledge and its associated categorisations and assumptions, with the characteristics of the organisational spaces in which they are situated, as represented in table 3.2. This leads me to the conclusion that different kinds of organisational spaces foster and support different kinds of organisational knowledge or learning, which in turn may result in the transformation of these spaces (for example, the ending of the community of practice) or the creation of entirely new organisational spaces (the theory of change process). These stories will be developed, interpreted and challenged in the following three chapters, as this thesis considers the relationship between the specificities of these organisational spaces and learning processes, and events at an organisational and national level.

4

Sciencewise the learning organisation: mechanism and narrative

Sciencewise's status as an organisation could be considered an ambiguous one. On the one hand Sciencewise actors and documents continually referred to the body as an organisation, identifying organisational goals and objectives, describing organisational routines and cultures, and even positioning Sciencewise as a 'learning organisation'. On the other hand documents also adopted the nomenclature of 'programme' or 'network', and at times during the research individuals were keen to stress that Sciencewise could not be thought of as an organisation. At such times they emphasised the lack of permanence of organisational structures and the lack of certainty about Sciencewise's future. This ambivalence was also justified with reference to the complexity of Sciencewise's structure, with three partner bodies operating in different fields and from different geographical locations in charge of Sciencewise's delivery, and then working in conjunction with a further set of organisations and private individuals in the everyday running of Sciencewise. Most of my interview participants frequently switched between 'we' and 'they' when referring to different Sciencewise activities, enacting a blurring of the insides and outsides of the organisation. Any attempt at bounding the organisation to distinguish between internal and external processes, to identify relatively coherent trajectories or describe formal organisational mechanisms, like this chapter, is therefore arbitrary to an extent, but also draws upon the working assumptions and definitions of the actors themselves.

Despite the diverse and highly distributed nature of Sciencewise activities (both across space and function) it was possible to identify a number of higher level and

more coherent shifts and changes occurring within Sciencewise during the period of research, addressing research questions 1 and 3 – ***'What did Sciencewise actors learn from and about public participation in science policymaking in 2013?'*** and ***'Through which mechanisms did learning occur and what qualities did this learning have?'*** – and touching on question 4 – ***'What visions of the past and future of science and technology innovation, democracy and publics are at play in these learning processes, and what role do they play?'***. In terms of Sciencewise's formal organisational make-up a number of new actors and bodies were brought into the running of the programme at the start of the new contract in 2012, with consequences for the management structure, organisational routines and Sciencewise's influence, as well as processes of organisational learning. Furthermore, during the latter stages of 2013 Sciencewise underwent a formalised process of reflection on its stated aims, objectives and activities, which opened up a set of new ideas and potential trajectories for Sciencewise, as well as encouraging the materialisation of some less visible processes of learning and reflection.

This chapter adopts a broad definition of Sciencewise as an organisation under study. Regular management meetings and the labour of permanent Sciencewise staff on the programme's payroll are considered equally as central to understanding the organisation as sub-contracted activities like public dialogues, thought leadership work carried out under the Sciencewise banner, or the less formally accounted for labour of Sciencewise actors when they were officially playing other roles but nevertheless forwarding Sciencewise aims and activities. All interview participants were invited to reflect on the commonalities and differences, the continuities and discontinuities of their work inside and outside of the Sciencewise programme as formally defined, and to consider how all of these elements impacted on their work. Furthermore, I was sensitised to nominally external processes which might also impact on or relate in another way to Sciencewise organisational processes, in order to gain a fuller understanding of the organisation and its context.

Following its re-launch in 2007-2008 as an expert resource centre, Sciencewise consciously positioned itself as a 'learning organisation'. The central aspects of this learning were best practice sharing and capacity building in Government. In practice these materialised as the development and maintenance of an online repository of guidance documents, case studies and evaluation reports of previous public dialogue

projects, alongside more diffuse efforts at relationship-building and training within different government departments. These activities were occasionally supplemented by more reflective reports and pieces of research concerned with conceptual development or mapping the field and laying out future directions for public engagement, carried out both by academics and practitioners, usually labelled as thought leadership pieces. After 2012 Sciencewise thought leadership activities became more formalised and were a regular element of the programme's activities, with greater efforts made to bring in a broad range of external experts. With regards to internal organisational learning, from 2008 onwards Sciencewise commissioned an independent evaluation of every public dialogue project the programme supported. Evaluations of the whole programme were initially carried out every few years, and after 2012 were conducted annually. With the exception of the thought leadership work Sciencewise's efforts to organise learning were labelled in an earlier study as promoting only instrumental forms of learning, by focussing on transmitting narrow models of public dialogue practice and technique and on short-term evaluations against set objectives (Pallett & Chilvers 2013).

Drawing on my data collection and analysis as described in chapter 3 this chapter begins by describing and exploring the consequences of the changes in the new Sciencewise contract which began in 2012. The main formal mechanisms for organisational learning within Sciencewise are then explored and their relationships with different forms and qualities of learning are identified. A central argument of this chapter is that a focus only on an organisation's formal learning mechanisms would give a very limited picture of organisational learning processes, and that mechanisms which look like they are designed to promote learning are actually often fulfilling other functions first and foremost. This then leads on to an analysis of some of the less visible ways in which learning and broader reflection were encouraged within Sciencewise and what their effects were. The fourth section of the chapter examines the role played by institutional memory and visions of the future in shaping and interacting with processes of organisational learning and reflection. The chapter then further challenges the role of formal learning mechanisms by exploring the ways in which non-knowledge was produced and promoted through Sciencewise organisational structures before finally considering

the broader changes in organisational aims and narratives which took place during the period of research.

4.1 The New Contract

In April 2012 the Sciencewise programme was re-launched under a new management contract, which was to have significant implications for subsequent Sciencewise activities and organisational learning processes. Until this point there had been considerable uncertainty about Sciencewise's future due to the dissolution of many other government advisory bodies or 'quangos' by the coalition Government, and the programme's strong associations with the former Labour government. However, the new invitation to tender for the running of the programme (document 99), released in October 2011, affirmed a commitment to the continued running and enlargement of the programme, at least until 2015, with high-level support from the then Universities minister and Conservative Member of Parliament David Willetts. According to my interview respondents this invitation to tender produced a flurry of informal conversations around the UK public dialogue and science policy communities, with diverse individuals and organisations, including academics, learned institutions and consultancies, trying to discern the actions and intentions of others and develop possible partnerships to take on the new contract. In the end only two tenders were put forward for the running of the programme, and the programme was awarded to Ricardo-AEA, the new merged identity of AEA-technology, a private management contractor (formerly the Atomic Energy Authority) which had been in charge of the Sciencewise programme since 2005. The difference in this new contract however, was that Ricardo-AEA had entered into a formal partnership for the running of the programme with the British Science Association and the 'think and do tank' Involve. From the start of the contract the three partners emphasised that they aimed to provide both continuity and innovation for the programme (document 2).

Perhaps the primary effect of the 2012 re-launch was the increased size of the Sciencewise programme, both in terms of the number of actors involved and on the payroll, and the number and breadth of the programme's activities. Sciencewise was able to carry out a greater number of public dialogue projects, also creating a need for more project evaluations and case studies, and the number of thought

leadership pieces commissioned also increased. Written into the initial proposal document by the three partners were also a number of additional activities which were new to the programme. These included: the community of practice; the horizon scanning process; the addition of the citizen group to the programme's advisory bodies; a planned business insight group, which was later abandoned due to lack of interest from business; and the creation of a new activity called 'high-level networking', to be undertaken by Roland Jackson of the BSA[2] and Simon Burall of Involve.

The increasing size of the programme created a need for it to become more *organised*, with more formalised and complex management structures and increasingly proceduralised and audited routines. The management structure of the programme, previously overseen by a single group, was split into the programme board and management team, as discussed in 3.1. Activities like communications and thought leadership which had previously been managed by individuals now became the responsibility of larger teams operating as part of the management structure. The number of DES's associated with the programme was rationalised and the remaining DES's each became an 'account holder' for a government department or body, whereas previously they had been much freer in which projects they could initiate and oversee. Formal DES meetings every four months were also initiated to allow DES's to share lessons and challenges, and to ensure they were all aware of every project which was being undertaken. The process for commissioning thought leadership work, formerly completely ad hoc, was also formalised with particular timings and procedures put into place.

There were several notable changes in organisational routines, engendered as part of this new contract and associated restructuring. As discussed in section 3.1, an online contacts relations manager and a knowledge management system were developed to assist the spread and accessing of organisational knowledge, in particular, internal documents under development and interactions with policymakers. Other small additions to existing routines included: the addition of a 'focus section' at the beginning of each steering group meeting, usually involving a visiting speaker from Whitehall; the formalisation of 'wash-up' meetings at the end

[2] Jackson relinquished his role at the BSA shortly after the start of the new Sciencewise programme, but kept his role as Sciencewise chair.

of each public dialogue project, bringing together project commissioners, contractors, evaluators and DES's to discuss lessons learned from each project and to feed into the final draft of the evaluation report; and the switch from sending a quarterly newsletter around Whitehall reporting on Sciencewise projects and achievements to a monthly e-digest.

One of the areas of largest change was in the processes around commissioning and designing new public dialogue processes. An extensive range of guidance documents for each stage of running a public dialogue project were developed and made accessible via the Sciencewise website (documents 55-70) to help those proposing to run a project. The creation of these documents required the formal articulation of key organisational assumptions and ways of doing, for example through the creation of criteria for initial project proposals (documents 56 and 62) or good project reports (document 65), and later more specific guidance on ensuring that project meetings and workshops ran smoothly (document 69). The idea of prospective public dialogue commissioners first developing a brief concept note describing their plans, before developing a full business case, was also developed to allow the programme board to more quickly screen out unsuitable projects and to suggest alterations in the scope and design of projects before policymakers (both MPs and civil servants) had invested resources in developing a full business case. The DES's were also involved in refining a template for the invitation to tender (ITT) for the running of public dialogue projects, which involved creating a list of criteria for projects which would ensure a higher quality of work from Sciencewise contractors, but which would also encourage innovations in public dialogue practice.

The changes occurring as a result of the new contract for the Sciencewise programme had several broader implications for Sciencewise. The increased size and complexity of the programme meant that it was no longer possible for one individual to have full knowledge of everything going on in Sciencewise at any given time. Thus modes of organisational communication became increasingly important, resulting in the use of a number of online knowledge management databases and the increased frequency of formal meetings. Despite these measures it became possible for Sciencewise actors not part of the management or programme boards to be completely unaware of some Sciencewise activities or of the reasons for the

programme's engagement in a particular activity. The second implication of Sciencewise's new contract, in particular, the involvement of the BSA and Involve in the management of the programme, was an increase in Sciencewise's visibility around and influence on Government. This change was influenced by a number of factors, but important amongst these was the existing networks in and around Government of the BSA and Involve actors. This, alongside their experience of other advocacy work within government, enabled them to promote the Sciencewise programme and ideas related to public engagement through a number of tactics, including becoming involved in joint seminar series, arranging private meetings with influential individuals and policy teams, writing widely read blog posts and longer pieces, and identifying opportunities for Sciencewise interventions in important and live discussions.

It was almost universally agreed amongst my interview respondents (members of the steering group were most likely to be sceptical) that the changes associated with the new contract had been very positive for the Sciencewise programme, boosting its profile, increasing the number and breadth of projects, and improving the quality of most Sciencewise activities. For example, one programme board member said *'the whole focus of the programme had changed somewhat… you know, we've got much better at linking into high level national priorities, [and] the whole open policy-making agenda has really given Sciencewise an impetus and more of a rationale for doing things'*. Respondents generally emphasised the involvement and actions of certain individuals – one Sciencewise management actor remarked, *'individuals make change happen, not institutions'* – rather than new routines, projects or structures. A minority expressed worries about the size and formalisation of the programme, for example *'it's sort of got bigger into this big kind of machine'* (Sciencewise actor). One common topic of discussion was what one Sciencewise management actor referred to as an organisational *'clash of cultures'* as the new partners and Sciencewise actors learned to work together at the start of the new contract. Those from smaller organisations described problems with getting to grips with the extensive reporting mechanisms required for the allocation of funds and staff time or in the development of projects within Sciencewise, meaning that things usually took longer and were less flexible. Ricardo-AEA was generally caricatured as the most rigid organisation, being the one with the most experience of Government contracting

relationships, as well as the most experience running the Sciencewise programme. In contrast, Involve and the BSA were characterised as being more creative, and having more expertise in public engagement, but little experience of how to run a large-scale Government contract. In general, whilst Ricardo-AEA saw its role primarily as the fulfilment of BIS's requirements for the programme, BSA and Involve actors were more likely to describe their role in a more normative or political way – though there were also individuals from Ricardo-AEA who did this. Despite many of the initial problems and organisational differences having been addressed, some were still concerned about the differences within the partnership and also the effect that the often unstated and conflicting goals of these individual bodies might have on the running of the Sciencewise programme as a whole. But others felt the mix of organisational cultures in the programme was useful, for example *'[s]o that's been quite an interesting tension if you like, but it's been a creative tension I think because I think both sides bring their strengths, they get frustrated with each other at times, but that's partnership'* (Sciencewise management actor).

Almost everything which happened during the period of research was driven to a large extent by what had been written in the original proposal document to BIS by the three contract partners. The 'social intelligence' work and the Whitehall policy seminars were the only two formal activities not mentioned in this proposal. The proposal document laid out much of the operational and financial details for the three year programme, which then fed into the development of yearly business plans allocating staff time and resources to different projects and activities. Some flexibility was allowed for within these parameters, for example the precise topics on which thought leadership pieces or public dialogue projects could be carried out, the interpretation of precisely what the citizen group might look like, or what resources would be needed for the community of practice after its piloting stage. However, there was little scope for broader shifts in emphasis such as the shifting of resources between public dialogue projects and advocacy work.

4.2 Mechanisms for learning

Given Sciencewise's self-conscious positioning as a learning organisation, it is unsurprising that interview respondents unanimously felt that learning was central to the programme's activities and success. For example:

'I think it's critical because we have to be improving what we are doing all the time, in order to make it… in order to make it more effective, um… I guess it… also in order to make it more attractive' (Sciencewise management team member).

'I mean, we… everything we do I guess is… is learning, because you know, it's all contributing because one of our… one of our other objectives is to develop best practice, um… in in everything we do… so whether it's the projects… whether it's the events, whether it's the high-level networking, whether it's the website, whatever it is, um… it is one of our objectives to develop best-practice… so, so you take what you've learned and put that into practice' (Sciencewise management team member).

'it's very important, I mean, the … the idea of Sciencewise is er… is basically to er… help government to do public dialogue better, and you obviously can't do that if you're not watching your own processes and trying to learn how to do it' (Sciencewise steering group member).

Though organised mechanisms for learning within Sciencewise were ostensibly designed to promote both internal organisational learning processes and the learning of external actors and organisations, the rhetorical and working focus within Sciencewise was on the latter form of learning. Interview participants frequently interpreted my questions about organisational learning as concerning only the learning of others, and Sciencewise's own organisational learning and reflection was sometimes seen as relatively unimportant. For example: *'what people have said in terms of the projects themselves is that… in the departments and the research councils who run projects, who commission contractors to do projects, really… they all learn a huge amount from doing it. And that seems to be where most of the learning happens, is amongst the people who are actually doing the projects, or who are on oversight groups for projects – a lot of learning happens there'* (Sciencewise management actor). Understandings of learning were strongly linked to the central Sciencewise goal of capacity building, encouraging more of a focus on external Government processes, as is evident in initiatives like the community of practice. For example learning was one of seven key dimensions which Sciencewise was evaluated against in the 2012-13 programme evaluation (document 44), but this was

understood in relation to the need to create an evidence base demonstrating the importance and value of public dialogue to external actors.

Several interview respondents problematized the idea of Sciencewise's organisational learning from different standpoints. Some challenged the idea that a straight-forward assessment learning was of any use, for example '*we could show in all evaluations that people have enjoyed themselves and learned something, this has a different aim… and so it's not ok to be happy with a positive outcome… you actually need to be able to create lasting change, has it done that?*' (Sciencewise actor). Others questioned the locus of Sciencewise's organisational learning, considering which parts would need to change in some way for learning to have taken place. Others' scepticism rested in the lived reality of organisational change in Sciencewise, for example pointing out a lack of explicit focus on learning: *'I think it should be the most important part of the programme. It's… at the moment it is not explicitly important. I think… I think quite a lot of learning happens for all of us… for all the people involved. But it's not explicit… it's not explicitly acknowledged'* (Sciencewise management actor). There were also other practical barriers to deeper organisational learning: *'It's an intelligent organisation in that sense, it will learn, but at the same time as people keep changing and different constraints are introduced in terms of what it's got to do and how much money it's got then those sorts of things will always mean that learning opportunities are set aside'* (Sciencewise steering group member).

Aside from the DES meetings, which as described in 3.1 were distant from other Sciencewise structures and activities, evaluation was the main Sciencewise mechanism to generate and capture learning from public dialogue projects. Independent evaluators were appointed at the start of each dialogue project, so that they could follow the progress of the public workshops and offer advice and reflections during the process. The evaluation reports would usually be published several months after the initial reports on the dialogue projects to allow the evaluators to conduct interviews with some of the actors involved, process survey data from the dialogue's participants, and observe any broader effects of the project on policy processes. The first draft of the evaluation report would be circulated among key actors in the dialogue project in advance of the wash-up meeting, which would involve the dialogue evaluators, contractors and commissioners reflecting on the successes, failures and key lessons of the project, facilitated by the project DES.

Though these discussions were not formally recorded, it was intended that they would feed into the production of the final evaluation report, and the shorter Sciencewise case study write up of the project, both of which would be available on the Sciencewise website.

Processes of evaluation (a requirement for all Sciencewise public dialogue projects) were explicitly linked to organisational learning in Sciencewise planning and public documents (e.g. document 48-51), for example a 2013 steering group document defined the Sciencewise evaluation approach as '*[t]he assessment of impact and the identification of learnings from projects and programme activities'* (document 13). The relationship between evaluation and learning was strongly reinforced during discussions in the February 2013 steering group meeting, where the minutes note *'[i]t must be remembered that a key aspect of the evaluation is to feedback learning into the design and delivery of the programme'* (document 15). Several interview respondents also drew this link, for example '*I think evaluation… is your way of operationalising a learning process isn't it… it's about saying "this is what we actually want to achieve, these are the assumptions we've made, these are the interventions we think will be most effective, these are the kinds of outcomes that we're hoping to achieve". So if you're constantly using that … to reflect on… on your process and your progress then you're learning'* (Sciencewise steering group member). A Sciencewise evaluator also drew this link: *'[i]t's actually about providing new forms of learning, new forms of understanding, that certainly are contextualised by a project and thinking about a project as a case-study, but contribute more to the overall perspective of dialogue and the policy terms of it'*. Public dialogue, activity and whole programme evaluations were used extensively for synthesising knowledge into advocacy and informational materials on Sciencewise's website such as dialogue case studies, guidance documents or the FAQs (document 70). However, some felt that the lack of a clearly described relationship between evaluation and learning, or any activities focussed explicitly on learning, weakened the potential for organisational reflection and learning. A minority of respondents felt that evaluation procedures were overused in Sciencewise, to the extent that they got in the way of getting things done or put off potential project partners.

Whilst evaluation remained a priority within Sciencewise during the period of research – indeed it was unanimously selected as an important activity at the

Sciencewise team day (document 147) – it is clear that evaluations played multiple roles in and around Sciencewise, aside from enabling organisational learning. Firstly there were some worries about the quality and consistency of the work of the public dialogue contractors, so the evaluations functioned as a quality control process, to check up on the project's delivery at every stage. It was also intended that through their interactions with the evaluators and through the evaluation reports, the dialogue contractors would be encouraged to reflect on their practice and learn in order to improve the delivery of future public dialogue projects. Though Sciencewise project evaluators took a variety of approaches, their general focus was on aspects of process and method and this was where most of their suggestions for areas of improvement were, rather than in the broader relationship between the project and the political system. Though Sciencewise's stated objective was to encourage culture change within Government, and many of its suggested evaluation metrics in guidance documents emphasised this dimension (documents 57 and 63). It is unclear how the contractors themselves viewed this feedback from the evaluators or whether they used it to aid further reflection and learning; however, generally this feedback would arrive months after the project had been completed.

The development of public dialogue case studies and the way these evaluation reports were used in the programme-wide evaluation indicates that they also provided an important audit function, as might be expected in an arm's-length government programme (cf. Power, 1997). Several interview respondents recognised this as a limitation, for example, *'[w]e have to be honest, that our evaluation of Sciencewise has to fit the criterion objectives that BIS set in its funding model, so in a sense there are things that we have to evaluate to prove that the money's been spent well, um… so on one level you could say it's a sort of operational evaluation'* (Sciencewise steering group member). Sciencewise felt the need to bring in 'neutral' observers to measure and verify the quality and impact of its projects, to demonstrate that it was being held to account and to provide all-important evidence of the programme's effectiveness. Several Sciencewise documents even use 'evaluation' and 'producing credible evidence' interchangeably (e.g. document 9). Thus while Sciencewise evaluation procedures offered an important mechanism for potential organisational learning and reflection, on the way they commissioned

and ran projects, the forms of public engagement they were promoting, or the topic areas they were engaging with, this was not the only or primary function of these mechanisms. Furthermore, other concerns, such as the need to provide convincing evidence of the success and impact of Sciencewise projects and therefore not to acknowledge failures or problems, potentially precluded opportunities for honest reflection and broader learning.

The yearly programme evaluations were also seen as a source of organisational learning about 'big picture' issues. For example the 2009-10 programme evaluation was cited as a key source for the new projects and ideas contained in the 2011 proposal document, such as the horizon scanning project and the community of practice. Through conducting interviews with Sciencewise and policy actors the programme evaluation reports had been useful in identifying generally agreed areas for improvement or opportunities for new initiatives. However, much of the focus of the programme evaluations – carried out by Diane Warburton, but with clear parameters set by BIS, the programme board and the steering group – was on how successful Sciencewise had been in encouraging the learning of others, namely policymakers and contractors, rather than on advancing Sciencewise's own learning. In common with the project evaluations the programme evaluations also served a key self-auditing function and were constructed with a policy audience in mind, meaning that findings had to be clearly and very concisely stated.

Another prominent mechanism for potential organisational learning was Sciencewise's thought leadership work. While in previous programme contracts much of the thought leadership work had been conducted in-house by DES's or steering group members, since 2012 Involve actors had developed a more systematic approach to commissioning thought leadership work from people and bodies outside Sciencewise at regular intervals. This created multiple opportunities for Sciencewise actors to learn about topics they had identified as being interesting and relevant to them, from people they had identified as experts in the field, though some thought leadership reports were developed and compiled by Involve actors with some relationship with Sciencewise. During 2013 thought leadership reports were commissioned on the topics of: engaging different kinds of publics (document 101); open policy (document 102); digital engagement (document 103); the impacts of deliberation on citizens (document 105); convincing the broader public of the

merits of public dialogue (document 105); long-term public engagement (document 106); the future of public engagement (document 107); responsive research (document 108); and using social media in public dialogue (document 109). However, these reports were primarily conceived of within Sciencewise as advocacy tools rather than mechanisms for learning and reflection, so much of the focus around thought leadership reports was on promoting them through events, webinars, social media and blog posts. Whilst members of the programme board and programme management team were generally aware of the themes and content of the thought leadership pieces, members of the steering group, citizen group, communications team or DES team were unlikely to be familiar with many of them. There were few opportunities for the discussion of these pieces and their implications within Sciencewise, with only a few of the pieces being presented to the steering group or discussed at management team meetings.

The creation of social intelligence reports – labelled on the Sciencewise website as 'What the public says' – was a new initiative of the 2012-15 programme contract, developed on the recommendation of the BIS contract-holders following an initial suggestion from steering group chair Judith Petts. This idea came from an earlier report by the Royal Commission on Environmental Pollution of which Petts was a member (RCEP 2008). The point of these new reports was to compile evidence on public views and values around particular topics, such as energy infrastructure or big data, drawing on both Sciencewise public dialogue projects and other public engagement or research projects. It was hoped that these reports would give a more credible and lasting insight into the shape of societal attitudes towards these different science and technology related issues, getting beyond accusations that public dialogue projects only offer a snap shot of the views of a small group, but also to provide a richer picture than that provided by public opinion surveys. Whilst the social intelligence work, carried out by Sue Hordijenko and Monica Lobo (BSA), provided an opportunity for Sciencewise actors to learn about and reflect particular topics and to develop perspectives on the state of science policymaking in that area, again the reports were mostly conceived of within Sciencewise as an advocacy tool. It was hoped they would demonstrate the value of public engagement to policymakers and that they could be used to robustly identify areas for future dialogues projects.

Further learning mechanisms were offered within everyday Sciencewise activities and management structures. For example, programme management team members reported collectively reviewing progress on key activities at every monthly meeting, based on writing a monthly report. Core Sciencewise publications and materials, such as the website, project guidance and key document templates were also reviewed and updated during the period of research, involving those Sciencewise actors considered most appropriate for the task – for example, the DES's reviewed the ITT template (field note 9), and James Tweed and Diane Warburton reviewed the project guidance documents. There were also reviews undertaken of key Sciencewise activities, including the community of practice, the communications strategy and the high-level networking, again carried out by small groups of Sciencewise actors. Several interview respondents also gave a sense of continual learning and reflection through their daily individual and collective practice, for example *'I think we're constantly learning. So every experience, whether it's high level networking, whether it's a project, whether it's an event that you've been to, we're learning about what works and what doesn't work and feeding that back in. The management team have monthly meetings which then feed into the programme board so we then get to reflect on what they're telling us, and perhaps tweak or make decisions about which direction we want them to go in'* (Sciencewise management actor). Several respondents also emphasised the role of key individuals as mechanisms of sharing learning or encouraging reflection, for example many of the DES's saw themselves as fulfilling this role, whilst others pointed to individuals from the programme board, or to Diane Warburton who played a bridging role between several different parts of the programme, including the DES group and the management team.

As discussed in 3.1 and 4.1 Sciencewise's online knowledge and contacts management systems could be considered as both a mechanism of and a barrier to learning. One the one hand they were set up to enable the spread of organisational knowledge to those not directly involved in its production, but on the other hand technical difficulties and a lack of connection to the material hosted on the systems meant that little knowledge was shared. Sciencewise actors also faced difficult questions about exactly how much information to share through these systems and in what form. Tacit shared assumptions and practices emerging between people working closely together could clearly not be shared through a system like this, but

there were other more ambiguous objects. In the contact relations manager in particular, different actors made different judgements about how much contact and discussion was required before they could record a new contact on the data base, and then gave varying amounts of information about the nature of these contacts. Furthermore, actors like Roland Jackson and Simon Burall – charged with the high-level networking – were constantly making and maintaining relevant contacts around Whitehall, even when not on Sciencewise time, adding another level of ambiguity around the recording of information.

4.3 Organisational reflection?

Despite the apparent rigidity of procedures for planning Sciencewise activities and resources, some new activities emerged from processes of broader organisational reflection and discussion during the 2012-15 programme contract. These included the social intelligence work, as described in 4.2, and the theory of change process (which became part of the whole programme evaluation), both of which became significant and transformative activities. There were also several instances where planned activities resulted from informal relationships and connections, such as the horizon scanning process or the Future Directions for Scientific Advice in Whitehall seminars. Furthermore, despite the limitations of the formal organisational learning mechanisms, during the period of research Sciencewise actors also encountered several opportunities for broader reflection.

Firstly the advisory structures, namely the steering group and the citizen group, stimulated reflection at times through the introduction of sometimes surprising new perspectives or through the verbalisation of tacit assumptions or tensions. For example, the Sciencewise guiding principles (document 98) – a core document outlining what public dialogue is and is not, why it should be carried out, the Government's aims and objectives for public engagement, and the forms of Sciencewise support available – were reformulated several times (including in 2013) in response to requests and input from the steering group. This resulted in the institutionalisation of 5 key principles which, to paraphrase, stated 1) that the context of the process would be conducive to the best outcomes, 2) the range of issues and opinions covered in the process would reflect the participants' interests, 3) the delivery of the project would represent best practice, 4) the project could

deliver the desired outcomes, 5) the process would be robust and contribute to learning. These principles were continually drawn upon by Sciencewise actors in their project guidance and advocacy, but have also proved useful in dealing with projects they perceived to have gone awry, such as a partnership with the FSA on the topic of genetically modified organisms which had to be abandoned due to what Sciencewise actors and the advisory board felt was an inappropriate framing of the dialogue process.

The idea of running a theory of change process also came from a steering group member, amid a robust critique of the pre-existing Sciencewise approach to programme evaluations at one of the group's meetings (document 15). The steering group member felt the programme evaluations were too instrumental, lacking a sense of clear collective objectives around which desirable outcomes and ways of measuring them could be identified. This resulted in Diane Warburton being tasked with researching ideas around theory of change processes, and orchestrating the process during Autumn 2013. Due to the rigid and routinized nature of the Sciencewise management bodies this impulse could only have come from one of the advisory bodies, though I got the impression that many individual management actors were highly supportive of the idea and saw the potential for the process to bring about broader reflection and to transform organisational objectives and activities. Similarly, several Sciencewise management actors shared with me an instance where one of the citizen group members had challenged the use of the word 'public' in Sciencewise discourse and documents, saying "shouldn't we really be talking about citizens?". The management actors felt that this had been a useful intervention, and one that many others in the management groups and on the steering group had agreed with but felt unable to verbalise.

The new 'focus section' introduced at the start of steering group meetings in order to bring in other voices for a presentation or discussion, though criticised for reducing the amount of time left for formal steering group business, also provided a space for the introduction of novel perspectives to Sciencewise management actors, and the strengthening of key relationships. Visitors to the steering group meetings in 2012 and 2013 included: Steven Hill from RCUK; Chloe Ross and Maria Nyberg of the Cabinet Office's open policy team; Anthony Zacharzewski from Demsoc (an NGO promoting democratic participation) and Ade Adewumi of the Government

Digital Service; and Professor Ian Boyd, the DEFRA Chief Scientist. Some of these contributions formed part of a larger identifiable trend of organisational reflection and learning. For example, Anthony Zacharzewski's presentation at the July 2013 steering group meeting (documents 20, 22 and 23), concerning his Sciencewise thought leadership piece on digital public engagement, was combined with a presentation from Ade Adewumi on the success of the Government Digital Service and its future potential. This stimulated a broader discussion around the digital agenda at the highest level within Sciencewise, and a deeper consideration of the relationship between this and Sciencewise's work. The thought leadership report on digital engagement was probably the most publicised Sciencewise report during 2013 and was clearly key to Sciencewise advocacy activities, with a launch event held at Civil Service Live, with Zacharzewski presenting the first community of practice webinar, and a robust debate about the potentials of digital engagement and dialogue between Zacarzewski, his co-authors Susie Latta and Charlotte Mulcare, and the academic Erik Jensen populating the Sciencewise blog throughout 2013 (documents 149 and 150). These discussions – both public-facing and in private – eventually resulted in the recruitment of a new Sciencewise 'digital DES' in October 2013 to pursue the potential for digital engagement further. The visit of Cabinet Office open policy actors to the steering group was also part of a similar process of reflection and discussion on the topic of open policy, which will be discussed in more detail in 5.2.

The theory of change process was stimulated by steering group input in February 2013, prompting further reflection and research by Sciencewise management actors about how the process could be put into practice. In October 2013 two external facilitators with expertise in running theory of change processes ran a day-long workshop with a selection of Sciencewise actors: all members of the programme board and programme management teams; two DES representatives (Suzannah Landsell and Daniel Start); one citizen group representative (Phil Ham, an Environment Agency employee); and one steering group representative (Paul Manners, who runs the National Co-ordinating Centre for Public Engagement). The initial theory of change document was then presented to each group in turn in the Sciencewise management structures, namely the management team, programme board, DES group (field note 9), citizen group (field note 11), and steering group

(field note 12), to give them a chance to alter, question or add things to the document, and to initiate a broader discussion about what the key characteristics were of the UK Government context which were relevant to Sciencewise. The 30+ potential Sciencewise activities selected through this process were then discussed and prioritised through facilitated group activities at the Sciencewise team day (at which all Sciencewise actors apart from citizen group and steering group members were present).

The central feature of theory of change processes is the idea of working backwards from a clearly defined long-term aim to then collectively identify key objectives or interim goals, and then an associated set of expected outcomes and outputs, then finally working out which activities and inputs will be required to achieve the goals (shown in figure 4.1). So whilst the defined aim for the 2012-15 programme remained the same – to increase the effectiveness and use of public dialogue in Government – an overall long term goal was newly identified through the theory of change process, namely that *'[a]ll decision making involving science and technology takes* ***public voices*** *into account, at the right time and in the right way, and is better, more effective and fairer as a result'* (document 146 and figure 4.1, my emphasis). The move away from 'public dialogue' towards 'public voices' as a central aim and justification for Sciencewise was much discussed in the meetings following the theory of change workshop and on the team day, with most Sciencewise actors feeling that it represented a positive and exciting step. The three interim goals identified through the process were also different from the goals assumed in previous Sciencewise evaluations, placing more emphasis on achieving cultural and structural change within Government, and on the creation of evidence to demonstrate the effectiveness of public dialogue processes.

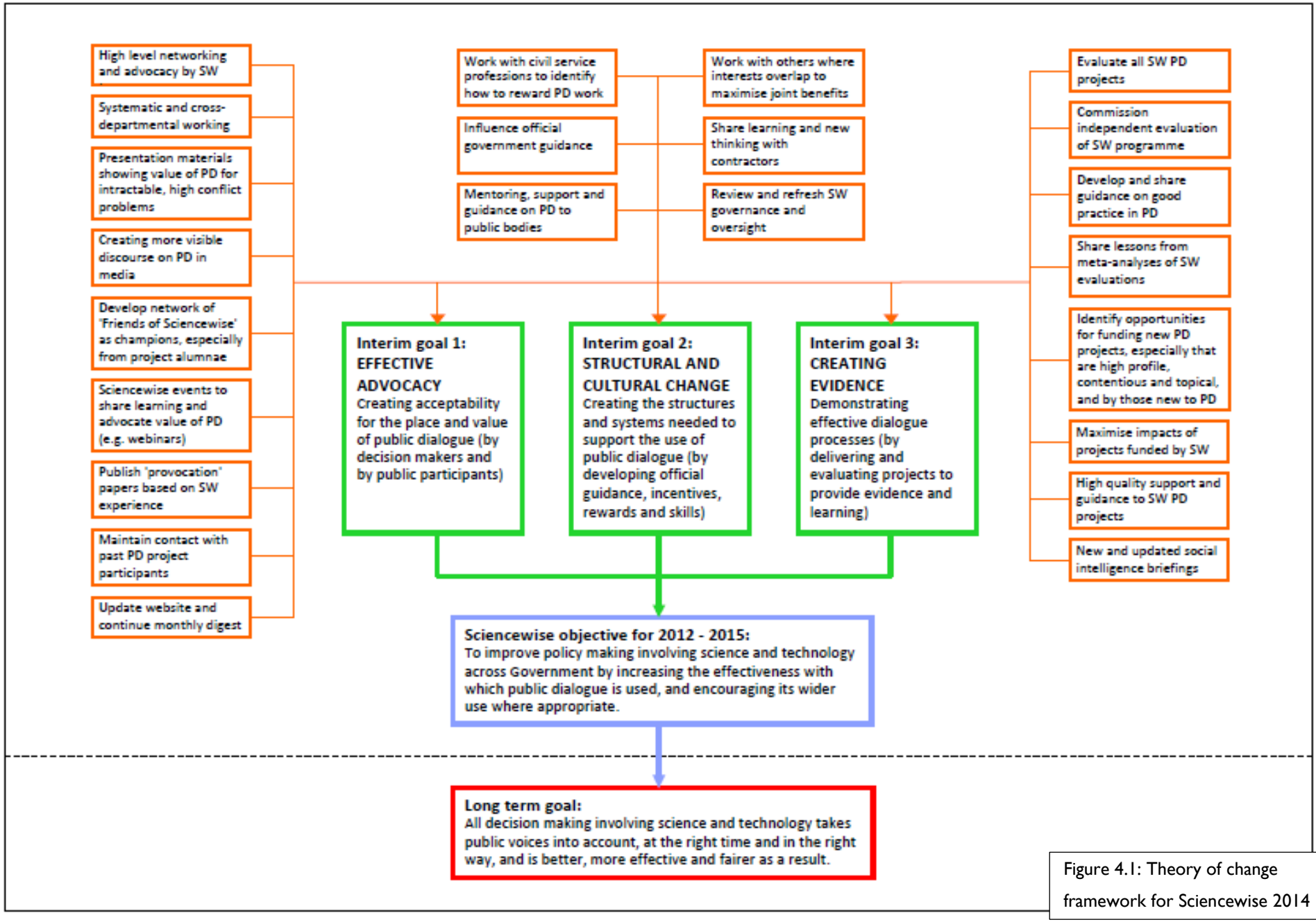

Figure 4.1: Theory of change framework for Sciencewise 2014

Discussions around the identification of desirable medium-term impacts of Sciencewise work made explicit several goals and assumptions which had until then been exclusive to individuals or particular groups. For example, the idea of having public dialogue or engagement included in official Government guidance and training was collectively agreed upon, and a formalised set of activities identified which could lead to this. Or similarly, the need to increase the quality and pool of available contractors was discussed, leading to agreement that more effort needed to be put into sharing key knowledge and practices with contractors.

A final broader area of reflection and change within Sciencewise was the definition of public dialogue itself, which had arguably become increasingly codified and tightly defined since its re-launch in 2007 – for example, most Sciencewise actors gave me a stock definition of public dialogue as deliberative, policy-relevant, including publics and experts, lasting one day or more, and involving citizens learning from experts and/or written information. These processes of learning and reflection were often ambiguous and difficult to trace. For example, in a previous study during 2011 (Pallett and Chilvers 2013) I found that the idea of public dialogue as a consensual practice was a strong trope in Sciencewise, woven through documents and interview transcripts. However, in this study there was virtually no association drawn between public dialogue and the necessity of reaching consensus, and the word seems to have been removed from most Sciencewise guidance documents. However, this was not a change acknowledged or reflected upon by any of my interview respondents, suggesting perhaps that the move away from ideas of consensus had been largely unconscious or simply that the change had been forgotten.

The DES's themselves stretched definitions of public dialogue, both deliberately and subconsciously through their everyday practices. For example, as most of the DES's had professional backgrounds in stakeholder engagement they would often incorporate aspects of this in their work on public dialogue projects, though it was explicitly stated in guidance documents that Sciencewise would not fund stakeholder work. This involved the way they set up project advisory boards or chaired important meetings, often with the aim of getting relevant agencies and individuals to work better together or to push for deeper organisational changes, as well as dealing with the immediate subject matter of each dialogue project. There

was also a push from the DES's, as well as some other Sciencewise actors, to take on more public dialogue projects involving social science questions, which again stretched the initial guidance given by BIS on the scope of the programme. This resulted in general agreement (including from the BIS actors present) during the theory of change process that Sciencewise's remit around 'science and technology policy' encompassed social scientific issues as well (field note 15). Furthermore, during 2013 Sciencewise ran a public dialogue project in partnership with the Cabinet Office on the uses and effects of 'wellbeing science' in policy, cementing this commitment to engaging with social science.

Another challenge to conventional definitions of public dialogue came from the 'Which publics? When?' (document 101) thought leadership piece (later a webinar) written by STS scholars Alison Mohr, Sujatha Raman, and Beverly Gibbs from the University of Nottingham, and commissioned specifically because Mohr had been vocally critical of previous Sciencewise projects. In the piece Mohr and colleagues drew on the recent STS literature and empirical examples from around the British Government to argue that there were different kinds of publics who could become involved in public dialogue projects – which they categorised as civil society, campaigning, latent, and diffuse publics – and that it was important to be aware of which kinds of publics a public dialogue was engaging. Several of the Sciencewise actors felt that this argument was compelling and useful, but it was clear (as discussed in 4.2) that the arguments made in the report did not reach all those involved in the Sciencewise programme. During the webinar at which Mohr and colleagues presented the work I also witnessed how difficult it was for public engagement and policy practitioners to let go of the idea of 'representativeness' as a central feature of any public engagement initiative. So whilst the piece deliberately refuted the idea that public dialogue projects have to be demographically representative, many of the webinar participants interpreted its argument as meaning that all public dialogues should attempt to engage members of all four of the different kinds of publics the authors had identified.

During 2013 Sciencewise supported the Bioenergy Distributed Dialogue, run in partnership with the BBSRC which was an explicitly experimental project interested in creating a dialogue which could run over a longer period of time than other public dialogue projects, allowing for constant interaction and iteration between

BBSRC research on bioenergy and the content of the dialogue itself. The public dialogue was also designed as a package which did not have to be carried out by formal dialogue contractors but could be taken up by bioenergy researchers, independent facilitators, social scientists and civil society groups, with mechanisms to feedback their findings to the BBSRC. Thus the dialogue deliberately contravened several of Sciencewise's key criteria for a successful public dialogue.

The design of the project was based on an earlier 'Democs' card game developed by the New Economics Foundation for an early Sciencewise project in 2005. The Bioenergy Distributed Dialogue's extensive set of cards contained stories about different stakeholders, different kinds of information about the characteristics and effects of bioenergy and some of the different moral and political issues thrown up by biofuels. The game itself was organised around four plausible scenarios of the future developed by the BBSRC, describing the effects of different kinds of actions or inaction around bioenergy, which were intended to provoke discussion and debate. Through the group discussions the participants created clusters of the issue and information cards which they thought were most relevant or interesting, and which were then recorded by the dialogue organiser. After this each participant also had a chance to record their own preferences and state which issues they felt were the most important on an individual feedback form. Both the individual and organiser feedback forms were returned to the BBSRC, and in the case of the processes carried out in 2013 the findings were then analysed by Ipsos MORI.

This project attempted to challenge conventional ways of carrying out a public dialogue project by allowing those interested to elect to take part or run a dialogue project themselves, by running over a longer period of time, and by creating stimulus material which could be changed over time in response to the emergence of new research findings or developments in the bioenergy debate. It was also an experiment in changing how public engagement events could influence and feed into BBSRC management structures which were generally more sceptical about their value. In practice there were fewer bioenergy dialogues carried out than had been anticipated by the BBSRC engagement team, with most BBSRC-funded researchers generally unwilling to engage with citizens in this way and with professional dialogue facilitators running dialogues only when specifically invited to and paid by the BBSRC or BBSRC researchers. However, some of the BBSRC public engagement

team carried out a number of the dialogues themselves with one dialogue conducted by a University of the Third Age group, and there is still the potential for the materials to be used by a wider variety of groups.

The main criticisms of the Bioenergy Distributed Dialogue, some from Sciencewise actors, assessed it purely as a dialogue project. For example, pointing out that the citizen meetings were not long enough to provide the depth of deliberation necessary in a public dialogue, or that sessions overseen by non-specialist facilitators might produce abnormal results. However, since the production of an initial report and evaluation from the first phase of the Bioenergy Distributed Dialogue, the project has been used several times by Sciencewise as an exemplar of public dialogue and engagement and a possible indication of how dialogue methods could develop in future, in order to 'scale-up' or achieve deeper institutional change through dialogue projects.

4.4 Sciencewise pasts, presents & futures

Any account of organisational learning processes must also engage with themes of temporality, namely the role played by memory and imaginaries of the future in organisational activities and structures, and in directing learning processes. The idea of institutional memory was a central justification for Sciencewise's existence and role. For example the 2005 Council for Science and Technology report which stimulated Sciencewise's 2007 re-launch called for a repository of memory and best practice on public engagement in Government. Perceived weaknesses in institutional memory within Whitehall – including the 'churn' of civil servants around different departments, and policymakers' lack of ability to learn lessons from prominent controversies like BSE and GMOs – also provided important rhetorical justification for Sciencewise activities in many of my interviews. Several respondents argued that without Sciencewise it was highly likely that many departments would run repeat engagement processes very similar to those run a few years earlier, or would forget altogether about a crucial and relevant insight from an earlier public engagement process when it became relevant to policy. For example, '*institutional memory per se, regardless of what the topic is within government departments is appalling. So I can guarantee that someone would repeat the dialogue in 2-3 years' time rather than reflecting on what they learnt this year and seeing how… what the new*

question was that they needed to ask or whether indeed there was a new question that they needed to ask. Because simply holding on to evidence as dialogue and knowing how to use it intelligently in the future is a pretty difficult and new idea for people' (Sciencewise actor). There was also a specific concern that the severity and subsequent resolutions of previous public controversies, especially BSE, were being forgotten in Government, thus weakening the justification for public dialogue and other institutional innovations which a controversy might stimulate. For example, *'[t]here is a danger that, as crises fade, administrations forget the importance and the complexity of building conversations between scientific experts, policymakers and the public'* (document 140).

The idea of collecting, storing and disseminating 'best practice' strongly informed the layout of the Sciencewise website, stimulating the production of case studies and guidance documents, as well as arguably the thought leadership pieces. This perhaps also contributed to the tendency for Sciencewise to outwardly present a rigid and universal model and definition of 'public dialogue' whilst its practices of public dialogue were much more diverse. The conception of Sciencewise itself as a repository or producer of institutional memory had resonances with the broader Government and political debate around the time of this research about how to ensure Government was making 'evidence-based policy', as discussed in section 5.3.

Interview respondents identified multiple repositories of institutional memory in and around Sciencewise, each with different levels of accessibility to different actors and requiring different modes of translation into everyday activities. The most frequently referred to repositories were the online documents mentioned in the previous paragraph and the memories of individual actors – often those identified as playing a bridging role between different Sciencewise groupings. The routines and procedures described in 4.2, such as public dialogue commissioning or evaluation procedures, could also be conceptualised as repositories and modes of accessing organisational memory, as they were constantly subject to review and change incorporating the outcomes of and lessons learned from previous projects. There were also several identifiable narratives or stories shared between Sciencewise actors or smaller groupings during the time of research (discussed further in 4.6), which might also be considered as repositories and modes of transmitting institutional memory.

The social intelligence work was a central initiative under development during the period of research seen as bolstering the storage and translation of institutional memory both within Sciencewise and within Whitehall. One Sciencewise management actor justified the social intelligence work like this: *'as well as doing the open-ended deliberative stuff we were getting a lot of calls with people saying well "what do you know about how the public thinks about these things? Not just what it says but how it thinks" um… I think we realise that attitude and opinion research only has so much value unless you understand how people are thinking about these things underneath. So the social intelligence work we did was an attempt to, not just sort of map where the public was, but to… in terms of opinions, but to tease out some of the underlying reasons and values behind that, as far as we knew from the research, from social media and all the rest'*. So the social intelligence reports were not just about synthesising insights from Sciencewise projects, but also bringing these together with research from elsewhere. Furthermore, through this work Sciencewise actors hoped not only to present and bring together existing knowledge about relevant topics, but also to use this knowledge to identify broader trends and drivers which might be relevant to policymakers. This approach clearly advanced Sciencewise's advocacy objectives, positioning the programme as a mediator or knowledge-broker of public attitudes, but it also arguably represented an attempt to provide a new way of storing and translating relevant policy knowledge about the public. The social intelligence reports were necessarily brief, so also faced the challenge of synthesising a rich diversity of different information sources in a meaningful way. At some point in 2013 it was decided to make the social intelligence reports into mutable documents, which could be updated in the light of new research or comments from policymakers, and by 2014 several of the reports were in their third or fourth versions. Thus the social intelligence reports were a dynamic repository of institutional memory, able to respond to the production of new knowledge, but also to the changing needs and preoccupations of the present.

The storage and translation of organisational memory not only played a role in the mechanisms of learning and instances of organisational reflection described in 4.2 and 4.3, but was also important in more emergent developments during the period of research; with particular aspects of history being evoked in very different ways in order to provide justification for or to interpret events in the present. As described

in 2.1, controversies around the commercial application of genetically modified organisms in the UK were central to the original rationale for Sciencewise's creation, linked both to the desire to avoid such high profile public science controversies in future, and to the hope that better methods for public dialogue could be developed, so avoiding a repeat of the apparent failure of the 'GM Nation?' dialogue in 2003. Several interview respondents also cited the case of GMOs in justifying the need for an organisation like Sciencewise in Government, and the topic also came up in several of the management meetings at which I was present in a way that suggested it was a central collective reference point proving the failure of central government to understand or adequately address public concerns. It was also claimed to me several times in the context of these meetings and some interviews that, given relatively few resources and the support of relevant Government agencies, Sciencewise actors would be able to 'solve' the GM problem. Many Sciencewise actors involved in advocating for the use of public dialogue across Government also reflected on how the example of GM is one they often draw upon strategically in arguing for early public engagement around other science and technology policy issues.

During the period of research Sciencewise also came into contact with several other actors evoking the memory of the GM controversy and 'GM Nation?' in contrasting ways. At the 'Experts, policy and open policy' seminar (part of the Future Directions for Science Advice in Whitehall seminar series) Lord Krebs chose to focus his talk on what he saw as the failures of 'GM Nation?', asking how these could be avoided in future if and when an open policy model were adopted. His talk focussed specifically on how this dialogue process had engaged a 'biased' cross-section of the population – citing the 2005 Pidgeon et al paper as evidence of this – and how it had unnecessarily derailed a promising policy area, in which the UK Government had invested heavily. This made him sceptical about the further institutionalisation of modes of public participation in science policy decision-making. In contrast to this, the 'Which publics? When?' thought leadership paper and webinar, authored by Mohr and colleagues from the University of Nottingham, chose to describe 'GM Nation?' as a highly successful public dialogue project, in a move intended by the authors to provoke controversy and reflection amongst the intended audience. They argued specifically that the process had been successful in

engaging with multiple kinds of publics, from so-called 'activist' to 'latent' publics, and in having a clear influence on policy.

The past of Sciencewise itself was also evoked differently by different actors, depending on their interests and perspectives on Sciencewise's form in 2013. So for those (a minority) who felt the Sciencewise programme had become too big, losing sight of its original mission and possible connections, Sciencewise's past form (particularly from 2007 onwards) was coherent and close-knit, with clear shared goals and shared knowledge of activities. For those for whom increasing Sciencewise's visibility within Government was a central concern, past Sciencewise programmes were ineffectual due to their low profile. Increasingly during the period of research, Sciencewise actors attempted to publicly present a coherent narrative of its organisational history and context, partly related to attempts to position Sciencewise as a gatekeeper of open policy practices. For the first time, Sciencewise described itself not only as an institutional response to the Philips Inquiry and the Jenkin report, but also placed itself in a broader historical trajectory of the institutionalisation of public participation in many policy and administrative domains from the 1960s onwards. These narratives also drew direct links between the institutional developments of the early 2000s and the development of open policy practices (see section 5.2).

Sciencewise practices and discourses in the present, and interpretations of organisational history, were also co-constructed with prominent imaginaries of the future of Sciencewise and the futures Sciencewise could stimulate. The manifest central Sciencewise imaginary during the period of research – as laid out clearly in the programme aims – was a future where public dialogue was regularly used in an effective way as part of decision-making in a wide-range of policy domains. This was often expressed by Sciencewise actors in the apocryphal narrative that Sciencewise's central aim was to do itself out of a job, by making public dialogue an integral and everyday part of Government decision-making processes. However, in the short and medium term this narrative was undermined by a subtler imaginary of the increasing power and influence in Government of Sciencewise and its constituent organisations. Whilst this was sometimes expressed simply as a way to reach the eventual goal of removing the need for the Sciencewise programme, the imaginary of increasing influence was also in conflict with this goal in the ways it was

used to justify activities for the promotion of Sciencewise itself – including those which significantly strayed from discussions of what Sciencewise defined as 'public dialogue'. This also lead to the funding of public dialogue projects in cases where it was suspected that the Government department would have gone ahead with the project without Sciencewise support (and therefore projects which did not strictly require Sciencewise funding), in order to develop relationships as a basis for further influence and exchange. Underlying this were feelings of doubt, held by most Sciencewise actors, that policymakers would ever be capable of understanding and enacting public dialogue in way that they felt was authentic and democratic.

Overlaid onto these paradoxical imaginaries, there were also contrasting imaginaries held by different groups of Sciencewise actors about precisely how Sciencewise would ultimately achieve its goals. For some Sciencewise was understood as fulfilling a Government contract, something which it merely needed to do competently in order to have the desired effect. Others had a more political imaginary of Sciencewise's role, describing the programme as a change agent not only within Government but also within BIS. This meant that they felt Sciencewise could not simply fulfil the contract for the programme as it had been laid out, but that Sciencewise actors needed to be involved in normative debates about policymaking and democratic inclusion around Government, and also to play a subtler role in opening up conversations about the purpose and activities of the programme within Sciencewise and with the BIS Science and Society Team (Sciencewise's contract-holders).

4.5 The production of non-knowledge

The emerging agnotology literature proposes that no account of organisational learning can be complete without a consideration of the ways in which non-knowledge is produced and perpetuated through organisational processes and structures. In the case of Sciencewise, non-knowledge was produced both intentionally and unintentionally, through a variety of structures, sometimes within what had been labelled as learning mechanisms. A central concept driving the production of ignorance or non-knowledge was the construction of expertise about democracy, and public dialogue in particular. The creation and maintenance of this expert status was important to the justification of Sciencewise's existence and role,

and is particularly important in defining the status of the DES's. Though apparently distant from Sciencewise management structures and decision the DES's held immense power to define public dialogue and engagement *in practice*, through their direct involvement in and oversight of public dialogue projects and through their roles in training civil servants and other awareness-raising activities.

The DES's tended to view their expertise in facilitation and dialogue as a craft, something that was largely tacit and therefore could not be set down merely through guidance documents. This also supported a perspective, expressed for example in the DES team meeting I observed (field note 9), that public dialogue was something which others would either 'get' or 'not get', making it very difficult to correct perceived ignorance about the theory and practice of participation. Furthermore, there was a sense that many of the contractors brought in to run Sciencewise public dialogue projects did not truly get what public dialogue was about – this prompted efforts to improve guidance on project tenders and discussions about whether to offer training to contractors – yet most DES involvement in public dialogue projects was necessarily light touch, meaning that projects could not get the full benefit of their expertise. The skill of facilitation was something which DES's saw as central to successful dialogue, and something which they also used to distinguish their own expertise from academic expertise about public participation. Again this skill was seen as something which could not be distilled fully in guidance documents (though this was attempted e.g. document 69) or even in DES advice to project managers and contractors. Thus guidance documents and discussions instead tended to focus on seemingly banal practical aspects of public dialogue, such as finding a good venue and serving good food for lunch (field note 14).

The idea of knowledge about public dialogue being essentially uncodifiable was also evident in other parts of the programme. For example, it was a shared belief among many Sciencewise actors that policymakers would only understand public dialogue truly if they had experienced it. This meant that efforts were often focussed primarily on securing dialogue projects with new Government partners, even when Sciencewise actors had doubts about the design and framing of the proposed project. This dynamic was also reinforced by the relatively marginalised position of Sciencewise actors within Government, meaning that if they wanted a proposed

dialogue project to go ahead they were often unable to suggest any radical changes or improvements to the submitted business case.

The idea within Sciencewise of public dialogue as consisting of largely tacit knowledge or being undefinable had multiple effects. On the one hand it cemented the power of Sciencewise and its 'experts' to define and delineate the practice of public participation, for example, giving Sciencewise actors a special status to speak on behalf of 'the public' within Government and enabling a 'tyranny of method' (cf. Cooke & Kothari, 2001) where Sciencewise's apparently undefinable 'public dialogue' could be seen as a gold standard of public participation practice, to the denigration of alternative methods. Furthermore, the unknowable or uncommunicable nature of public dialogue meant that it was difficult for other actors or bodies to gain a similar expertise or status, or to have a say on the practice and definition of public dialogue, though other bodies were increasingly adopting a 'public dialogue' model during the period of research. On the other hand, the often unstated definitions of public dialogue (despite the prevalence of a basic stock definition of the practice) also created significant ambiguity and blurring around the definition of public dialogue in practice, where there were unacknowledged but diverse interpretations of the meaning of public dialogue by different people and in different contexts.

Another important dynamic in thinking about the production of non-knowledge within the Sciencewise programme was the necessity for brevity in project reporting, and relatedly the sometimes extensive chains of project auditing and reporting. Public dialogue projects themselves were of course designed to answer a very narrow set of questions defined by policymakers, and this framing influenced how the discussions amongst the participants were reported and what was reported. This framing also meant that in some cases it was clear that certain knowledge was deliberately not being sought. For example, during the period of research Sciencewise supported a public dialogue project in partnership with the Office of Unconventional Gas and Oil (OUGO) within DECC on the topic of shale gas extraction, something which at the time was the subject of much public and media debate, as well as high-profile public protests. This dialogue project did not ask its participants whether they agreed that shale gas extraction or 'fracking' should be part of the UK's energy provision, rather it just sought to explore how

people thought Government should engage with and compensate communities affected by the practice. This framing was justified within Sciencewise as fitting within the guiding principles, as the dialogue sought only information that would have a potential impact on Government policy and did not give participants false expectations by also encouraging debate about a policy area which had already been settled within Government. However, arguably this decision to perpetuate non-knowledge about public attitudes towards fracking (at the time there had been opinion polls, but no other deliberative research or processes) was also politically convenient for OUGO and DECC, avoiding the creation of information which would potentially provide further evidence of public dissatisfaction with Government policy.

Those charged with writing up project reports, usually the dialogue contractors and evaluators, often had little time to learn about the specificities and power dynamics of the policy issues they were feeding into. However, at the same time they were compelled to write pithy and accessible reports and summaries in order to increase their uptake and spread around Government, meaning that it was often likely that relevant knowledge from the public dialogue project might be left out or under-emphasised. These problems of inevitable brevity and selectivity within project reporting were further confounded by the layers of sub-contracting and audit within Sciencewise. Dialogue projects were usually originated by Government departments or research councils with guidance initially from the programme board and sometimes the DES's. The civil servants would then be responsible for appointing a contractor to carry-out the dialogue, with some oversight and support from a DES, and would then project manage the rest of the dialogue process, though often with little or no involvement in the actual dialogue events. The contractors would write initial project reports which the civil servants could interpret and use as they liked, followed by an evaluation report by the evaluators who would normally have been present at some of the dialogue events. The evaluation and project reports would then be synthesised by Sciencewise management team actors into a case study for the website. Thus while there were great variations in how public dialogue projects were managed, how much oversight the DES had, and how much interest and involvement the relevant civil servants had in the dialogue, it was often the case that there was no one person with a full

overview or understanding of all of the stages of the process. This meant that those involved in the process had divergent understandings of its purpose and context, whilst they were expected to report to one another comprehensively but concisely.

Another form of non-knowledge continually produced within and around the Sciencewise programme was the deliberate amplifying of ambiguities. For example, in their engagements with discussions about open policy, Sciencewise actors frequently used the tactic of exaggerating the level of ambiguity and vagueness in existing Government definitions of open policy, in order to advance their own versions (e.g. document 102). I also came across several examples of initiatives within Sciencewise where I felt ambiguity around their origins and purposes had been deliberately retained, perhaps to mask the full motives of the individuals initiating them, or to retain some diversity of understandings of the role of these initiatives. For example, although the shared story of the theory of change process was that it had been initially suggested by a steering group member back in February 2013, several of my interview respondents felt that there were other individuals who had played a prominent role in fostering ideas around the process and making sure that it happened. The maintenance of ambiguity was also important in the relationship between the partner organisations and private individuals involved in running the programme, in order to preserve the prerogative to make decisions and plans on their own behalf, and also to allow the continued co-existence of their sometimes contrasting long term ambitions for Sciencewise.

Several Sciencewise activities and practices were also characterised by a need to maintain secrecy or privacy about particular kinds of knowledge and information. For example, secrecy was written into the design of the community of practice, in theory to allow policymakers to discuss sensitive aspects of policy or to share challenges and failures from their projects. This secrecy prevented the generation of insights and contributions of new knowledge from non-policymakers such as dialogue practitioners within the community of practice. Secrecy was also a feature of many of the public dialogue projects because of the relationships of outsourcing that were involved. The supply of knowledge about public dialogue methods and approaches to contractors was deliberately limited in order to prevent any one contractor gaining a competitive advantage over others, including those who had not worked previously with Sciencewise. This is perhaps one of the reasons why

the contractors carrying out the horizon scanning public dialogue project were not made fully aware of the shared reservations that Sciencewise actors had about the horizon scanning process as a whole. There were also cases where sensitive policy information was shared with Sciencewise actors but not with the contractors carrying out the dialogue project, either because it was perceived to affect their neutrality or because the contractors were not trusted with the information.

The flow and availability of knowledge about perceived failures within Sciencewise was also limited due to secrecy concerns. For example, in 2010 after the high-profile collapse of a dialogue project which Sciencewise was supporting in partnership with the Food Standards Agency, there were many efforts within Sciencewise to understand what had gone wrong during the project, and how it could be avoided in future. This involved steering group discussions and the production of a 60 page report on the failure of the dialogue by a group of DES's. Yet whilst, several interview respondents referred to this report, it was not openly available to non-Sciencewise actors or regularly drawn upon internally, and there was no project page for the dialogue on the Sciencewise website. The failed FSA dialogue was discussed in only one of my participant observation periods (field note 9), when it was brought up by one of the DES's who had been involved in writing the report, but was not drawn upon explicitly in any of the discussions around the theory of change process. The failure of the project – though the dialogue had been abandoned on reasons of principle – was seen as a threat to the demonstration of Sciencewise's successes, impacts and value for money around Whitehall and therefore a threat to the continuation of the programme.

4.6 Changing narratives

The final dimension of organisational learning explored in this chapter relates to changes in organisational narratives and the creation of new narratives. The formal definition of Sciencewise's remit and mission – to *'improve policy making involving science and technology across Government by increasing the effectiveness with which public dialogue is used, and encouraging its wider use where appropriate to ensure public views are considered as part of the evidence base'* (document 2) – as initially laid out by BIS's Science and Society Team in the invitation to tender (document 52) for the 2012-2015 programme, was unchanged from previous programme contracts, and all

Sciencewise activities during the period of research were nominally aimed at fulfilling these goals. However, there was considerable ambiguity around how the goals were understood and put into practice, including a blurring of which programme activities were designed to fulfil which goals. Arguably the definition of Sciencewise's mission became more central to the everyday activities of the programme during this time, due to the reinvigoration of the programme with new partner organisations and the integration of a BIS representative for the first time into the management structure of the programme. The closer involvement of a BIS representative (Karen Folkes) in the everyday running of the programme however, also brought BIS actors more generally into more fine-grained discussions about the direction and priorities of the programme, allowing their perspectives to evolve and be influenced by others in the programme.

Interview respondents had a diversity of attitudes towards Sciencewise's aims, with some emphasising their continuity and consistency, for example: *'the objectives for Sciencewise at that point didn't particularly change, and so the the… um… the specification that came from BIS was… to all intents and purposes more of the same. What we've changed a bit is how that's delivered and who does what'* (Sciencewise management actor). Others expressed the desire to broaden or alter Sciencewise aims, for example: *'[w]ell one of the questions really is 'why just science and technology?'* (Sciencewise management actor). Some even saw tensions within the Sciencewise mission, for example: *'there's a tension at the heart of Sciencewise because it's a creature of government but what it's actually trying to do is take… take power away from government,'* (Sciencewise management actor).

Sciencewise's goals were defined as promoting the wider use of public dialogue across Whitehall and the research councils, and increasing the effectiveness of public dialogue projects within Government (document 2). The programme set about achieving these goals through three main activities: advocating the value of public dialogue in and around Government (addressing the first goal); capacity building within government, including the provision of training sessions and guidance documents (addressing both goals); and the doing of public dialogue projects (addressing the second goal). However, there were diverse understandings of these different kinds of activities within Sciencewise and some disagreements as to which category some of Sciencewise's activities fitted within. For example, several

interview respondents expressed confusion about the 'high-level networking' initiative, questioning whether it was intended as an advocacy or capacity building activity, and this was also a discussion brought out through the theory of change process. If high-level networking was about advocacy then actors wanted to know how its effectiveness could be monitored and measured, and if it was about capacity building many actors felt it overlapped too closely with the work of the DES's around Government. The debate around high-level networking also revealed internal discomfort about advocacy work which promoted Sciencewise itself, rather than public engagement in general, as this was an activity which had been explicitly ruled out by BIS actors in previous programme contracts. Through the theory of change process the purpose of high-level networking was clarified as an advocacy tool, distinct from the work of DES's, and it was collectively decided that raising awareness of Sciencewise itself amongst Government and other groups was a worthwhile way of fulfilling Sciencewise's aims.

More generally within Sciencewise during the period of research I identified a more tacit movement towards understanding the majority of Sciencewise activities in terms of their potential role in advocacy. This perhaps reflects the growing profile of Sciencewise in Government following the start of the 2012-2015 contract, as well as anxieties about the future of the programme beyond 2016, which was still seen as being precarious. The role and aims of the Science and Society Team within BIS was also under review during much of 2013, compounding this feeling of uncertainty. For example, public dialogue projects were increasingly selected and justified in terms of their role in advocacy rather than on judgements of their quality and substantive effects. Sciencewise actors therefore showed a preference for encouraging dialogue in high-profile policy areas or in cases where it would allow Sciencewise to build a relationship with a new grouping within Government, perhaps leading to a more effective dialogue project in the future. This gradual drift towards advocacy was also evident in understandings of the newly routinized thought leadership work, which emphasised the advocacy role of the pieces over their potential function in capacity building or in improving the practice of public dialogue, as discussed in 4.2. A typical justification of this growth in advocacy work, from high-level networking to social intelligence and thought leadership, was given in a May 2013 steering group document: *'[i]n order to be able to influence the*

development of policy involving science and technology, Sciencewise aims to be recognised as a key centre of expertise on involvement with the public' (document 18).

As suggested above, some central Sciencewise narratives and the changes to them were made explicit and codified through the theory of change process – though the official statement of mission and aims stayed the same. These included the increased importance of advocacy work, and in particular the permissibility of promoting Sciencewise itself. The theory of change process also resulted in the transmission of new organisational narratives, in particular the broadening of Sciencewise's stated aim and role as a convenor of public voices, not just a producer of public dialogue. This transformative narrative in reality had little effect on the activities and self-presentation of the 2012-2015 Sciencewise programme, but it was taken forward through the independent evaluation of the programme commissioned in mid-2014, which many Sciencewise actors hoped would go on to shape future programme contracts.

Conclusions

This chapter has argued that the establishment of a new Sciencewise programme contract in 2012, with new programme partners, was a central factor in the flows of knowledge and learning observed during the period of research, as well as the impediments to learning. The increased size and external visibility of the programme which came with the new contract introduced new opportunities and mechanisms for learning and reflection, by bringing more actors into the programme and improving its connections to other organisations, including Government. This also resulted in the increasing routinization of programme activities and the stratification of programme actors, presenting new challenges for the sharing and flow of organisational knowledge. Furthermore, the increasing focus of the programme on broader Government processes during the period of research, in particular the emphasis on advocacy work, arguably detracted from opportunities for more organised mechanisms for internal learning and reflection. However, it will be argued in chapter 5 that this more outward-leaning focus (though it mainly extended only to other UK Government processes) also produced important instances of learning and reflection in itself.

A focus solely on formal organisational learning mechanisms within the Sciencewise programme, as explored in 4.2, gives at best a limited picture of the processes of organisational learning and reflection which took place during the period of research. Furthermore, it was shown that many mechanisms which were apparently intended to produce organisational learning actually served other primary functions, such as audit or advocacy, in some cases undermining the potential for learning and reflection. A more organic attempt to follow processes of reflection, as identified during the period of research, in 4.3 reveals far more about important changes and shifts in assumptions and understandings within the Sciencewise programme.

This chapter has focussed on several specific aspects of organisational learning in more detail, namely: memory, imaginaries, non-knowledge, and changing narratives. These were all identified as important, yet relatively neglected, aspects of organisational learning in 2.4. Section 4.4 described how memory and future imaginaries are constantly reworked and performed through organisational decisions and processes in the present, affected by modes of storage and accessing, current preoccupations and concerns, and interactions with external imaginaries and interpretations of the past. Section 4.5 described different kinds of non-knowledge produced through Sciencewise learning processes, in particular drawing attention to the broader impacts of the new public management's outsourcing model on potential learning and reflection. Finally, section 4.6 described broader changes in organisational narratives occurring at a broader and more subtle level within the Sciencewise programme. By doing all of this the chapter presents a picture of Sciencewise as a complex and distributed organisation, a dynamic network of organisational spaces with multiple instances of cross-influence.

5

The politics of participation and learning: Sciencewise and British democracy

As a UK Government programme with an explicit mission to influence and work with diverse parts of Government, Sciencewise cannot be understood without reference to its broader national and political context. Emerging in a political context strongly influenced by the fallout from the BSE public controversy, and in a New Labour administration committed to deliberative modes of public engagement, during the period of research Sciencewise was operating against a very different set of co-ordinates, driven by austerity and a more antagonistic Coalition Government culture. Whilst the period of research coincided with a time of expansion for the Sciencewise programme, as well as growing influence and visibility around Government, this political context also raises questions about what effects changes in the broader democratic and science policy landscapes had on Sciencewise.

This chapter explores Sciencewise's organisational learning in the context of broader national-level changes in democratic structures and science policymaking, drawing again on participant observation, semi-structured interviews and document analysis as described in chapter 3. In doing this it seeks to address research questions 1 and 4 – '***What did Sciencewise actors learn from and about public participation in science policymaking in 2013?'*** and ***'What visions of the past and future of science and technology innovation, democracy and publics are at play in these learning processes, and what role do they play?'*** – but in a more expansive way than attempted in previous chapters. Sciencewise is considered to be in a co-productive relationship with this broader landscape of

governance changes, from civil service reform to renewed enthusiasm for evidence-based policy; seeking to influence the practice of government, but also being influenced by these structures and efforts in unexpected ways. Learning is shown to have political dimensions and larger scales of relevance. This is in line with the argument made in 2.4 that power and politics are not separate from or somehow corrupting influences on learning processes, but rather are an intrinsic part of them. The changes occurring within Sciencewise during 2013 cannot be understood without attention to changes in the broader political context and Sciencewise's attempts to engage with them.

The Sciencewise programme was one of many structures in and around Government at the time of research attempting to advance democratic inclusion and legitimacy. Many government departments and cross-departmental bodies drew upon citizen panels or similar models in aspects of policymaking and delivery. Large public service providers such as the National Health Service (NHS) drew upon multiple practices of inclusion, from the involvement of citizen representatives in oversight structures to deliberative consultation methods around specific issues. The use of Freedom of Information requests by citizens to gain knowledge of processes within Government was also growing in the lead up to the period of research. Aside from national elections, consultation procedures were the most widely adopted method for democratic inclusion, designed to allow input from interested parties concerning forthcoming policy decisions. During the 2007-2011 contract the Sciencewise programme had been involved in drawing up best practice principles for Government consultations, but during 2012 and 2013 these principles were reviewed by the House of Lords (document 130). Involve was one of the organisations which gave evidence at this inquiry (document 125), arguing for the need for genuine and prolonged public engagement around policy issues. Another important public engagement approach in Government, especially in the domain of science policy, was public opinion polling, which was nominally used to inform policymaking and implementation. The Science and Society Team within BIS who held the contract for the Sciencewise programme were responsible for conducting public attitudes to science surveys (originally labelled as public *understanding* of science surveys) every three to four years, in order to inform their STEM education

and public engagement strategies, and to understand public attitudes around key areas of science policy.

The period around 2013 also saw broader changes around meanings and structures of British democracy, from the emergence of the UK's first post-war coalition Government to the rising popularity of small political parties like the Green Party and the UK Independence Party. Whilst David Cameron's rhetoric of the 'Big Society' was short-lived, a discourse of localism persisted within Government, prompting developments such as the election of local Police and Crime Commissioners in 2012. The spectre of the 2014 Scottish independence referendum was evident throughout the period of research, both in the concerns of ministers to be seen to be making policy in-keeping with the wishes of Scottish voters, and in broader commitments to devolution in Scotland as well as discussions around devolution in other nations and regions. The independence vote also stimulated greater unease about conventional democratic institutions and practices, unsettling assumptions about meanings and forms of democracy in the UK. From 2012 onwards the restructuring and reform of the civil service was an important factor in discourse and practice around policymaking and implementation, as well as broader discussions about democracy.

This chapter begins by describing some of the most significant elements of the civil service reform agenda, detailing their impacts on Sciencewise and public engagement in policy more generally. Section 5.2 then focusses in on open policy, the aspect of the civil service reform agenda and broader Government imaginaries with which Sciencewise had the most engagement during the period of research, with transformative implications for the programme. Another key debate externally and within Sciencewise during the period of research was around the use of evidence in policymaking. This and its implications for the role and use of public dialogue forms the focus of 5.3. The chapter then moves towards a broader consideration of the national imaginaries of science policy and democracy which were at play during the period of research, exploring their possible implications for and effects on Sciencewise work, and drawing upon empirical examples of when Sciencewise and Sciencewise actors engaged with these imaginaries. The chapter concludes with a broader consideration of the changes in meanings and practices of

democracy during the period of research, using the concept of a 'constitutional moment' as a centrepiece for discussion.

5.1 Public participation and civil service reform

In June 2012 the incumbent coalition Government published the 'Civil Service Reform Plan' (document 122), laying out an ambitious set of changes to the structure, size, role and management of the British civil service. In his foreword to the document the then head of the civil service Sir Bob Kerslake summarised these reforms thus: *'[w]e will be a more open and flexible organisation. We will be more focussed, we will do fewer things, but we will do them better'* (document 122: 5). The main elements of civil service reform, as laid out in this document, were: the reduction in size and changing shape of the civil service; improvements in the civil service's policymaking capability (including open policymaking and making resources more closely match government priorities); a stronger focus on policy implementation; 'sharpening' Government accountability; strengthening civil service skills and organisational performance; and giving civil servants 'a modern employment offer'. It is evident even from the short forewords to the document, from Francis Maude, Kerslake and the Prime Minister David Cameron, that the reform plan aimed to address a diverse set of perceived problems in the civil service and Government, from distancing civil servants from the 'Yes Minister' stereotype of intransigence and external criticisms of incompetence, to mimicking the 'dynamic' work and employment practices of the private sector, and improving democratic legitimacy. Furthermore, all of this was part of a larger programme of austerity and radical cuts in Government structures and services.

Woven through the commitments in the Civil Service Reform Plan, and especially emphasised in the Minister for the Cabinet Office Francis Maude's foreword, was the desire to bring more Government business and information online – a measure which was seen as aiding cost-cutting and transparency concerns, as well as bringing Government up-to-date with developments in the private sector. This growing interest in online participation and engagement was perhaps more long-standing than other elements of the Civil Service Reform Plan, with some steps towards this already being undertaken by the previous Labour administration. The 'digital by default' strategy for dealing with Government information and services was

announced in 2010 and implementation began in 2011 with the launch of the new Government Digital Service, aiming to revamp department websites and experiment with modes of presenting and collecting information digitally. This championing of the digital agenda was also accompanied by enthusiasm for the democratising potential of online engagement and in particular social media, expressed for example in documents like the 'Civil service social media guidance' (document 132).

The civil service reform project coincided with the start of the 2012-2015 Sciencewise contract, whereby the Sciencewise programme made greater efforts to increase its profile and influence in Government. A particular target for Sciencewise actors, discussed for example in steering group documents (document 5) and by several interview respondents (especially management actors), was the Cabinet Office, due to its central role in defining changes in policymaking practice and in overseeing 'civil service learning'. It was hoped that given the changes in civil servant training called for in the reform plan, there would be an opportunity to make competencies in public engagement or dialogue a core part of the expectations and training of civil servants, giving Sciencewise actors a clear reason to engage in discussions around civil service reform. This hope also became codified as a key goal and indicator of success during the Sciencewise theory of change process in 2013.

Sciencewise used its thought leadership pieces in particular to debate various aspects of civil service reform, including open policy (document 102), digital engagement (document 103), and social media engagement (document 109). In 2013 an edited anthology (document 100) was also released as part of Sciencewise thought leadership work explicitly addressing debates around civil service reform and including contributions from some of the prominent actors involved, namely chapters on civil service reform, localism, evidence-based policy, and open data. The Institute for Government's programme director and former civil servant, Jill Rutter, also gave a talk at the first Sciencewise Community of Practice face-to-face meeting (field note 8) based on her anthology chapter on the relationship between civil service reform and public dialogue. As discussed in 3.3, Sciencewise actors also used their involvement in the 'Future directions for scientific advice in Whitehall'

seminars to develop relationships and discussions around key issues related to civil service reform, including open policy and evidence-based policy.

In her piece on civil service reform in the anthology, Jill Rutter noted that in the context of public dialogue in policymaking, civil service reform had *'the potential to cut two ways. First, it makes it harder to establish external relationships – fewer people, stretched thinner, in post for less time. Second, it makes the civil service more dependent on other sources of knowledge and expertise – whether in the Government's own delivery bodies or in academia or beyond'* (Rutter, document 100:11). The majority of my interview respondents and many of the actors who I encountered through participant observation expressed an ambivalent attitude towards civil service reform, with many inclined to be cynical about what it might mean for public dialogue and Sciencewise, despite the rhetoric of openness and devolving power. However, there was a strong emphasis, particularly in Sciencewise documents, on the *potential* for civil service reform to advance Sciencewise aims and agendas. For example, a steering group document (document 17) noted that the renewed focus on the feasibility of implementing policies and 'involving delivery experts' in policymaking was useful to Sciencewise, as it could be argued that public dialogue processes had been proven to resolve issues around policy implementation. Another steering group document (document 13) suggested that open data could also support greater citizen involvement in policymaking by improving citizen knowledge and understanding of key policy areas, and this was also underscored in the theory of change (field note 15), and in the anthology document (document 100).

As will be discussed in 5.2 open policy was also identified universally across the Sciencewise programme as an important and constructive way to reframe and enhance arguments for public engagement and dialogue around policymaking. Several interview respondents also framed the developments in the civil service reform plan as part of a broader positive shift and perhaps inevitable trend, which was rendering old ways of policymaking redundant. For example: *'there's a, there is a shift, you know, open policy, civil service reform, it's creating a change within civil servants, within policy-making, to consider more the… the views of the public, where are the public coming from on this. Er… and so for the first time…probably in its life I think for Sciencewise, we are um… at the limit of the available financial support for new dialogue*

projects' (Sciencewise management actor). Similarly, Jill Rutter's anthology contribution (document 100) suggested that the Government's broadening understanding of accountability was also a potential indicator of a greater willingness to engage.

On the more negative aspects of civil service reform, Sciencewise documents and discussions often highlighted the dangers of cost-cutting and austerity in reducing Government capacities for and willingness to carry out public dialogue or similar processes. Jill Rutter's chapter in the anthology notes that some Government departments had already experienced budget reductions up to 33%. For example one Sciencewise actor said *'I mean another thing that's really changed in terms of the projects is that… civil servants because of all the cuts to the civil service there's a lot of… civil servants have a lot less time, so everything is done at break-neck speed. So they decide they want to do something, it can take ages and ages to get to a point where they decide they want to do something, and then it has to be done in 6 weeks or something, and that's really different… and that makes funding very difficult'*. Theory of change documents also noted, *'austerity has created uncertainty and squeeze on public spending resulting in limited funding for projects and very limited capacity among civil servants to experiment with new approaches to policy making. Sciencewise funding requirements are sometimes seen as adding to these burdens'* (document 24). During the first Sciencewise community of practice meeting (field note 8) it was also noted that *'in the current environment you need to make a business case for everything you do'*.

There were also other worries or even perceived paradoxes related to civil service reform. For example, in the same community of practice meeting (field note 8) several actors highlighted the dissonance between the strong rhetorical push for openness across Government, and the ease with which in recent months David Cameron and other ministers had made announcements which clearly undermined stated consultation periods or other open processes. In the same meeting some also expressed worries that whilst civil servants were increasingly being expected to practice openness and engage with a broader set of actors in policymaking, it was unclear what resources or career incentives were in place to encourage or support them in doing this. A theory of change document similarly noted that: *'[t]here are no structural or career incentives for civil servants to undertake public dialogue: it remains a largely unrewarded risk'* (document 24). Another worry expressed by interview

respondents and in participant observation instances (e.g. field note 9) was that prominent and not fully worked through ideas related to civil service reform, such as 'contestable policymaking', could actually create competition for Sciencewise in carrying out public dialogue projects and undermine its position as the Government's expert resource centre for work around public dialogue and engagement.

5.2 Making sense of open policy

As described above, the emergence of the idea of open policy was an important element of the reforms enacted on the civil service under the UK's coalition Government from 2010 onwards, and was perhaps the most prominent idea to emerge around Government and policymaking during the period of research. Following the first elaboration of the meaning of open policy in the civil service reform plan (document 122) Sciencewise actors engaged in a number of experimental engagements with and interventions in the open policy agenda, with implications for the programme's position in debates around evidence-based policy and democratic inclusion. The opportunities for Sciencewise signalled by the concept of open policy were grasped early on in the 2012-2015 Sciencewise contract, with an introductory steering group document (only one month after the civil service reform plan was published) noting: *'[o]ne query that has arisen from the Government Office of Science relates to the Civil Service Reform Plan. Changing Civil Service process has the potential to have a major impact on the introduction of new initiatives such as dialogue. One particular focus in the Reform plan is "open policy" with a reference to getting wide public input. At present the mechanism mentioned for this is 'crowdsourcing'"* (document 3). A 2013 document laying out steering group priorities also recognised that *'[t]his agenda offers opportunities and challenges for the use of public dialogue and for Sciencewise'* (document 13).

Despite much internal scepticism about the Government's agenda, high profile discussions around open policy provided an opportunity and a ready audience for Sciencewise to restate the initial rationales for public involvement in policymaking, and to put forward its public dialogue projects as examples of best practice. Many Sciencewise actors also felt strongly that the concept fitted with their democratic values, as well as seeing its potential to exert influence in Government. Within

Sciencewise the open policy agenda was seen as a way to facilitate greater access to the Cabinet Office – a key programme aim as described in 5.1 – and to frame public dialogue and engagement activities as a central and necessary part of civil service work. Some of this engagement with open policy was done on an informal, ad hoc basis, drawing on the existing networks of members of the Sciencewise management structures, some of whom had connections in the Cabinet Office or the Government Office for Science, or were working with these bodies as part of other initiatives like the Open Government Partnership (which Involve was helping to run at the time). During 2013 Sciencewise also ran a public dialogue project in partnership with the Cabinet Office on the use of wellbeing indicators in policy, in part to demonstrate the value of public dialogue methods to Cabinet Office actors.

There was some concern that the open policy agenda would be interpreted in Government mainly as referring to digital engagement, something which might detract from public dialogue processes. For example, one Sciencewise actor reflected, *'I don't think any kind of proponents of digital by default have ever said that everything should be digital but they've… kind of the… it seems as though lots of those conversations seem to go in that direction and… this great new thing called the internet and everybody's going to be participating on it'.* This also led Sciencewise actors to take the digital engagement agenda more seriously themselves, considering how digital methods could be incorporated into public dialogue, through thought leadership reports (document 103), social intelligence (documents 110 and 119), guests at steering group meetings (documents 20, 22 and 23), and eventually the recruitment of a 'digital' DES (field note 15).

These informal relationships and private meetings provided the opportunity for some trial and error in how ideas could be presented and which arguments proved the most persuasive (cf. Pelling et al. 2008) but also resulted in more formalised Sciencewise activities. Initial contact with the Cabinet Office and other open policy advocates, for example by inviting them to steering group meetings, influenced some of the dialogue and thought leadership topics chosen in Sciencewise – namely a dialogue run on the topic of public views of open data, and a thought leadership report on digital engagement. Sciencewise also began to superficially adopt the rhetoric and practices of open policy, for example, demonstrating transparency

within its own organisational decision-making by putting meeting minutes and evaluation reports online, and incorporating the citizen group into its oversight structures. In 2013 when the programme decided to elicit external proposals for their next series of thought leadership reports, it was deliberately labelled as a 'crowd-sourcing' exercise, using a key buzzword from the civil service reform plan.

Gradually, through several interventions and iterations during 2013, a 'Sciencewise line' on open policy was developed which appears to have had some influence on broader Government understandings of open policy. Firstly Tim Hughes, a Sciencewise and Involve researcher, developed an internal position paper on open policy, exploring how the agenda had been laid out in the civil service reform plan and what links could be drawn with public dialogue. This paper then formed the basis of the talk given by the Sciencewise chair, Roland Jackson, at the Sciencewise hosted seminar 'Experts, publics and open policy' (field note 2), part of the 'Future directions for scientific advice in Whitehall' series. In this talk, Jackson strongly argued that policy could not truly be open without substantive citizen involvement, namely public dialogue.

These arguments were echoed in the Sciencewise thought leadership piece 'Windows or doors? Experts, publics and open policy' (document 102) co-written by the STS scholar Jack Stilgoe (a member of the Sciencewise steering group), Sciencewise's head of dialogue Simon Burall, and Tim Hughes. The piece retold the story of Sciencewise's development and the dual democratic and substantive functions of public dialogue in the frame of open policy, stretching the Government definition of open policy as collaboration with a broader set of actors and forms of expertise to include citizens. The authors also suggested that open policy should also be about open-mindedness to different responses and outcomes: *'[o]pening up expert advice means paying attention to, rather than obscuring uncertainty. It means opening up the inputs to scientific advice (who is allowed to contribute, how and on what terms?). It also means changing the outputs from advice, such that they do not offer single prescriptions but rather help to inform the range of available policy options'* (document 102). This perspective was also strongly expressed by some interview respondents, for example one Sciencewise actor said: *'[I see] open policy making and public engagement as being about a stance… as much as it is about a process or form, it's about… it's about the attitude you take to the world, are you standing there with your*

shoulders square and your feet firmly on the ground because you're ready for a fight, or are you standing there quite kind of loose and nimble and listening to what's happening and moving around' . This piece was also a chapter in the edited collection which emerged from the 'Future directions for scientific advice in Whitehall' seminar series (Doubleday & Wilsdon 2013, document 145). In these engagements Sciencewise actors also more subtly distanced themselves from definitions of open policy as competition and from the focus on outsourcing, which were also a strong feature of the civil service reform plan.

These documents, events and online interventions were part of an attempt to position Sciencewise as a gatekeeper of the definitions and best practice of open policy. Several key strategic moves were made here. Firstly actors emphasised the vagueness of other available definitions of open policy. The 'Experts, publics and open policy' piece states: "*Open policy-making' does not have a widely agreed upon definition and, as with all such terms, there is a danger of it meaning everything and nothing at once. Indeed, the Civil Service Reform Plan itself does not provide a precise definition, but sets out an aspiration to 'Establish a clear mode of open policy-making"* (document 102), and this was also a point made by Jackson in his talk at the 'Experts, publics and open policy' seminar (field note 2), and in his subsequent blog post (document 141). This was an important strategy in allowing Sciencewise to define the term itself. As one interview respondent put it *'nobody's really sat down and tried to work out exactly what open policy-making is or… well there's certainly no one view… so it's there to be shaped and Sciencewise should have I think some role in doing that'* (Sciencewise actor), and similarly another said *'still nobody knows quite what it means um… er… and of course that means there's quite a lot to play for in terms of trying to establish what it might mean or what it could mean, so we try to play our part in that, so that's still very much a process that's continuing'* (Sciencewise management actor). Secondly attempts were made to suggest equivalence between open policy and public dialogue. As one Sciencewise management actor put it, they were trying *'to take this view that Sciencewise does dialogue to the view, and you've heard us explaining it, that what Sciencewise is in the business of doing is open up policymaking to the public voice, through doing deliberative dialogue'*. The 'Experts, publics and open policy' piece drew this comparison out:

> *Both open policy-making and public dialogue share many of the same drivers, such as a shifting relationship between citizens and the State, and a changing role for Government in the 21st Century context. They both recognise, to a certain extent, that a top-down model of policy through central diktat is no longer sufficient and/or acceptable; both start from a similar position that policy and governance would be strengthened by the inclusion of a greater diversity of inputs and challenge into the process; and both are responding in part to the increasing complexity of society and the questions and issues that need to be addressed.*
>
> *Both are also arguably linked to the idea of democratised knowledge in that they recognise that a) relevant evidence and knowledge exists in many different forms and are held by those not previously credited with having something to offer, and b) knowledge, insight and evidence is much more readily available to everyone in a networked and globalised world.* (document 102)

Thirdly, they developed the embryonic idea from Government documents, especially the reform plan (document 122), of openness meaning more inputs into policymaking – for example, *'[o]pening up to a wider range of views undoubtedly strengthens the final policy, making it ultimately more effective and efficient'* (document 102) and, more strongly, *'Chris Wormald, Permanent Secretary at the Department for Education said, at the policy seminar held at NESTA on 8 January, that he saw open policy-making as about being open and about having different people making policy (e.g. IPPR or Demos). That, for me, does not go quite far enough, unless 'different people' explicitly includes the public'* (document 141).

A further tactic adopted by Sciencewise actors to underline their expertise and experience – and perhaps to promote reflection in Government – was to historicise open policy practices and ideas, presenting open policy as the latest in a line of interventions in UK policymaking aiming to make it better and more authoritative, from the creation of bodies like the Food Standards Authority following the BSE crisis, to the creation in 2004 of Sciencewise to make deliberative public dialogue an integral part of policymaking. For example, this line was strongly adopted by the academic Jack Stilgoe in his introduction to the 'Experts, publics and open policy seminar' (field note 2), where he spoke of the broader changes taking place in the civil service or being planned. He saw developments around open

policy as indicating that policy debates had moved away from the technocratic approach advocated in the 1980s, but felt that the current move had not been fully realised or described. In particular, memories of the BSE crisis and the findings of the subsequent Phillips Inquiry were strongly evoked in this event, in the thought leadership piece (document 102), and in the accompanying blog post which Stilgoe wrote for the Guardian's 'political science' blog (document 140), in part to underline the importance of institutional innovations around open policy.

In a definitional slide (see figure 5.1) used by the head of open policymaking in the Cabinet Office, Maria Nyberg, at the February 2014 event she co-hosted with Sciencewise, there seems to have been some influence from Sciencewise and other citizen participation advocates. For example, 'co-production' is listed as a method for 'engaging the full range of views', and 'collaboration' and themes of open-mindedness and humility are recognised in the statements in the background of the diagram. However, explicit talk of citizens remains absent, and themes of participation are marginal.

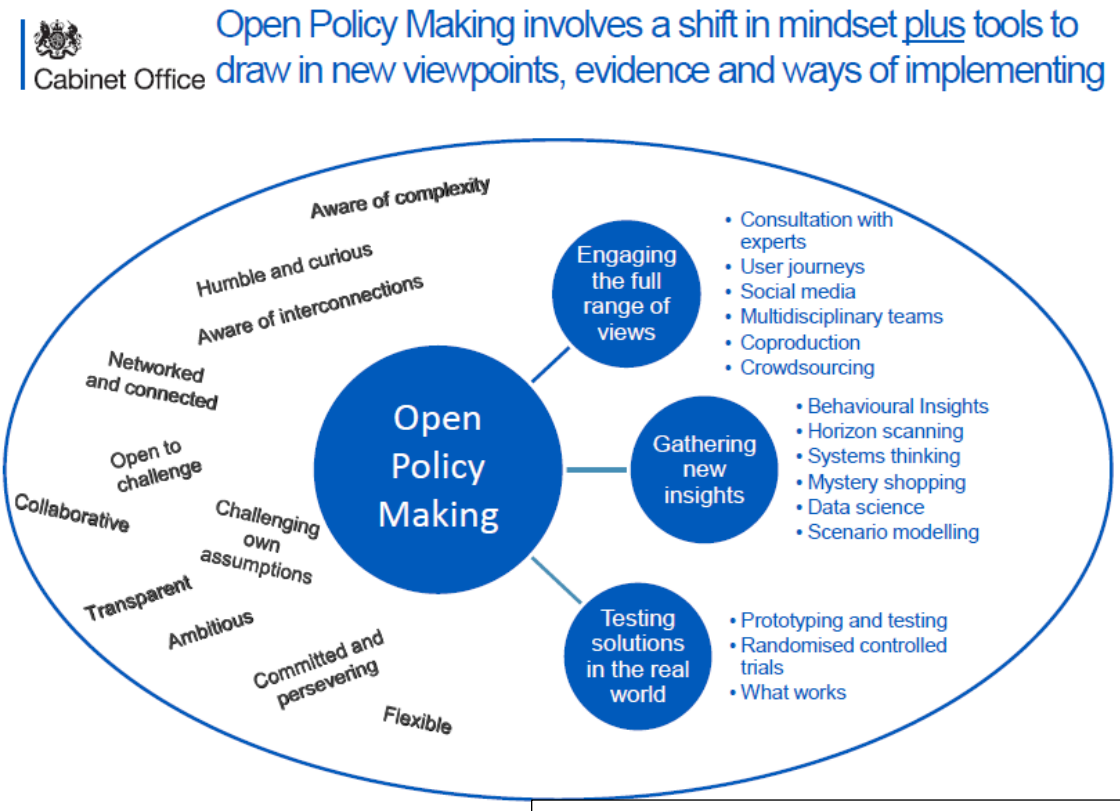

Figure 5.1: Open policy definition slide, February 2014

Interestingly, opportunities for citizen engagement and openness to challenging new ideas seems to have been further down-played in a later, more condensed version of the diagram, which was presented on the open policymaking team's blog in June 2014 (figure 5.2). With the only references to potential citizen participation methods being social media and crowdsourcing, both elements which Sciencewise actors had been keen to critique. Similarly to figure 5.1, the use of the word 'collaborative' on the diagram also potentially but did not necessarily imply citizen involvement in policy.

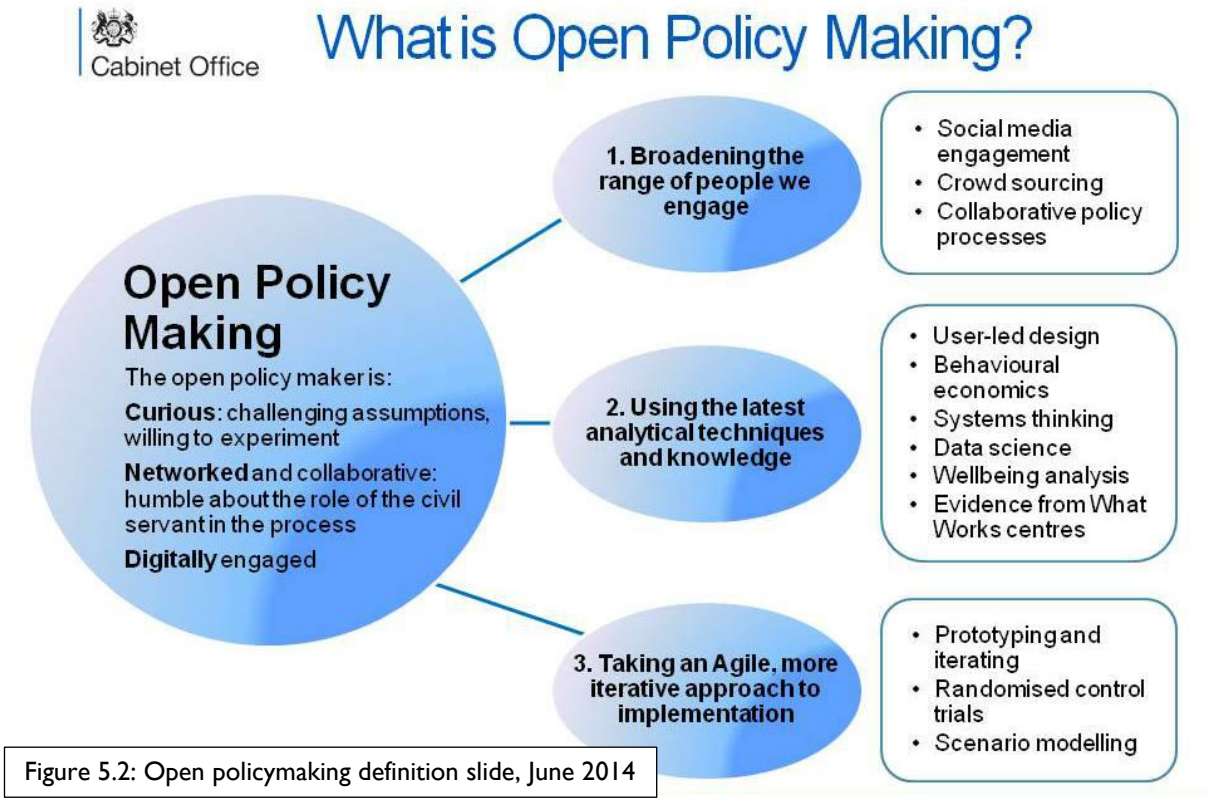

Figure 5.2: Open policymaking definition slide, June 2014

Almost all of my interview respondents felt that Sciencewise's involvements in the open policy debate had substantially increased the programme's profile and influence in Government. They also cited evidence for this claim, for example a 'policy stakeholder' was quoted in the 2012 Sciencewise programme evaluation (document 44) as saying *'[Public dialogue is] very important. And you may be familiar with the Civil Service Reform Plan. It has a renewed focus on open policy making, involving experts, public and other organisations. So there is impetus from the centre as well. … To improve policy outcomes and improve the communication of policy'*. The July 2014 version of Sciencewise's FAQs notes *'Public dialogue is increasingly being recognised as*

filling this evidence gap for policy makers and aligns with the Open Policy Making agenda of the Cabinet Office's theme of Reform in Action' (document 93). Open policy was also identified as the most important element of the Government context in Sciencewise's theory of change process. In February 2014 Sciencewise co-hosted an event with the Cabinet Office's Open Policymaking team for civil servants, presenting a number of Sciencewise projects (amongst other examples) as exemplars of open policy, and giving details of Sciencewise support available for future open policy projects (document 142).

Sciencewise's interventions in the open policy debate also resulted in changes within Sciencewise or in aspects of the programme's activities. In particular, by attempting to manipulate definitions of open policy Sciencewise actors also began to stretch their own definitions of public dialogue and the programme's role. One example of this is the increasing interest and investment in digital methods of engagement observed during the period of research. The 'experts, publics and open policy' piece (document 102) discusses not only the potential of public dialogue, but also begins to use the language of co-production[3] and co-design in laying out a vision of open policy. It also reflected on the multiple ways in which the Government can know and respond to public concerns and attitudes: *'current public dialogue usually involves a relatively small number of people at a particular moment in the development of a policy. At the same time as the dialogue is taking place, Government is collecting evidence to feed into the policy using a wide variety of methodologies and information sources. The challenge for the policy maker is to absorb and synthesise the vastly different forms of inputs that are required to make a more informed decision. To better understand the role of public dialogue in open policy-making, we therefore need to look at moves towards openness in a more conventional advisory setting'* (document 102, page 5). This excerpt from the minutes of a steering group meeting also suggests that Sciencewise engagements with open policy were also important in the shift towards defining Sciencewise's role as bringing 'public voices' into policymaking, rather than just public dialogue: *'[t]he use of the term "public voice" in several places in the document was queried – it may not be appropriate to claim that the outputs of a public dialogue are the (single) public voice. In response Simon Burall agreed that public*

[3] Co-production here is understood differently from Sheila Jasanoff's formulation of the co-productionist idiom (Jasanoff 2004a), to mean the making of decisions and services together with citizens.

dialogue is not bringing the (single) public voice to policy making. Rather the term was being used as shorthand in the context of open policy making, which can be seen as opening up policy to the public voice' (document 26). Some interview respondents also mentioned that they felt the open policy frame helped to make the case that Sciencewise need not be restricted to working just on science and technology policy issues.

5.3 Evidencing public dialogue

Having operated at a low profile for most of its existence, during the 2012-2015 contract the Sciencewise programme enjoyed greater recognition and policy influence both in the UK and abroad due to the involvement of better networked individuals in the programme itself, and also because of the opportunities afforded by the 'open policy' agenda. This resulted in Sciencewise undertaking more public dialogue projects and working with a much wider range of partners than at any point in its past, and its advocacy work around public dialogue and engagement was starting to reach central policy bodies such as the Cabinet Office. Previously regarded by most departments as a Government communications initiative, and institutionally treated as such, the programme's greater recognition in Government from 2012 onwards meant that it moved into more ambiguous territory in the minds of policymakers, sitting strategically but sometimes uncomfortably between debates about democratic engagement on the one hand and evidence-based policy on the other.

Debates about evidence-based policy were revived in the early years of the coalition Government, by prominent science advocates like Ben Goldacre and Mark Henderson, through broader debates about policymaking and the civil service, and in the run-up to Sir Mark Walport's inauguration as the new Government Chief Scientific Advisor in April 2013. For example, at the 'Broadening the evidence base' seminar at Nesta (part of the 'Future directions for scientific advice in Whitehall' seminars) Chris Wormald, the head of the policy profession for civil servants stated *'evidence is a 'Grade 1' issue for the civil service and it always has been'* (field note 1). This latest version of the debate centred on a strong perception that civil servants lacked the capacity – especially scientific and mathematical skills – to process and use evidence effectively. For example, a 2011 Institute for Government publication

noted a *'lack of culture and skills for using rigorous evidence in the civil service'* (document 124), whilst Henderson's widely read 2012 book *The Geek Manifesto* lamented the lack of politicians and civil servants with STEM qualifications. This view was to an extent wilfully perpetuated through the civil service reform plan (document 122), which referred to the programme 'Yes, Minister' several times – attempting to set the new model it proposes apart from this image and thus portraying civil servants as incompetent and self-interested humanities graduates – and laid out new requirements for building capacities and staff training. The other key feature of the evidence-based policy debate at the time was the focus on the 'robustness' of evidence used and the potential for using more quantitative and quasi-experimental methods in policymaking (e.g. documents 123 and 126). This argument responded to the rising prominence and perceived success of behavioural economics in Government through the introduction of the Behavioural Insights Unit, excitement about the potential for 'big data' to revolutionise policymaking and planning around Government services, and the strong promotion of the use of methods like Randomised Controlled Trials in policy areas like education and justice, both by advocates like Goldacre and by policymakers (document 123).

The momentum behind these arguments spurred the creation of the Alliance for Useful Evidence, a body run by Nesta which was a co-sponsor of the 'Future directions for scientific advice in Whitehall seminars', and the 'What Works' centres, a joint venture by Nesta and the ESRC on behalf of Government. The What Works centres were a flagship Government policy in 2013, which aimed to build on the success of the health body NICE (the National Institute for Health and Care Excellence, which was viewed as an exemplar of evidence-based policymaking) and apply quasi experimental methods in policy areas involving service delivery, namely: educational achievement; early interventions; crime prevention; and quality of life for older people (documents 126, 129 and 131). The Alliance for Useful Evidence and the What Works initiatives championed the inclusion of a much greater diversity of sources of evidence or kinds of knowledge in policymaking – in line with the concurrent movement towards open policy – but were also based on a rigid set of assumptions about what constituted legitimate and rigorous evidence or credible policy knowledge, and therefore how this knowledge should be used in policymaking (document 131). Most fundamentally, and perhaps unsurprisingly, both

initiatives adopted a positivist and quantitative framework in the way they thought about evidence, even in reference to topics in the domain of the social sciences. The phrase 'what works', which was commonly repeated by policymakers and advocates both in and outside of the context of the 'What Works' centres (e.g. field notes 1 and 5), also clearly reflected the politico-epistemological position that the evidence would lead to definitive, singular and lasting policy solutions, though some attempted to add nuance to this position (e.g. document 126).

Many of my interview respondents felt that there was a lot at stake for Sciencewise in these debates and initiatives around evidence-based policy. On the one hand many recognised that public dialogue had the potential to be considered as a much more central part of government business if it was viewed as a method of evidence-gathering for government policy. For example, Jill Rutter's contribution to the Sciencewise anthology notes, *'[p]ublic dialogue can be an important part of the evidence base for social policy and practice'* (document 100). In an interview exchange one Sciencewise actor with significant experience in Whitehall explained why they felt public dialogue needed to be regarded as evidence to really be taken seriously and remembered within Government:

> *'that's why this concept of 'is it evidence' is really important because the government departments do evidence-based reviews, I listened to a presentation a couple of weeks ago by [a cross-departmental body] but… I don't know whether thinking about what the public thought about the topic a few years ago would count as evidence. So we're back in that big circle of 'what is evidence? 'is dialogue evidence?' 'what is the impact on policy-makers?' 'what is the impact on decision-makers?'*
>
> *Me: So I mean, from your perspective dialogue is strengthened if it is seen as evidence in these processes?*
>
> *Respondent: Absolutely, yeah, absolutely, and that's a major cultural shift that would be required, by government departments, and particularly the strong scientific departments, because to be frank the only evidence that ever gets used is either pure science or economics'.*

This exchange captures the hope shared by many in the management and steering structures of Sciencewise that if public dialogue was categorised as 'evidence' it would therefore be dealt with by a government department's evidence and research team, giving it a higher status, more policy influence and a greater likelihood of being remembered than a project viewed as a communications initiative. For some this also meant that Sciencewise needed to reconsider how it presented, gathered evidence from, and evaluated public dialogue projects, for example using more quantitative measures, allocating more resources to evaluations, and adopting digital methods in order to satisfy requirements for statistical significance through 'scaling-up'.

However, interview respondents were also concerned that assessing public dialogue as evidence within Government frameworks which were overwhelmingly geared towards quantitative methods would lead to dialogue being dismissed as too anecdotal and not statistically representative enough to be considered as robust evidence for policy. The introduction to the Sciencewise anthology notes *'the issue of 'what counts as good evidence?' is contentious'* (document 100). Following on from this, in reference to the 'Experts, publics and open policy' seminar (field note 2), the anthology reflects: *'[f]or Jackson, this tension is between "more 'rigorous' scientific, economic and environmental evidence, to much more qualitative (and sometimes seemingly anecdotal) evidence from public engagement processes". Others would dispute such a tension. At a Sciencewise debate in the House of Lords, the chief social researcher at Defra, Gemma Harper, took issue with a dichotomy between 'science' and 'anecdotal' approaches, and sang the praises of a mixed-methods approach'* (document 100). My own reading of this exchange at the seminar (field note 2, and see section 3.3) was that Harper herself felt that evidence from public dialogue was often too anecdotal to be fitted into DEFRA evidence management and gathering frameworks, and that she had highlighted the barriers to understanding and integration between different forms of expertise, even in the multidisciplinary model DEFRA had just adopted.

These tensions were played out in the October 2013 Sciencewise steering group meeting I observed (field note 12) when the DEFRA Chief Scientist Professor Ian Boyd was invited to speak in the focus section of the meeting about his perspectives on public participation in policymaking. He based his remarks on a comment piece he had written for the journal Nature the month before (document

148), addressing the evidence-based policy debate from a scientist's perspective and exploring what scientists could do to make their research more policy-relevant. Boyd emphasised the need for scientists and policymakers to engage with the public and to take public views seriously, and he argued that it was part of democratic process to engage with and accept the apparently irrational or controversial views of democratic representatives (Boyd's Minister at the time at DEFRA, Owen Paterson, had recently made controversial remarks about climate change). However, the crux of Boyd's argument, in the paper and in the meeting, was that scientists had to be better at using statistical methods in their work, in order to avoid the creation and amplification of biases in their data, and to ensure the evidence they produced was robust and credible. When Boyd was challenged by several members of the steering group on whether he felt that Sciencewise produced 'robust evidence' in these terms, his response was that provided they used the right statistical methods to eliminate bias then it would be.

For several of my interview respondents this encounter encapsulated the challenges of getting those in Government to understand the nature of public dialogue and see it as a valid basis for policymaking. Several also expressed annoyance that Boyd had clearly not been fully briefed on what Sciencewise did before the meeting, preventing any meaningful exchange about the use of different forms of evidence in policy. Others felt that the meeting had been worthwhile due to a more subtle agenda of gradually introducing actors like Boyd to Sciencewise ideas and practices, contributing to a more diffuse movement around Government where 'one day' public dialogue might be accepted as credible policy evidence. Furthermore, one respondent felt that Boyd's remarks had moved between several contradictory visions of the public and public participation, some of which were more in line with the Sciencewise approach. It was also pointed out that having Boyd and his PA present at the lunch before the meeting had facilitated more informal interactions with Sciencewise management actors, discussing topics such as the impact that earlier public engagement around Bovine tuberculosis (a controversial policy issue at the time) might have had on the development of Government policy and on public reactions on this issue.

To me this exchange also revealed the strong power differential in debates about the use of evidence in policy. Despite their apparently superior expertise in matters

of public participation and engagement, Sciencewise management actors and steering board members felt unable to challenge the fundamental premise of and assumptions behind Ian Boyd's talk at the meeting. It was seen as more important to have him 'onside' but apparently confused about what they considered to be fundamental tenets of public dialogue, than to risk losing him as a potentially powerful advocate. A representative of the Government Office for Science was also present at the meeting to observe Boyd's presentation in preparation for a presentation the Government Chief Scientific Advisor Sir Mark Walport was making the next week on the topic of public engagement. Yet she did not have the chance to hear Sciencewise actors' perspectives on public participation, as she was only present for and interested in Boyd's talk.

Related to the prominence of the evidence-based policy and open policy agendas, there was an ongoing and unresolved debate within Sciencewise during 2013 on whether public dialogue was research or a democratic act. Due to their backgrounds in conflict resolution and stakeholder engagement, several of the DES's felt quite strongly that public dialogue should be viewed as a form of market research, as it only included those with no pre-defined stake in an issue and it was not aimed at resolving a particular state of affairs (field note 9). Actors who had more of an advocacy role within Sciencewise were more likely to emphasise the normative dimension of public dialogue, seeing it as a democratic trial or experiment which opened up a particular policy issue to citizen input and scrutiny. This view is also reflected more generally in Sciencewise's gradual drift towards a greater focus on advocacy, as described in 4.6. However, several actors were also willing to take a more interpretive or strategic view of this debate, recognising that at different times and in different contexts it would sometimes be appropriate and constructive for public dialogue to be viewed as research or evidence, and at some times it would be beneficial for public dialogue to be seen as a source of democratic legitimacy and accountability.

5.4 National imaginaries of science and citizens

As well as being caught up in and interacting with national level debates and organisational changes in Government around (science) policymaking and democracy, during the research period organisational changes and learning within

Sciencewise were also influenced by more diffuse visions and views. In 2.4 I adopted the term imaginaries (cf. Jasanoff & Kim 2009; Taylor 2002) to describe these collectively imagined forms of social life and order which also impact on decisions about governance and knowledge-making in the present. A strong and central imaginary at the time of research, something also noted in much STS literature from the past decade (cf. Irwin 2006; Jasanoff 2010; Stirling 2008; Wynne 2006), was the idea of the primacy of scientific and technological progress for human wellbeing and economic prosperity. This imaginary was reflected for example in the Government's decision in 2012 to protect the science budget amid broader austerity cuts, as well as the arguments made by various bodies in and around Government about the importance of retaining investment in science and technology. During the period of research the Chancellor George Osborne announced a new framework of the 'Eight Great Technologies' around which policy decisions within BIS and funding decisions in UK research councils would be guided. Within this framework was a tacit assumption that the technologies, which included big data, regenerative medicine and energy storage, were unproblematic social goods, which would also produce broader positive consequences and spin-offs. This imaginary also contained an implicit assumption that more and faster scientific progress was always a good thing, and therefore a concomitant desire to remove any barriers to this progress, such as public opposition. Such arguments were made particularly strongly around topics in the future of healthcare and the biosciences, seen to be areas of UK economic advantage and also as delivering relatively unproblematic social goods, namely a healthier citizenry. However, these areas also inspired public controversy at the time of research, for example around so-called 'three-parent babies' (mitochondrial transfer) or ongoing debates about GMOs, and made up a significant proportion of Sciencewise projects up to and including the period of research.

Sciencewise actors consciously engaged with the 'Eight great technologies' framework in a number of ways. Firstly, the first eleven social intelligence pieces Sciencewise carried out (documents 110-120) covered each of these eight technologies and some related topics, and explicitly aimed to create a resource for policymakers interested in public attitudes towards these science policy areas. This was supposed to immediately create a profile and audience for the Sciencewise

social intelligence work in Government, though I found little evidence of its impact during the period of research. Secondly, Sciencewise actors strategically sought to initiate public dialogue projects related to these topics, and between 2012 and 2014 carried out public dialogues on: open data and data management (linked to the 'big data' topic); bioenergy (linked to the 'synthetic biology' topic); and how Rothamsted Research should work with industry (also linked to the 'synthetic biology' topic, and the 'agri-science' topic). Public dialogues were also undertaken in closely related topics and policy teams, such as the stratified medicine and mitochondrial transfer dialogues, which engaged with some of the actors involved in making policy decisions related to the 'regenerative medicine' topic.

A second prominent Government or national imaginary at the time of research, and one closely related to the imaginary of scientific progress, was an imaginary of the need to avoid public controversies around science policy issues. This was a central imaginary in justifications for public engagement and dialogue, both in the institutional history of Sciencewise and similar ventures, and in the justification of new public dialogue projects, or debates about Sciencewise's continuing relevance. Furthermore, the apparent strength of this imaginary supports Jasanoff's (2005a) characterisation of British civic epistemology as still retaining an elitist and deferential character. Welsh and Wynne (2013) have described this imaginary as one of the public as threat. They identify a broad and early modality of this imaginary in UK governing institutions during and after the 1990s, with publics cast as a threat to rational science policy decisions, due to their apparent deficits in scientific knowledge (ibid.). However, from 2000 onwards they observe the emergence of a second modality of the public as a politicised threat requiring the careful policing and management of prominent activist groups for the purposes of state security (ibid.). The idea that early and in-depth public participation around emerging technologies and scientific issues will prevent future controversies from emerging was implicit in Government discourses about public engagement and in policy-facing Sciencewise documents. It was also something that some of my interview respondents and those I observed discussed as a sometimes deliberate and necessary strategy to justify public engagement to policymakers who they thought would not understand or appreciate broader arguments for public participation.

The strength of this imaginary was also illustrated and bolstered by the frequency and emotive power with which events around BSE and GM controversies were remembered by actors in and around Sciencewise, as discussed in 4.4. For example, in one of my participant observation instances I was present for a discussion amongst Sciencewise actors about the power in policymaking circles of arguing that public engagement could avoid a new technology or issue 'becoming the next GM'. Furthermore, this is also an imaginary that the 'Which publics? When?' thought leadership paper's authors sought to play with and challenge, in their reframing of 'GM Nation?' as a successful public dialogue process. The multiple and conflicting evocations of the memory of GMO controversies also hint at the potentially slippery nature of evoking the public controversy imaginary in support of public participation. For example, the way that Lord Krebs discussed the problem of public controversy around GM at the 'Experts, publics and open policy event' (field note 2), suggested that in his view public participation could increase controversy around a particular issue, because participants and the broader public were simply unable to engage with the complexity of the issue at hand. Therefore, for some actors the desire to avoid controversies might actually signal a need to limit public engagement with and input into certain areas of policymaking (cf. Jasanoff 2005a). Welsh and Wynne (2013) also note the apparent paradox in the growth of the imaginary of the public as threat at the same time as institutionalised procedures for public participation, such as Sciencewise, were being put into place.

This paradox highlights the broader difficulties encountered by Sciencewise actors in engaging with these imaginaries through their work, something which several interview respondents reflected on. On the one hand actors felt strongly compelled to show how Sciencewise thinking and projects complemented the scientific progress and public controversies imaginaries, in part to justify and gain support for individual public dialogue projects, but also to further secure the position of the programme itself, which was still viewed as being precarious beyond the end of 2016. There was a sense that, as discussed in 5.3, Sciencewise actors needed to get important and influential individuals like Chief Scientific Advisors or Ministers onside, and that this could only be done through an emphasis on consensus and shared agendas, which due to the power differentials at play generally meant Sciencewise actors accepting broader Government agendas. On the other hand

some Sciencewise actors, especially members of the steering group or those with a good overview of debates in Government, also recognised the potential for imaginaries of scientific progress and public controversies to undermine arguments for greater democratic engagement. For example, these imaginaries were often evoked in ways which saw the main role of the public as potential barriers to scientific and technological progress, a view often reflected in discussions at the CSaP horizon scanning workshop (field note 4).

As suggested in 5.2, a third prominent Government imaginary at the time of research was one about openness in government and policymaking. This was linked to the open policy pronouncements made in the civil service reform plan (document 122) and other statements from the Cabinet Office, but also had broader cultural resonances with transnational moves to openness in a range of domains, from academic calls for open access and open data, to hacker spaces or bodies like Wikileaks. Furthermore, this has been identified elsewhere as a significant trend in government, business and media discourse and practice globally (Bowles et al. 2014). This imaginary was strongly expressed and reflected on by most of my interview respondents, with some actors in and around Sciencewise even suggesting that the move towards openness was inevitable. For example, the 'Experts, publics and open policy-making' thought piece states: *'[b]ut beyond this, open policy-making is the explicit articulation of an inescapable trend in the future direction of policy-making and Civil Service reform. This is partly a result of changes in the expectations of citizens, and partly the result of technological changes, both of which mean that institutions are being scrutinised ever more closely'* (document 102). An interview respondent thought that *'the broader underlying… kind of, you know, movement in the world is towards more openness and participation and that people are much… they're kind of less willing to be deferential, they're less willing to kind of just let government decide. So it feels to me as though whatever actually happens with the immediate actions of Government, the kind of… the tectonic plate underneath is pushing in the direction of more open policymaking'* (non-Sciencewise actor).This suggests also that the openness imaginary provided more of a challenge to consistent features of British political culture and civic epistemology (Jasanoff 2005a).

As suggested above the precise meaning of openness in this imaginary was ambiguous and therefore highly contested, but it contained both ideas of

transparency and inclusion. Thus there were elements of continuity with the deliberative democratic and consensus-politics imaginary which characterised the Third Way approach of the New Labour administration responsible for setting up Sciencewise. Furthermore, there were clear fore-runners to these new objects of 'open policy' and 'open data' in the institutional innovations enacted by the Coalition and New Labour governments, including the use of focus groups in developing policy, but also legislation enabling freedom of information and the increased monitoring of government and media bodies (cf. Bowles et al. 2014). Arguably, even institutional innovations such as the large scale public inquiries which attempted to engage with infrastructural controversies of the 1970s and 1980s were an attempt to conduct science policy discussions in a more transparent way, even if most people's ability to actively participate was limited (e.g. Wynne 1982; O'Riordan et al. 1988). However, there were also several ways in which this more recent imaginary of openness was distinct. Firstly, the imaginary of openness was strongly influenced by ideas about and hopes for the new forms of engagement which might be facilitated by digital technologies, from collecting and analysing public attitudes expressed on social media, to enabling more in-depth online conversations between citizens and policymakers.

Secondly the openness imaginary developed and travelled through different transnational networks. Several of my interview respondents referred to President Obama's inaugural speech in his first term of office, in which he committed is administration to becoming the most open Government there had ever been (cf. Bowles et al. 2014), as an important spur for civil society action and for other Government's to adopt the rhetoric and practice of openness. For example, the Open Government Partnership used this speech as a central justification for its founding and role. Furthermore, in the attempts by organisations like the Open Government Partnership to articulate a vision of open government and policy which would be globally relevant and credible, they arguably adopted a formulation which most strongly reflected American political culture or civic epistemology. So instead of imagining democracy as a process of bringing citizens into policymaking and encouraging the generation of consensual outcomes, the openness imaginary emphasised the ability of all non-government actors to input into or influence processes of Government should they wish to and should they have the relevant

knowledge or expertise to engage (cf. Jasanoff 2005a). Thirdly, the imaginary of openness was not only about democratic practice and accountability, but there was also a strong vein of it concerned with improving policy practice, and bringing in new methods and expertise from business.

Historians of science have shown how embedded ideas of objectivity are in visual methods and culture. For example, Daston and Galison (1992) describe the emergence of the scientific ideal of communicating exclusively through photographs and graphs; of letting the facts be seen (in an apparently neutral and unmediated way) and therefore speak for themselves. Similarly, Porter's (1995) account of the growing power of statistics and other numbers as supposedly objective and self-evident policy objects, hints at a similar idea of needing a clear line of sight to ensure objectivity. Furthermore, Ezrahi (1990) suggests that European and North American political culture of the twentieth century has been closely built upon ideas of scientific objectivity and the supposed neutrality of machines, as a cultural resource to build the legitimacy of political actions. This promoted attempts to make political discourse and practice more technical and to move away from moral and normative questions. In terms of visibility, it was assumed that if the government machine was transparent, the actions of representatives would always be visible and therefore accountable, allowing the continual assessment of their competence.

Thus notions of transparency and openness are linked to a desire to ensure the objectivity and accountability (in a democratic sense) of political representatives, but also serve as ways of ensuring the objectivity (and therefore assumed quality) of evidence and knowledge claims in the political sphere. Looking at the imaginary of openness in this way highlights the links between moves to openness and debates about evidence-based policy, which may superficially appear to be quite distinct and even in conflict with one another. As suggested by some Sciencewise actors, this casts the discussion about open policy as the latest in a long line of innovations attempted to improve the democratic and substantive authority or legitimacy of policymakers, based on assumptions of objectivity and emotional detachment.

5.5 Constitutional moments in UK science policymaking and democracy

This chapter has described a number of significant transformations in and around Sciencewise in policy and democratic practice. Drawing on the discussion of the changing nature of democracy in 2.1 it therefore seems appropriate to ask whether the magnitude and nature of these changes qualifies the time around the period of study as a 'constitutional moment', similar to the two periods of democratic transformation which Jasanoff has described in the US context (Jasanoff 2011a). Jasanoff has described constitutional moments as relatively brief periods where basic rules of political practice are rewritten, leading to an alteration in relations between citizens, experts and the state (ibid.). She identifies two such moments in twentieth century US politics, namely: a pluralistic moment between 1940 and 1980 characterised by the enlargement of the public sphere to include new issues, viewpoints and actors in regulatory decisions; and a neoliberal moment from 1980 onwards characterised by a contraction of key parts of the state and a reversion to expert reasoning around important areas like bioethics. Jasanoff argues that both of these moments were stimulated by fears about future science and technology and abuses by the state, which were understood very differently at these different times. Thus, constitutional moments must be understood as deeply embedded within and arising from specific political cultures.

From Jasanoff's account I identify three key criteria delineating a constitutional moment: firstly, it results from collectively identified fears related to science and technology, and the perceived abuses of the state; secondly, it brings about some sort of reconfiguration in relations between the state, experts and citizens; and finally it creates lasting change in democratic structures and practices. With regards to the first criterion, Jasanoff herself in a later piece has identified a widespread loss of faith in government and ideas of (technological and scientific) progress across Europe, North America and the Arab world (Jasanoff 2012). This is I think supported by the broad sense apparent within the civil service reform and digital government movements that there is a need for governing institutions in the UK to evolve and alter their practices in order to retain legitimacy and credibility. Furthermore, for Jasanoff (ibid.) debates such as those around evidence-based policy which I described in 5.3 are part of a broader reversion to technical

procedures or fixes in response to the continual failures of the alliance between science, technology and democracy; supporting again the diagnosis of deep unrest around structures of democracy and policymaking. There were diverse ongoing debates and concerns around developments in science and technology, and crucially their governance, during the period of research, concerning, for example, data privacy and surveillance, GMOs in the food chain, futures of energy demand, supply and infrastructure, and the consequences of an ageing population created in part through improved healthcare and nutrition. The Scottish independence referendum, continual battles around the role and form of the House of Lords, and the role and organisation of local Government could also be considered to be symptoms of the specific British crisis of legitimacy and democratic governance.

However, there were potentially other prominent motivations for the democratic changes identified in this chapter. The open policy agenda can be understood in a very neoliberal frame as a story of yet more radical outsourcing of Government functions, with resonances with Jasanoff's second constitutional moment in the US (Jasanoff 2011a). In this understanding the constitutional moment is motivated perhaps not by the declining credibility of existing governing institutions, but instead by a (minority) ideological agenda which assumes the private sector is always preferable to the public sector. Furthermore, the popularity of outsourcing Government functions is driven by a desire to displace risks and uncertainties away from central Government, and onto less publicly accountable bodies. As Jasanoff points out (ibid.), neoliberal policies too could be considered chiefly as responses to perceived abuses by the state and embody a very particular view of scientific and technological progress.

In reference to Jasanoff's second criterion of a constitutional moment concerning constitutional reconfigurations, several of the democratic and policy developments described in the earlier sections of this chapter certainly have the potential to reconfigure relations between experts, citizens and the state. Civil service reform stimulated radical contractions in some parts of the state, following broader cuts in advisory bodies and regional governance structures at the start of the coalition Government's term in office. The digital government agenda also stimulated reconfiguration in creating a powerful new Government default, which stated that information about Government activities and decisions would always automatically

be made available, unless there were particular reasons to withhold it. In a more diffuse sense the open policy agenda has also reconfigured relations by creating new coalitions of civil society groups, for example around the Open Government Platform, the potential for a broader variety of experts to become involved in Government policymaking, and the potential for a greater variety of opportunities to become aware of and engage in decision-making processes.

Given that both of Jasanoff's constitutional 'moments' spanned several decades, a consideration of the more historical institutional developments discussed in 2.2 will be necessary to allow a full comparison. Whilst many of the developments observed during the period of research may appear incomplete and remain highly contested, they represented a significant departure from the reliance on technocratic measures and methods or structured public inquiry processes which characterised science policymaking in the UK up until the 1980s. In particular, whilst the public were still viewed as ignorant (Wynne 2006) or as a threat (Welsh & Wynne 2013) during the period of research, the rights of citizens to be involved in decision-making processes and to challenge their outcomes had been tacitly accepted and extensively institutionalised, with significant implications for relations between experts, citizens and the state. In this sense even the adoption of the languages of openness and participation, even where they are differentially interpreted or put into practice, seems to indicate a significant constitutional shift.

Attending to this larger temporal scale is also important in addressing Jasanoff's final criterion of constitutional moments related to the permanence of the constitutional shifts observed, as it is difficult to predict how many of the structural and discursive reconfigurations of citizens, experts and the state observed during the period of research will persist. The reduced size of the civil service will continue in the medium term, along with the digital by default agenda. However, open policy within Government is still nominally managed and led by a small open policy 'team' within the Cabinet Office, so it lacks institutional permanence. It is also unclear how long their central initiative, the Cabinet Office Policy Lab, will last and what broader effects it is likely to have in Whitehall. The future of Sciencewise itself is also uncertain, and it is an open question whether Sciencewise's new found level of influence in Government would remain if the open policy agenda is largely dissolved in future. However, when considered over the timescale of several decades, many

of the institutional features described in this study do appear to represent a relatively stable and distinct break from previous constitutional relations. For example, regular and substantive public participation has become a routinized and expected part of science decision-making (cf. Brown 2009; Munton 2003), and governing institutions are now expected to share a significant amount of information about their processes and effects to gain legitimacy and appear democratically accountable, rather than just being trusted on the basis of their membership and elite position.

In general, therefore, it can be argued that the institutional innovations and characteristics described and analysed in this study comprise part of a broader constitutional moment in British democracy, characterised by greater institutional transparency and openness to new voices and perspectives – though, clearly, there remain significant exceptions and notable examples of Government secrecy, especially around matters concerning national security. This also highlights important historical differences between US and British political cultures influencing the adoption and translation of this most recent set of institutional innovations around open government. In a UK political culture where 50 years previously citizen involvement in decisions around science and technology would have been almost unthinkable, recent moves towards institutionalising public participation and openness have created significant new openings for the expression and fostering of new forms of public reason. In a US political culture which had long been considered to be more open to challenge from citizen voices, the recent 'opening up' of governing institutions has arguably served more to erode procedures and opportunities for accounting for public voices and public reason (Jasanoff 2011a).

This study also adds a further dimension to Jasanoff's constitutional moments in highlighting the importance of shifts occurring at a much more fine-grained spatial and temporal resolution. Whilst the general institutional trend is towards greater transparency and citizen participation, earlier chapters have also shown the diversity and non-linearity of these organisational processes, and this chapter has highlighted significant ambiguities in the interpretation and implementation of objects like open policy. Furthermore, I have suggested that it is not only processes which are evident at the level of the state which are significant, but the micro-spaces of policy seminars, organisational meetings or even informal encounters

might also be important in spurring new ideas and practices. These more ambiguous and fluctuating practices will in some cases have meaningful and lasting impacts on institutions and policy decisions, for example in determining the future funding of bodies like Sciencewise or setting precedents for public involvement around controversial policy issues like fracking.

A further question to ask would be to assess if the changes described in British democratic structures and practices can support the creation of more just, inclusive and promissory futures, as Sheila Jasanoff argues they should (Jasanoff, 2012). For Jasanoff (ibid.) the ultimate success and appropriateness of these changes should be judged as an attempt to construct a collectively credible 'public reason' through institutions, practices, discourses, techniques and instruments. Her appeal to reason is not one which evokes classic ideas of rationality and utility, but rather an attempt to express the required intertwining of substantive and normative commitments within governance structures to create systems and objects which can at least temporarily hold things together in a way which is mutually accessible and credible. These are high standards for democratic governance in the so-called 'knowledge society', but 'openness' is potentially one idea around which such structures could be formed.

Conclusions

This chapter has shown how contemporary developments in policymaking practices and institutions act both to enable and constrain Sciencewise's organisational aims, and have diverse implications for processes of organisational learning. On the one hand, conversations around open policy, evidence-based policy and other reconfigurations in relations between experts, citizens and the state have stimulated and provided opportunities for organisational reflection and even experimentation, leading to changes in organisational assumptions and practices. On the other hand, these processes and their connections to prominent and persistent trends and imaginaries also had the effect of constraining and determining Sciencewise learning processes, from the question of whether public dialogue can be considered a source of robust evidence for policy, to the continual need to outsource Sciencewise activities to retain legitimacy and manage risks.

Many features of Sciencewise's management and approach, as described in 4.1 and 4.2 have much in common with what has broadly been labelled as the 'new public management' (Hood 1991), and furthermore, the developments around civil service reform and the open policy agenda discussed in this chapter could be considered as the logical progression of this style of governance. The new public management was identified by analysts in the early 1990s as an international trend in public administration with distinct forms and effects in the UK context (e.g. Hood 1991; Rose & Miller 1992). Broadly speaking, these authors described the trend as the importing of private sector logics and practices – namely the creation and use of markets (e.g. Hood 1991), the increased importance placed on the role of managers and management (e.g. Ferlie et al. 1996), and the increased use of procedures to measure and monitor success (e.g. Power 1997) – into public sector bodies and processes. Extending Foucault's theorisation of governmentality Rose (Rose 1993; Rose & Miller 1992) saw this move as characteristic of the era of 'advanced liberalism', in the state's attempts to govern at a distance through the authority of expertise and bodies removed from the state. Thus outsourced bodies, such as Sciencewise, would gain legitimacy and the ability to influence practice through their apparent neutrality from the interests of the state, but would have to regularly practice self-discipline and monitoring through audit procedures in order to appear accountable and retain legitimacy (Power 1997). However, in contrast to this Foucauldian analysis, which focuses on the effects of top-down structuring processes, my co-productionist approach would equally emphasise the potential for much smaller scale processes, such as the Sciencewise theory of change, to influence or disrupt trends of 'advanced liberalism'.

The rhetoric of open policy seems to take the new public management further by outsourcing yet more functions from the state – including the business of policy-making itself – and broadening the pool of bodies and 'expert' groups who can legitimately participate in governance. Furthermore, in several open policy practices, such as contestable policymaking or social impact bonds, the job of auditing practices is done through the market itself, measuring returns on investment. Related to this, Power (2007) has described the increasing importance of risk management as a practice in public organisations since the 1990s, characterised by a narrow and managerial definition of organisational risks and

attempts to rationally manage risks faced. He sees this as a new phase of audit culture (cf. Power 1997), requiring states, organisations and individuals to demonstrate the rigor and infallibility of their risk management processes, regardless of their effectiveness at avoiding catastrophic outcomes. This new expression of audit is also more clearly linked to neoliberal and entrepreneurial visions of organisational management which emphasise the positive potential of risks to boost innovation (ibid.). Furthermore, Power (ibid.) argues that it is precisely this attempt to organise in a way to control all potential risks which often prevents public organisations from recognising early warnings or learning from failures, and can lead to the creation of further risks through the unintended consequences of risk management. This instrumental approach to risk management is likely to reduce opportunities for more reflective organisational learning, precisely through this attempt to simultaneously know all risks and to deny uncertainties.

6

Experiments in science policy and democracy: exploring learning and reflexivity

Exploring the organisation a decade since its initial creation, this research presents a picture of Sciencewise as an established and long-running institutional experiment in democratic engagement and science policymaking. This institutional experiment has taken place against a backdrop of other institutional experiments, from civil service reform to changes in structures of research funding, as well as broader cultural changes in understandings of and assumptions about democracy and science policy issues. Furthermore, it is possible to identify several similar organisations and initiatives in the UK and beyond, attempting similar organisational experiments in governance practices, from the Cabinet Office's open policy team, to the NHS citizen project (in which Involve were a partner) or Mindlab in Denmark. Therefore there are potentially broader lessons to be drawn from this study of Sciencewise for other organisations and initiatives operating at the interfaces between science, policy and society. Amongst these lessons are insights into: how and what organisations like Sciencewise learn and what influences or limits this learning; how practices and discourses around public participation or democracy in the context of policymaking have changed; the relationship between such organisations and broader changes in democratic representation and policymaking; what has led to instances of reflection and reflexivity; and how more systemic processes and dispositions of reflexivity can be encouraged.

This chapter seeks to draw together the narrative of this thesis so far, and to summarise the perspectives ventured on processes of organisational learning,

organisations themselves and broader processes of reflection and reflexivity. This analysis will continue to draw upon my qualitative data collection and analysis and discussed in chapter 3, but also starts to consider the broader implications and interpretation of these findings. In doing this it offers synthetic answers to research questions 1-4 on the what and how of organisational learning, which then form the basis for an exploration of question 5 – '***Were there any opportunities for broader reflection and reflexivity, and what could be done to encourage this in Sciencewise and similar organisations?'***. In doing this, the chapter explores the key contributions of this thesis in: developing a perspective and insights on organisations engaging with science, policy and citizens and how they learn; offering empirical insights on recent changes and movements in UK democratic and policymaking practices; reflecting on the conditions and processes of institutional reflexivity; and bringing together literatures concerning practices of experimentation with theorisations of learning and reflexivity.

The chapter begins by bringing together insights on the characteristics of Sciencewise's organisational learning processes from chapters 3-5 with the discussion in 2.4 of ways of understanding learning processes. This leads on to a discussion of the different ways in which understandings and practices of public participation were organised during the period of research, with reference to literature discussed in 2.2 and 2.3. The remaining three sections of the chapter address research question 5, firstly discussing instances of and limits to reflection and reflexivity in and around Sciencewise during the period of research. This is followed by an exploration of my own attempts to engage with and intervene in Sciencewise in order to promote learning and reflexivity, and a consideration of what this experience indicates more generally about the promotion of a disposition of reflexivity within science policy and public participation organisations. The final section of the chapter returns to the discussion in 2.5 of connections between reflexivity and ideas about experimentation, considering the analytical and practical benefits of using the metaphor of experimentation.

6.1 Multi-scalar learning processes

A co-productionist account of learning, like that offered here, would emphasise concurrent changes in discourses, institutional structures, practices and identities at

multiple scales, instead of merely describing learning as the gradual accrual of new knowledge. My co-productionist framing also places an emphasis on learning realised in material, embodied and institutional changes rather than cognitive or discursive movements. In this section I draw out these features of the learning processes described in chapters 3-5, attempting to cover both processes which have been perceived as successful and unsuccessful, and to cover changes occurring both in and around Sciencewise. Thus far the thesis has described in detail several significant learning processes in and around Sciencewise at three different scales and with diverse characteristics. This section takes the analysis of these processes further by considering connections between processes at different scales (cf. Bulkeley 2005), and responding to several themes in the learning literature which were discussed in 2.4, namely: learning understood as changes in standards and classification systems; learning understood as the travel and adoption or translation of models and ideas; learning understood as a transformation of ways of seeing and engaging with organisational problems; and learning understood as changes in shared narratives.

At the start of the period of research Sciencewise's central organisational aim could have been described as upholding a standard of public dialogue practice (cf. Star & Lampland 2009). Sciencewise actors had a clear collective definition of what counted as public dialogue – a policy-relevant, deliberative, and facilitated process, bringing together experts and citizens, providing relevant topic information, lasting longer than a day, and providing information on public views which would be useful in policy decisions. The organisation promoted this standard through the production of guidance documents (documents 55-70) and the production of public dialogue case studies, through advice and training offered by DES's, and through auditing processes including independent evaluations (e.g. document 40) and oversight by DES's. This in turn produced a secondary standard of evaluation practice, which was promoted through oversight and guidance documents. During the period of research, however, as a result of the theory of change process, a number of 'non-standard' public dialogue projects, and more diffuse developments and contestations, the standard-ness of public dialogue became much more ambiguous, in that the possibility of standardising the practice had been called into question, and the desirability of public dialogue itself as a standard for broader

democratic practices had also been undermined. A complete change in standards was not observed during the period of research, and it is likely that that this change could only be realised fully in later contracts of the programme. So it is unclear whether these processes have entirely undermined public dialogue as an organisational standard, or whether it is likely to be replaced by another standard, such as 'digital engagement' or 'open policy', or alternatively a lack of central organisational standards of democratic practice.

Alongside the importance of standards, there were a number of key classificatory systems at play in Sciencewise during the period of research which underwent changes. Changing standards of public dialogue at the level of the organisation were also linked to broader contestations at the level of the state about what should be considered as robust evidence for policymaking and who should produce and broker such evidence. This contributed to the blurred organisational categorisation of public dialogue which flipped between treating public dialogue as a research project or more normatively positioning it as a democratic intervention. Whilst there was no definitive move from one way of categorising public dialogue to another during the period of research, this malleable binary categorisation was a source of tension and reflection amongst Sciencewise actors, and altered as it fed into different learning processes, from discussions about evidence-based policy to more targeted attempts to alter particular Government departments and states of affairs.

As discussed in 4.6 the classification of organisational aims changed during the period of research, with several activities being tacitly or explicitly reclassified as advocacy-based activities. The theory of change process also resulted in the reformulation of Sciencewise's organisational aims – for example, more explicitly stating the need for Sciencewise to advocate for its own role, and bringing out the aim of providing evidence for policy and to demonstrate the value of dialogue – and some shifts in their associations with key organisational activities – for example, linking mentoring and support work with civil servants to the aim of encouraging structural and cultural change in Government, rather than just the promotion of public dialogue (see figure 4.1). Furthermore, the classification system for Sciencewise activities also changed to incorporate new activities during the period of research, namely high-level networking, social intelligence (which was seen as

entirely distinct from thought leadership work, and thus dealt with through different teams and structures), and the promotion of the Sciencewise programme itself.

Linked to processes of learning and change at the level of the state, different science policy topic areas became more rigidly classified during the 2012-2015 Sciencewise contract through the organisation of Sciencewise DES's as 'account holders' for different Government departments or bodies, where previously they had been much more free-floating around Government. Sciencewise actors also made attempts to engage with dominant classificatory systems for science policy issues in Government during the period of research, for example engaging with the Treasury's 'Eight great technologies', and engaging in 'horizon scanning' work. However, moves from inside the Sciencewise organisational network to incorporate social science policy decisions such as the Cabinet Office wellbeing science public dialogue, and other public dialogue projects chosen on a more strategic basis, also acted to challenge classificatory systems of science policy issues, in line with a key issue discussed in the theory of change process: that the most important and controversial Government policy decisions were often those which transcended individual departments or singular problem definitions. These moves also involved challenging or stretching existing classifications within and around Sciencewise concerning what counted as a 'science policy issue' and what counted as 'evidence' for policymaking (see 5.3).

Related to the second set of themes derived from 2.4, during the period of research there were a number of ideas or models which travelled into and around Sciencewise and were translated, with various degrees of permanence and influence on broader structures. As well as being a standard, public dialogue was of course a model which Sciencewise was trying to promote and mobilise. There was some evidence that other bodies such as research councils or Sciencewise contractors were adopting or modifying the model for use in different contexts. Furthermore, through Sciencewise's greater visibility within Government during the period of research the idea of public dialogue also travelled further, for example being referred to in civil service or think tank documents, and discussed at policy seminars (e.g. field note 2). However, the discussion of non-knowledge in 4.5 also highlighted some of the limitations to the broader travel and adoption of public

dialogue as a model, and the travel of the outcomes of individual dialogue processes, such as the horizon scanning public dialogue. Despite the existence of a large body of informational and guidance documents it was difficult for Sciencewise actors to convey the complexity and tacit dimensions of the model in ways which were salient to different contexts like Government departments or market research companies, meaning that it was often relatively superficial and process-related elements which were able to successfully travel.

The outputs of the horizon scanning process, as discussed in 3.2, were in Latourian terms, inscriptions (cf. Latour 1990) through which Sciencewise actors and others involved in the process hoped the model they had developed and its outputs could travel and have influence on broader policy processes. This could also be seen as an attempt to create objects that could not only travel, but also scale-up certain ideas and processes to the level of the state. However, these inscriptions, namely the list of 30 pressing policy challenges relating to science and technology and the quadrant mapping citizen priorities (see figure 3.4), attempted to incorporate details from hugely complex processes and were communicating between several very different contexts, namely academic discussions, a public dialogue process, and the House of Commons. Thus the reception of the processes largely focussed on issues of taxonomy and appropriateness of context, rather than on the substance of the issues identified or on the broader challenge to Government modes of foresight intended by the process's architects.

Ideas and models which travelled into Sciencewise structures during the period of research were most notably the idea that there are multiple publics rather than a singular public, the concept of a community of practice, digital engagement and open policy. The idea of multiple publics travelled into Sciencewise through the 'Which publics? When?' thought leadership piece (document 101), and was also supported by the move to referring to 'citizens' rather than 'the public' in management conversations, discussed in 4.3. However, there were limitations to the ability of thought leadership pieces to change collective assumptions within Sciencewise due to their tendency to be directed more towards influencing Government and raising Sciencewise's profile. Some Sciencewise actors also defined their identity in opposition to academic approaches to and ways of thinking about public engagement, and thus were sometimes sceptical about the practical uses of

academic innovations like the concept of 'publics'. At a discursive level it appears that Sciencewise actors did begin to use the word 'publics' more in the way they described public dialogue projects, for example, and in the naming of the Sciencewise hosted seminar (field note 2) as part of the 'Future directions for scientific advice in Whitehall' seminar series.

The community of practice model was not viewed as an academic concept but rather as an 'off-the-shelf' tool, used in other Government and NGO initiatives, but was also seen as an idea which fitted with Sciencewise values and something which could foster closer relationships with civil servants. This model was translated and embedded largely unsuccessfully into Sciencewise during the period of research, in part due to a mismatch between the expectations of Sciencewise actors and the expectations of the civil servants they hoped to enrol into the community, and also perhaps because the model itself was not capable of fulfilling the function of bringing such a disparate and disengaged community together.

The digital engagement model was picked up by Sciencewise actors as a key part of Government agendas around public engagement and science policymaking, and thus the translation of this model into Sciencewise activities was enabled through meetings (e.g. document 23), thought leadership pieces (e.g. document 103), blog posts (e.g. documents 149 and 150) and more informal discussions, and resulted in the recruitment of a digital DES. Related to this, 'open policy' was not only a travelling idea in and around Sciencewise, but was also something which provided a bridge between process and accountability-focussed arguments from within Government and the more normative democratic perspectives of organisations like Sciencewise (or even between these competing views as they played out within Sciencewise). This meant that there was much at stake in the contestation around different definitions of open policy, in which different kinds of interests could be satisfied. However, in accordance with the third theme of learning as discussed in 2.4, it has been argued that emergent and contested objects can sometimes retain a level of diversity in their definitions which would allow them to straddle different social worlds. In this case open policy could be called a boundary object (Star & Griesemer 1989), productively retaining distinct and different meanings in the worlds of Whitehall and the activist community (to simplify this diverse debate), thus playing a different role in each. Its position at a boundary or at multiple

boundaries could mean that open policy was a point of highly fruitful conversations and learning between different domains resulting in new knowledge and understandings being produced. However, the multiplicity of meanings of the term would still risk unproductive miscommunications and interactions around the concept of open policy.

Open policy could also constitute a policy window (Kingdon 2003): a potential opening for a permanent change in discourses and configurations resulting from a particular event, debate or coalition of actors. The theory of change process also arguably created such a window within Sciencewise structures, for certain emergent ideas and challenges to the status quo to be realised. In this light, open policy was a potential opening for more radical ideas on openness, transparency and citizen involvement to be taken-up in policymaking, perhaps as part of the civil service's core principles, or to be promoted through the Cabinet Office's experiments in new modes of policy making. In terms of the more diverse settings outside Whitehall through which the object of open government may travel, Dave Guston, drawing on the work of Joan Fujimura (Fujimura 1992), has developed the notion of standardized packages (Guston 2001). In contrast to being a boundary object, which may merely sit on the boundary between different social worlds, as a standardized package the object of open government would hold the potential to more concretely transform practices as it travels around diverse settings of social and political action, not only in Whitehall. However, at the time of writing definitions of open policy do not appear to have been stabilised, and as discussed in 4.2 there were some indications that Cabinet Office actors were beginning to revert back to some of their narrower initial definitions of the term. Furthermore, there were some (at least temporarily) successful standardisations of the term open policy between the design community, policy implementers and Whitehall, through the idea of 'policy labs' (which did not explicitly call for citizen engagement but potentially included it), resulting in the creation of a Cabinet Office policy lab during 2014.

The introduction of the Sciencewise social intelligence work was arguably also the result of a change in ways of seeing and defining organisational problems, resulting from reflection and interaction with external ideas and processes. The work can be understood as part of Sciencewise's broader move towards more advocacy-type

activities as discussed in 4.6 to improve its profile in Government and to improve the chances of the programme being given funding beyond 2016. It was also a response to the strength of the evidence-based policy discourse in Government, and an attempt to counter accusations that public dialogue outputs were too anecdotal and small-scale to be meaningful, by amalgamating the results of several dialogue and research projects around a particular topic, and attempting to identify broader insights and trends. Finally the work built on the idea of Sciencewise as a repository of organisational memory for Government but also developed on earlier interpretations by linking to debates about evidence and attempting to create a malleable and constantly updateable source of memory.

In relation to the fourth theme of learning discussed in 2.4, chapters 3-5 have described a number of influential narratives which travelled through and were co-produced with Sciencewise structures and practices during the period of research (cf. Linde 2009). The narrative of Government reform, and in particular changes in policymaking practice, was influential for example in spurring engagement with open policy and the digital agenda. The narrative of the development of a rejuvenated Government approach to foresight had also been stimulated around the time of the civil service reform plan, and was something which Sciencewise actors and others attempted to build on through the horizon scanning process. However, this narrative does not seem to have been strong enough within Government to prevent the outputs of the horizon scanning process being dismissed due to their taxonomic mismatches and their architects having apparently insufficient knowledge of current Government horizon scanning processes. The narrative of the failure of the 'GM Nation?' dialogue was a long-standing one within Sciencewise, but was also one which was adopted and challenged by other actors in other spaces and at other scales. The narrative had an ambiguous and fluid relationship with Sciencewise activities and structures, sometimes used to justify them and support the practice of public dialogue, and other times used to undermine the practice of public engagement completely. A narrative which emerged within Sciencewise during the period of research, specifically through the theory of change process, was the narrative of Sciencewise enabling Government actors to engage with public voices. This narrative enabled Sciencewise actors to think more expansively about their role in science policy and democratic processes, and to have collective

conversations about what the programme's future aims and activities should be (cf. Gabriel & Connell 2010).

6.2 Spatial and temporal orderings of learning processes

As well as describing the diverse forms and outcomes of learning processes in and around the Sciencewise network, chapters 3-5 have also been concerned with the processes of ordering and organising which infuse them. To bring out the central role played by space and power within learning processes, as discussed in 2.4, this section considers the contexts and topographies of organisational learning in and around Sciencewise by exploring several ordering devices. The section starts by extending chapter 3's discussion of the characteristics of different organisational spaces and their consequences for learning to encompass new dimensions and new organisational spaces identified during the period of research. This then leads on to an analysis of imaginaries and memories as ordering devices at multiple interrelated scales.

Table 6.1 is a modified version of table 3.2, which presented a heuristic of the main characteristics of the organisational spaces described in chapter 3. The orange cells in the table are cells from table 3.2 which have been slightly altered in light of additions or challenges to the original stories told of these organisational spaces in chapter 3, from the analysis in chapters 4 and 5. There are also two new rows in the table (the blue cells) which directly draw on the analysis in chapters 4 and 5 to describe modes of accessing memory and dominant imaginaries in each of the organisational spaces, in order to further enhance understanding of the relationship between the characteristics of these organisational spaces and the kinds of learning that occurred with them. These additions and their implications for understandings of organisational learning will be discussed below.

	Management spaces	**Horizon scanning**	**Policy seminars**	**Community of practice**
Relationship to Sciencewise	Core business	Funded project	Peripheral	New/experimental initiative
Duration	Permanent	Temporary/ 1 year	Temporary/ 3 months	Recent/ potentially permanent
Key features	Regular meetings; formally defined roles; project tendering, management and evaluation routines	Three formalised workshops and reports	Five open meetings; high profile publications	Online community space; closed meetings; open webinars
Who involved	Permanent Sciencewise staff members; those with formal invited governance roles; limited invited guests & observers	Sciencewise programme board actors; invited participants in workshops & public dialogue	High profile science policy actors; those interested in debates around scientific advice/evidence in policy	Sciencewise programme management actors; government employees; through leadership contributors
Extent routinized	Highly routinized	Routinized elements	Open	Open but using set models
Response to failure	Evaluation/repression	None	Debate/discussion	Adaptation
Connected spaces	Formal Sciencewise spaces, Government discussions about evidence and policy	Sciencewise advocacy; government horizon scanning	Civil service reform; Sciencewise advocacy	Sciencewise thought leadership; Sciencewise advocacy
Responsiveness to other spaces	Constrained, but opportunities for new perspectives when visitors and citizen group members present	Constrained	Highly responsive to current policy debates, but a narrow vision of who or what should be involved in policymaking	Responsive, but closed to inputs not from civil servants and Sciencewise actors
Modes of accessing memory	Routines, documents, online systems, individuals	Expert elicitation/anecdote, documents/diagrams	Narrative/anecdote	Documents, individuals
Dominant imaginaries	More widespread involvement of public voices in policymaking	Contested/ambiguous	Evidence-based policy, Open policy	Sciencewise as key knowledge-broker

Table 6.1: Characteristics of organisational spaces, extended version

The analysis in chapter 5 suggests that although Sciencewise management spaces were mainly connected to other formal Sciencewise spaces, there were significant instances of cross influence with spaces of debate and demonstration around new policy practices, including open policy and evidence-based policy. This responsiveness was driven in part due to the interests and connections of some of the individuals involved in the Sciencewise management spaces, as well as the conscious decision to invite external speakers to steering group meetings, including NGO representatives, members of the Cabinet Office's open policy team and the DEFRA Chief Scientist Ian Boyd. The increasing concern with advocacy within management spaces and worries about the future of the Sciencewise programme also further motivated this connection to Government debates and agendas. The connections to the spaces of policy debates is evident in some of the decisions taken in the management spaces, including the appointment of the digital DES, the topics of many of the thought leadership pieces and some of the public dialogue projects, and the running of several events on topics like open policy. Despite this cross-influence between spaces the dominant imaginary in the Sciencewise management spaces remained the desire for the more widespread inclusion of public voices in decision-making, with new concepts such as open policy or digital engagement being interpreted through this imaginary rather than changing it.

The management spaces relied on a large variety of ways of storing and accessing organisational memory, from increasingly organised routines and procedures for core activities, to documents and individual memories, which were all constantly being drawn upon and transformed within meetings and everyday activities, to incorporate new experiences and perspectives or in response to external processes. In contrast, the horizon scanning space relied on relatively few devices for accessing memory, namely the knowledge and anecdotes of the individuals involved in the relevant part of the process, and a number of brief documents and diagrams which aimed to convey process outcomes. These sources of memory were arguably less malleable and adaptable to new contexts and circumstances, and sometimes even difficult to interpret out of context, contributing to some of the challenges faced in the process in creating meaningful connections between its constituent parts and the spaces of Government it hoped to influence. The dominant imaginaries in the horizon scanning space were also much more

contested or ambiguous, with those organising and orchestrating the process possessing a much more radical imaginary of policy change around practices of foresight than many of the individuals involved in the workshops themselves or in receiving the process's outputs. This ambiguity or clash of imaginaries perhaps also contributed to difficulties in travel and translation of key messages and concepts.

Whilst the space of the 'Future directions for scientific advice in Whitehall' seminar series was strongly connected to and responsive to the spaces of Government policymaking debates, as discussed in chapter 3, the analysis in chapter 5 also drew attention to what is potentially excluded from or occluded by dominant Government agendas around openness, digital engagement and evidence-based policy. Furthermore, despite the involvement of several academics and other non-policy actors, with the exception of the University of Sussex seminar the seminar series was very weakly connected to debates and agendas in UK academia, or spaces of civil society action and organisation around science policy. The domination of Government imaginaries of openness and (quantitative) evidence-based policy in the space, might also further explain why it was difficult to advance more challenging alternative perspectives which might have prompted more reflection about some of the seminars' main messages. The fleeting nature of the seminars themselves also meant that they were reliant on the narratives and anecdotes of the individuals present as a way of accessing memory, meaning that memories were highly malleable but also limited to the topics under discussion and the actors present.

Whilst the community of practice space could be considered a well-connected and responsive space within Sciencewise, the broader discussion of organisational processes and external influences in chapters 4 and 5 highlights again the multiple and potentially useful groups, such as practitioners and academics, who were excluded from engaging with and feeding into this experimental space. Furthermore, the main modes of accessing memory within the space were Sciencewise documents, or the memories of the individuals involved, meaning that the restricted membership strongly shaped the ideas and memories available to it. The low levels of participation in the community, even amongst members, also severely restricted resources of memory. The dominant imaginary of the space saw Sciencewise as a key knowledge-broker around the practice of public dialogue and public

perspectives related to science policy, with clear links to the strong desire within Sciencewise to promote its own image and profile. This imaginary does not seem to have been shared by the non-Sciencewise actors in this space, or it is possible that they were not sufficiently invested in the more foundational imaginary of the necessity for more public involvement in policymaking, contributing to the lack of participation in the space.

Table 6.2 presents a further modification to table 3.2 as it appeared in chapter 3, by considering four organisational spaces further to the initial spaces which were identified in the early stages of research. These are all spaces which featured prominently in the analysis in chapters 4 and 5, and which have some similar and some contrasting characteristics to the organisational spaces already discussed.

	Theory of Change	**Bioenergy Distributed Dialogue**	**Which Publics? When? Report**	**Social Intelligence**
Relationship to Sciencewise	Core business	Public dialogue project	Thought leadership report and community of practice webinar	Key part of advocacy work
Duration	One-off process	Temporary/ 2 years, with the potential to run further	Temporary/ 6 months	New permanent activity
Key features	Collective identification of organisational context, long and medium term goals, and key activities and indicators	Decentralised approach to running public dialogue using a downloadable card deck and feedback form	Report resulting from academic review work and open webinar presentation	Reports synthesising insights from earlier dialogue projects and other research
Who involved	All Sciencewise staff and oversight actors, external facilitators brought in to run a one-off workshop	BBSRC actors, some Sciencewise actors, independent facilitators, recruited participants and community groups	Three academic researchers, some Sciencewise actors, interested facilitators and science communicators	Sciencewise actors
Extent routinized	Novel but based on existing models	Building on and challenging existing models	Conventional thought leadership report	Highly routinized
Response to failure	Set up as a response to failure	Adaptive design, but did not anticipate low take-up	Invited due to earlier criticisms	None
Connected spaces	Sciencewise management spaces; Government discussions about policymaking	Other public dialogues; BBSRC research and management structures; Sciencewise management and evaluation spaces	'GM Nation?'; community of practice	Sciencewise thought leadership; Sciencewise advocacy
Responsiveness to other spaces	Highly responsive	Highly responsive	Responsive to broader Government debates	Responsive to Government agendas
Modes of accessing memory	Individual memories, collective discussion	The card deck, citizen workshops, feedback forms	Academic literature, stakeholder workshop	Documents
Dominant imaginaries	Greater Sciencewise influence in Government	Creating a large-scale and adaptive model for citizen involvement; challenging BBSRC management structures	Multiple and changing publics	Positioning Sciencewise as a key evidence-broker in Government

Table 6.2: Characteristics of organisational spaces, with new spaces

The theory of change space was a temporary space resulting directly from reflection and contestation in the Sciencewise management spaces. In this sense it was a highly responsive and strongly connected space, providing a bridge between Sciencewise everyday and management spaces and spaces of discussion and contestation around policymaking in Government. In common with the seminar series and community of practice space its novelty and temporariness contributed towards greater experimentation and reflection within the space, allowing for adaptation of practices through trial and error. Through accumulating insights during several rounds of discussion and refinement, and then a final whole team meeting to decide upon priorities, the space drew repeatedly on individual memories which were malleable and adaptive to context, but also needed to be viewed as credible and relevant to other actors in order to be included in the theory of change which was identified. Thus the process aimed to collect a diversity of perspectives which it then hoped to bring together to produce a degree of consensus on intended outcomes, which it seemed to have achieved in the December team meeting (field note 15, document 147). The dominant imaginary which was expressed and increasingly emerged from this space was one of Sciencewise gaining increasing influence in Government, also prompting shifts in other prominent Sciencewise imaginaries, such as the move from promoting public dialogue to promoting public voices, in part due to the incorporation of broader state imaginaries in the process.

The Bioenergy Distributed Dialogue was also a temporary and novel organisational space which had a much more experimental and reflective character than the first four organisational spaces considered in chapter 3. The space was designed to be highly adaptive, both to the results of the citizen deliberations and advances in bioenergy research, creating the (yet unrealised) potential for the dialogue be longer running and more influential than most Sciencewise public dialogues. However, the unanticipated low take-up of the dialogue kit amongst BBSRC researchers in more conventional scientific research spaces was more difficult to adapt to, but the BBSRC public engagement team managed to mitigate this to an extent by running several processes themselves and encouraging other practitioners who they knew to carry out the process in other locations. It was also hoped that the dialogue would influence BBSRC institutional structures in a broader way by

demonstrating the potential value of deliberative public engagement to senior management actors, and several of my interview respondents indicated that they felt the process had received a positive reception in these quarters. The reliance on the card deck and feedback forms as the main modes of accessing memory and communicating findings potentially limited the richness and translatability of outputs from the processes in a similar way to the horizon scanning space.

The 'Which publics? When?' thought leadership work was set up as a highly responsive space as it was commissioned based on earlier criticisms of Sciencewise public dialogue projects from the authors (e.g. Mohr and Raman 2012). The report and webinar responded to current Government debates about policymaking, and was also strongly linked to contemporary debates in the academic literatures. The space had a weaker link to Sciencewise spaces however, due to the authors' low level of contact with most Sciencewise actors and processes, and the tendency within Sciencewise to focus the promotion of thought leadership reports outward rather than encouraging discussion and reflection amongst Sciencewise actors. The dominant imaginary in this space was one of multiple and changing publics who could be engaged in science policymaking, and thus directly challenged dominant Sciencewise and Government imaginaries and assumptions which conventionally casted a singular public. The norm of representativeness, in particular, seemed to be a barrier to the travel and translation of the concepts the academics in the space were trying to promote, and the radical challenge to thinking about science policy which they posed.

The social intelligence reports constituted a novel but highly routinized and permanent organisational space which was set up to be responsive to demands for high quality evidence for use in policymaking. This was linked to the imaginary of positioning Sciencewise as a key evidence-broker in policymaking, though there was little evidence during the period of research of these reports being used in policy decisions or cited as an indicator of Sciencewise's expertise. The idea for social intelligence also came out of a connection to an earlier organisational space, in the shape of the Royal Commission on Environmental Pollution report (RCEP 2008), through the chair of the Sciencewise steering group Judith Petts, who had also been a member of the Commission. The social intelligence reports themselves were

created as a way of accessing institutional memory, but were intended to be more malleable and responsive to changes in context and framing than other documents.

There are further organisational spaces which have been touched on in the earlier analysis which could be discussed in this way including: the space of the retendering of the contract in 2011; Sciencewise evaluation procedures or other guidance documents; other public dialogue projects; the thought leadership space in general; and the nebulous discussions around open policymkaing. A lack of data prevented the incorporation of historical spaces like the 'GM Nation?' dialogue into this schematic, though the connections and imaginaries are evident, and there were similar limitations to the consideration of much more informal organisational spaces around the Sciencewise programme in this way (cf. Pelling et al. 2008).

6.3 Organisational reflection and reflexivity

Whilst research question 5 about instances and opportunities for reflection and reflexivity has not been explicitly addressed in chapters 3-5, several significant examples of organised and responsive organisational reflection have been described. This section will explore these examples of reflection and consider what they indicate about broader dispositions and processes of reflexivity in and around Sciencewise during the period of research. To do this I draw upon the potential characteristics of reflexive organisational structures suggested in section 2.5 based on the STS literature.

Sciencewise thought leadership work offered one such device for organised reflection through identifying and inviting perspectives from external actors with expertise in public participation and science policy, and by developing ideas emerging from Sciencewise public dialogue projects. However, as discussed in chapter 4 there was little collective discussion within Sciencewise of the meaning and implications of these thought leadership pieces beyond the programme board and the individuals involved in commissioning and drafting them, limiting their potential to stimulate deeper reflection. Though limited in scope and more focused towards self-audit, Sciencewise's public dialogue and whole-programme evaluation procedures were also formal and routinized processes which created opportunities for reflective learning. By continually assessing Sciencewise activities against stated goals, the evaluation processes provided opportunities for these goals to be

challenged and developed, and also for the identification of new challenges or practices. For example, during the period of research there was a collective view within Sciencewise (e.g. document 45, field note 9), resulting from the evaluation of the stem cell dialogue (2008) and the mitochondrial transfer dialogue (2012) that public dialogues often revealed a higher level of public acceptance of apparently controversial technologies than would be expected from media discourses, or the assumptions of policymakers. The approach to the whole-programme evaluation always involved interviews with relevant actors who were not part of Sciencewise, bringing in insights about changes in Government thinking about policymaking, or perspectives from the academic community.

It was also out of discussions around the whole-programme evaluation that the theory of change process emerged, the only process designed explicitly to foster reflection during the period of research. As detailed in 4.3, the theory of change prompted reflection about Sciencewise's overall aims and role, as well as its broader context, especially in the UK Government. This process fed directly into the prioritising of activities in the business plan for the final year of the 2012-2015 Sciencewise contract, and also influenced the terms of the whole-programme evaluation which was commissioned in 2014 from an external consortium. However, during the period of research it was unclear to what extent the more conceptual shifts which took place through this process had fed back into ordinary Sciencewise spaces and procedures.

Instances of more responsive organisational reflection also emerged during the period of research, often to take advantage of perceived opportunities or to deal with apparent organisational failures. For example, Sciencewise's initially ad hoc and increasingly formalised engagement with the open policy debate could be considered one example of responsive reflection, which had impacts on attitudes towards public dialogue within Sciencewise, as well as the programme's overall aims. The apparent failures of the horizon scanning process and the community of practice's online space also stimulated collective reflection within Sciencewise. Discussions about the horizon scanning process produced a shared narrative criticising its structure, and in particular the decision to place the public dialogue process after the expert workshop. Adaptive responses to a lack of engagement with the community of practice online space from a sub-group of Sciencewise

actors produced first attempts to boost participation through the site, for example through setting up polls, and then a considered decision to devote more time and resources to face-to-face meetings and webinars.

It was argued in 2.5 that reflexivity cannot be the result of responsive action only, but rather is a more conscious practice and disposition (cf. Stirling 2006; Wynne 2006). One potential reflexive capacity of science policy organisations which emerges from the literature (e.g. Stirling 2006) is the ability for organisations to consciously reflect on the nature of key organisational objects – in Sciencewise's case the public, democracy and the science policy issues under discussion – and furthermore to show an awareness of its own impacts on these objects. Whilst there is evidence of some reflection on the nature of the public within Sciencewise, through the 'Which publics? When?' thought leadership work and discussions about whether to refer to 'citizens' or 'the public' in official documents, there are few indications that these reflections altered assumptions and activities within the programme. Sciencewise's involvement in the open policy debate arguably also engendered reflection on the nature of democracy, and even on the implications of exclusively using public dialogue over other methods as a democratic tool. However, during the period of research there was little evidence that this had prompted the programme to procedurally redefine or move away from public dialogue as a central practice.

The extent of reflection on science policy topics was arguably much more context specific, depending on the topic itself, the partner institution, and the way the public dialogue project was being run. For example, there were certain topics such as synthetic biology or climate change which the Sciencewise programme had a longer history of engaging with, potentially leading to deeper thought and reflection, or the creation of connections with seemingly distinct topics, such as connecting the dialogue around flood responses to broader discussions around climate change. However, the focus on developing important relationships – for example, the wellbeing dialogue with the Cabinet Office or a public dialogue on the topic of leap seconds with BIS – or prompting methodological innovations – for example, the Bioenergy Distributed Dialogue – arguably detracted from a focus on the substance of science policy topics themselves and prevented deeper reflection within the programme. Furthermore, it could be argued more generally that as Sciencewise's

central aims were understood as the promotion and carrying-out of public dialogue projects, the science policy topics themselves were always epiphenomenal. The instrumental and audit-based approaches to evaluation of public dialogue projects as discussed in 4.2, and the richness of information and context lost through the chain of reporting on public dialogues as discussed in 4.5, also prevented the capacity for greater reflection on science policy topics.

A second capacity for organisational reflexivity could be the ability to acknowledge and live with uncertainties and ambiguities (cf. Gross 2010a; Wynne 2006). As discussed in 4.5, the prevalent practice of outsourcing in Sciencewise, and its related concerns for commercial confidentiality and fair competition, limited capacities for the acknowledgement of organisational uncertainties and ambiguities. For example, outsourcing relationships meant that Sciencewise could not be open with public dialogue contractors about uncertainties or ambiguities around current public dialogue projects or in their relationships with different Government departments, due to the sensitivity of some of these matters and to avoid one contractor gaining knowledge which gave them an unfair advantage. Similarly, it was not always in the interests of dialogue contractors to fully disclose uncertainties and ambiguities around their own processes, in case this harmed their ability to win future contracts for Sciencewise-funded dialogue projects or due to difficulties in their relationships with the Government departments for whom they carried out the work.

More generally, whilst Sciencewise actors and documents rhetorically acknowledged and drew attention to the essential unpredictability of public dialogue outcomes and also labelled this as a key reason why Government departments and bodies should do dialogue, this uncertainty was also de-emphasised in certain contexts. This was sometimes done to play-down the risks to Government (cf. Power 2007) of conducting public dialogue projects, and also sometimes to perform the expert status of Sciencewise actors, implying that programme actors could predict with a high amount of certainty (often in closed meetings, e.g. field note 9) what the public would say around a particular issue. Insecurities around Sciencewise's future funding and status within Government also sometimes worked against the acknowledgement of uncertainty and ambiguity, with Sciencewise actors feeling increasingly compelled to engage in self-auditing and quantification practices

in order to justify the programme's role and impact. There was a perception that such statements needed to be made with great certainty, given the austerity and risk-averse cultures in Government, and the drive towards quantification further increased the apparent certainty of trends identified or predictions made (cf. Porter 1995).

A third and related capacity for organisational reflexivity would be openness to unexpected events and the ability to deal with these and perceived failures productively, using them as an opportunity for learning (cf. Garud et al. 2011; Gross 2010a). The Sciencewise programme responded adaptively both to the failure of the community of practice idea and the much shorter-lived business engagement group, eventually shifting effort and resources towards other activities. The programme also evaluated or carried out internal reviews of virtually all of its activities, including more internally contested practices such as the citizen group and the high-level networking activity, in an explicit attempt to identify and account for unexpected developments or failures. Again, however, concerns about Sciencewise's reputation in Government and the future of the programme limited organisational capacity to acknowledge failure and absorb some kinds of unexpected events, due to the need for constant justification of the positive impact of the programme and the need to agree yearly business plans with BIS actors. One prominent example of this is the way that the failure of the public dialogue with the FSA was dealt with. Whilst several of my interview respondents felt that the event had re-emphasised the importance and role of the Sciencewise principles, leading to a subsequent review of those principles, there were no other notable changes in organisational commissioning procedures and definitions as a result of the failed dialogue. Furthermore, the report collaboratively written by Sciencewise actors following the collapse of the project is not widely shared or referred to.

A fourth capacity for organisational reflexivity could be the extent to which organisational actors are aware of and can create constructive connections with actors and processes external to formal organisational structures (cf. Pelling et al. 2008). Attempts by Sciencewise actors to take advantage of Government agendas from the civil service reform plan, observed throughout the period of research, suggested the Sciencewise programme had the capacity to do this. Furthermore, this capacity was potentially enhanced by the geographically and organisationally

distributed nature of the programme, with actors being able to draw upon insights and connections from their other roles and collaborations. Findings related to Sciencewise thought leadership and evaluation activities suggest that the programme's capacities to consciously learn from actors and processes external to the UK Government, such as academics, other practitioners, or NGOs were less well developed, though there was still clearly some cross-influence between these communities.

A fifth and related capacity for organisational reflexivity is the ability to respond to diverse forms of public reason and engagement (cf. Jasanoff 2012; Leach et al. 2005) whether or not they are formally accounted for in organisational structures. As discussed above, the high level of reflection within the programme during the time of research about the definition and practice of public dialogue, and the reframing of Sciencewise's long-term aim in terms of public voices, suggested that Sciencewise actors had become aware of other possible forms of public reason. However, arguably the main motivations for this reflection came from processes occurring within Government, especially civil service reform, rather than from expressions of public reason or alternative forms of public engagement itself, such as instances of social protest and public dissent. Sciencewise's selection of public dialogue topics and partners did, nevertheless, indicate a responsiveness to more 'uninvited' spaces of public participation and other forms of collective public reason. For example the choice of the topics of shale gas extraction and Bovine TB, and the initiative of partnering with Rothamsted Research, both had clear links to public protests and disquiet around Government policymaking. Furthermore, these were all dialogue projects which appeared to have been primarily initiated by Sciencewise, rather than the partner organisations.

A final capacity for organisational reflexivity discussed in 2.5 was the ability of organisations to reflect on and transform central aims and assumptions in the face of new experiences or unexpected events (cf. Bickerstaff et al. 2010; Wynne 2006). The most prominent example of this kind of conscious reflection on and change in assumptions during the period of research was the theory of change process, but a number of more diffuse and arguably less conscious shifts, like the move away from consensus as a key feature of public dialogue processes, were also observed. As discussed above, unexpected events or organisational failures rarely resulted in

deeper reflection on or transformation of assumptions or aims. This suggests that the theory of change process was quite an unusual organisational space within Sciencewise in terms of enabling greater transformation and reflexivity, and its temporary nature was therefore potentially a limit to future transformations which seemed unlikely to emerge from formal Sciencewise spaces and practices during the period of research. The temporary nature of the theory of change process also potentially limited the extent to which the transformations which occurred within it could travel and be translated in the context of other Sciencewise organisational spaces and processes.

6.4 Interventions and reflexivity at the science-policy interface

The analysis of moments of reflection and reflexivity in the Sciencewise programme above also has broader implications for other organisations at the science-policy interface or those attempting to orchestrate public engagement and participation. This section considers these broader lessons for how reflection and reflexivity can be deliberately encouraged within such organisational contexts and what this means for academics attempting to engage with or even intervene in policy organisations. To take the co-productionist idiom seriously requires an acceptance of my own role in the processes co-producing knowledge and governance around public participation and policymaking (and this is a strong tenet of the STS literature more broadly e.g. Hamlin 1992). The case of Sciencewise also illustrates the performativity of social scientific concepts and practices in the policy domain, requiring a relational and reflexive awareness on the part of the researcher, which forms part of the analysis rather than merely being a methodological discussion. Thus I begin the section by describing the motivation for and effects of my small-scale interventions in the Sciencewise programme highlighting and attempting to interpret this as part of the analysis, before considering broader lessons for organisations attempting to promote reflection and reflexivity.

As discussed in the conclusion to chapter 3, I had two formal opportunities to give feedback to Sciencewise. The first opportunity came in the December 2013 team day where I gave a brief presentation and hand-out (see appendix IV) with headline findings of my research. The findings given here were very much based on initial reflections from my 12 month period of ethnographic work, drawing heavily on the

ideas and concerns of many of my interview respondents, as well as being informed by existing perspectives from the academic literature. After fully analysing my data and working through these ideas further in earlier thesis chapters, I wrote a longer report aimed at Sciencewise actors and the independent evaluators of the programme in November 2014 (see appendix V) which presented more conclusive findings and recommendations. Both of these interventions were driven by a desire communicate my research findings honestly and in a way that would be relevant and persuasive to Sciencewise actors, hopefully influencing how they thought about learning processes within the programme. In doing this I also tried to find a balance between drawing upon existing proposals and ideas within the programme and introducing some newer but potentially more challenging ideas. The language of these documents was carefully chosen to draw upon organisational 'buzzwords' and avoid terms like 'reflexivity' which were considered by some of the actors I encountered as obscure and academic. I also tried to create some new buzzwords of my own, in the hope that they might capture the imaginations of some Sciencewise actors and also potentially to allow me to follow the travel of these ideas.

In both feedback documents I restated the rationale for the research project and emphasised how unanimously my interview respondents identified learning as key organisational process and goal. In my feedback to the Sciencewise team day I gave four recommendations, namely: 1) continuing *reflective practice* – drawing on a term and practice which was familiar to practitioners working within the programme, but also highlighting the need to try to continually and systematically encourage reflective learning perhaps through new or altered practices and procedures; 2) taking advantage of *third-party modest witnesses* – highlighting Sciencewise's long history of productive relationships with other practitioners and thinkers with interests in public engagement, but also pushing Sciencewise actors to think about how they could make the most of organisational practices like the thought leadership pieces for learning and reflection; 3) anticipating *dialogue futures* – I suggested that Sciencewise could draw on its new-found reputation and influence within Government to offer further leadership by engaging in anticipatory governance processes around public dialogue and democracy, something which I also hoped would build on some of the insights from the theory of change process,

and encourage the discussion of more diverse perspectives about practices of democracy beyond public dialogue; and finally 4) being open to learning from *shadow spaces* – I gave examples of instances where Sciencewise had learned from informal meetings or unexpected events and suggested that the programme should think about how it could ensure that these kinds of learning and reflection were more widely enabled through organisational processes and structures.

There was little evidence that Sciencewise actors directly drew on my recommendations and concepts in their subsequent prioritising of programme activities at the team day (e.g. field note 15, document 147). However, ideas about learning and conscious reflection were constantly returned to throughout the day, though they were often presented in the frame of evaluation or creating evidence of impact, suggesting that my feedback and presence at the workshop potentially had a small influence on the direction of discussions. In April 2014 a Sciencewise thought leadership report concerning public dialogue futures (document 107) was published, authored by an Involve researcher, along the lines of what I had suggested in my feedback, but without attempting a broader anticipatory governance process with other stakeholders. Nevertheless, this report provided a basis for future work in this vein, and could potentially be used as a justification for carrying out such processes in a future contract of the programme.

In the first draft of my longer feedback report for Sciencewise (which was intended also for broader consumption beyond the Sciencewise programme) I summarised six key findings and four recommendations. The key findings were: 1) Sciencewise programme actors all felt organisational learning and reflection was a key aspect of the programme's success, but organisational mechanisms and measures tended to focus on processes of learning external to the programme (summarising the arguments made in chapter 4); 2) the increased size of the programme had created new challenges for management and promoting learning within the programme, particularly highlighting problems with online knowledge-sharing systems and disconnections between the different management groupings (summarising the argument made in 3.1); 3) the increased focus on direct advocacy within the programme had both stimulated and limited organisational learning processes, for example the influence of Sciencewise's involvement in debates about civil service reform on the programme, but also the problems with framing reflective work like

thought leadership and social intelligence purely as advocacy tools; 4) there had been significant changes in the programme's approach to evaluation, in particular around the theory of change process, creating the potential for increased reflection and high-level learning; 5) significant instances of learning and reflection within the programme had been stimulated by unexpected connections and processes (similar to point 4 in my recommendations to the team day); and finally 6) the model of outsourcing the work of public dialogue, thought leadership and other activities potentially undermined opportunities for organisational learning (summarising some of the arguments from 4.5), which was my most challenging point.

The three recommendations were: 1) a repeat of the recommendation to Sciencewise to engage in anticipatory reflection around public dialogue, emphasising the potential for the programme to convene a high-profile process around this, drawing upon their existing thought leadership reports and other resources, as well as strong relationships with relevant government, academic and practitioner actors; 2) the need to create periodic organised opportunities for deeper reflection outside of normal organisational structures, like the theory of change process, given the significance of the theory of change process in collecting and generating transformations in organisational practices and assumptions; and 3) drawing on the potentially more challenging concept of 'experimentation' (as discussed in 2.5, but also linked to more popular discussions of experimentation around policymaking, e.g. Harford 2011) as a conscious disposition which could allow Sciencewise actors to reflect on and become more aware of opportunities for learning coming from unexpected places.

At the time of writing it was too early to assess the reception or influence of this feedback, but it is hoped that this will be a document which Sciencewise will share through the programme's website, and that it might also prompt deeper discussions with Sciencewise actors, either informally or through further presentations at management meetings. Through Diane Warburton, this document was also passed on to the team carrying out the 2014-2015 whole programme evaluation, which includes the geographer Phil Macnaghten. By creating a document which I hoped would be viewed as accessible and realistic, as well as with some imaginative elements, it was also my intention that this could be drawn upon if and when a new invitation to tender is written for future programme contracts.

From the analysis in this chapter and the recommendations given to Sciencewise, a number of more general conclusions and recommendations related to organisational reflection and reflexivity emerge. One argument which emerges from this analysis is that attempts to consciously encourage organisational reflection and reflexivity do not necessarily require the creation of entirely new organisational systems and practices. Instances of reflection and even reflexivity within Sciencewise were engendered by unexpected connections with external processes or by interventions by external actors. Thus, as I argued in the Sciencewise report, further instances would be most constructively fostered through an awareness of the potential for learning and reflection to happen in this manner, and a greater willingness to entertain the new ideas and practices which could potentially be adopted from diverse organisational spaces. This is also linked to the disposition of experimentation which I described in the Sciencewise report, which I see as encouraging organisational actors to be more conscious of opportunities for learning and reflection from new organisational initiatives or organisational problems and failures, by viewing them as iterative experiments (cf. Gross 2010a). At the Sciencewise team day (field note 15) a number of participants expressed the concern that a renewed focus on learning and reflection within the organisation would divert already strained resources away from core organisational activities, echoing a concern which would be likely to be shared by many organisations in and around government. Therefore, the argument that learning and reflection does not necessarily involve further investment of limited organisational resources, but is rather concerned with making the best use of organisational resources, connections and experiences, is also potentially an expedient one.

The financial and political pressures placed on organisations like Sciencewise, however, do clearly often function as a limit to learning and reflection, for example, preventing the open acknowledgement of failures, challenges, ambiguities and uncertainties, and directing much organisational effort towards the constant demonstration of organisational successes and impacts, understood against a narrow set of criteria. This also potentially limits the extent to which organisations are able to challenge dominant imaginaries, assumptions and practices, though this might be a vital component of conscious reflexivity and experimentation. Furthermore, there are likely to be other immovable organisational features

influencing capacities for organisational reflection and reflexivity. In Sciencewise's case these included the widespread practice of outsourcing programme activities, which was a much more general feature of arms-length government programmes at the time, and Sciencewise's position as a body run on short-term contracts and at an arms-length from BIS, rather than, for example, being a more central team somewhere like the Cabinet Office.

The example of Sciencewise also seems in some ways to confirm the apparent paradox discussed in 2.5 between processes of institutionalisation and formalisation, and processes or dispositions of reflexivity. The best examples of reflection and reflexivity in the Sciencewise programme during the period of research either came from unexpected sources like civil service reform or the Bioenergy Distributed Dialogue, or were the result of temporary initiatives like the theory of change process. More formal organisational spaces or processes, such as the management meetings or procurement and evaluation procedures were much more limited in their capacities to encourage and foster reflection and reflexivity, and even directly prevented these kinds of processes and dispositions in some cases. However, the above analysis has shown how closely connected these formal organisational spaces were to the more informal, experimental or external organisational spaces which fostered reflection and reflexivity. The theory of change process resulted directly from an intervention within formal Sciencewise management spaces, and fed into the creation of the business plan for 2014-2015. Insights into processes around civil service reform were translated into the Sciencewise context through steering group members and meetings, as well as the connections of Sciencewise management actors, resulting in formal activities such as events, public dialogue projects and thought leadership reports. The Bioenergy Distributed Dialogue emerged through Sciencewise's normal public dialogue commissioning and procurement procedures, before the potential for greater learning from the process became obvious to the majority of Sciencewise actors. This suggests that attempts to improve organisational capacities for reflexivity could fruitfully aim to enhance the connections between what we might broadly characterise as more institutionalised and more reflexive organisational spaces, rather than trying to change the characteristics of these spaces and structures altogether.

The analysis in this chapter, and my experiments with intervening in Sciencewise processes, also suggest a number of insights for academics engaging with organisations of science policy and democracy. My in-depth ethnographic engagement with the Sciencewise programme was invaluable in determining the form and presentation of my feedback. In particular, it gave me a good understanding of the kinds of organisational processes that my feedback could be channelled through, as well as giving me more opportunities to give feedback and try out ideas with different programme actors. My ethnographic understanding of the organisation also helped me to identify key organisational concerns and aims, many of which were tacit, leading me, for example, to play on the narrative of Sciencewise's increasing influence and profile in government and to build on the idea of Sciencewise as a learning organisation, but also to avoid becoming embroiled in the on-going debate about whether public dialogue was market research or a democratic tool. More broadly I was also able to sense programme actors' almost exclusively positive attitudes towards the theory of change process, despite some initial scepticism, allowing me to draw on the successes of this process in my recommendations.

The relationships I had developed with key individuals in Sciencewise were also useful in working out how to pitch my interventions, for example, with advice to steer clear of the term 'reflexivity' or discussions about the extent to which current organisational routines, like the approach to evaluation, might be open to change in future. The length and depth of my contact with the programme also enabled me to identify definitional differences and ambiguities, such as the tendency to view learning as a more instrumental process concerned with evaluation and evidence, or even to see it as a process that Sciencewise was encouraging others to undergo. This enabled me to ensure greater clarity around my own recommendations.

A significant challenge I faced in giving feedback to the Sciencewise programme was finding the balance between giving immediate and potentially impactful feedback and insights on organisational processes in action (which I was frequently called upon to do) and giving more considered insights following careful analysis and after the period of research when I had less access to programme actors and processes. Many more important analytical insights, such as the role played by the open policy debate and Bioenergy Distributed Dialogue in challenging organisational definitions

of public dialogue, or the work on competing imaginaries, were only fully worked through several months after the period of research. My recommendations during the period of research and at the team day were generally much more procedural, and much more based on ideas also expressed by programme actors themselves. It took longer than expected to develop the more substantive feedback document for Sciencewise actors, with the result that it was circulated to them more than a year after the period of research, when my presence and many of the processes I discuss might have been a distant memory, and in the context of some significant organisational changes which had occurred since the period of research with implications for learning and reflection which were difficult to assess from the outside.

6.5 Institutional experiments in science policy and democracy

The metaphor of experimentation was suggested in 2.5 and in my feedback documents as one way of developing perspectives on institutional reflexivity, foregrounding the coming together of ideas about the world with material interventions in the world, highlighting the need to empirically monitor the outcomes of these interventions, and hinting at a more iterative understanding of processes of democracy and policymaking. Furthermore, Sciencewise actors who I interviewed and observed sometimes referred to more temporary, novel and responsive organisational spaces as 'experiments' or as having an 'experimental' character, suggesting that this term had a similar resonance for them. The processes of learning and reflection in and around Sciencewise described in this thesis could all be understood then as instances of experimentation in policymaking between the parallel concerns of evidence and democracy. This experimentation was primarily focussed on meanings of democracy and democratic practice within government and on debates about the appropriate production, gathering and assessment of policy-relevant evidence. Studying such developments as experiments draws attention to their interactions with the broader governance system in which they resided and emphasises the role of surprise events or uncertainty and ambiguity in influencing how such initiatives played out. Furthermore, understanding the account in this way emphasises the insights of philosophers and historians of science that processes of experimentation have implications not only for the object being experimented with, but also the experimenting subject itself (cf. Stirling 2006;

Wynne 1993). For example, experimenting with the Bioenergy Distributed Dialogue potentially affected Sciencewise's approach to public dialogue as well as BBSRC structures and research programmes, and Sciencewise's experiments with the open policy agenda clearly impacted on Sciencewise plans and activities.

Whilst it is perhaps more straight-forward to understand Sciencewise's engagements with the Bioenergy Distributed Dialogue or the open policy agenda as experiments, as compared with other learning processes described above, there is utility in pushing the metaphor further. For example, the theory of change process could be understood as an experimental intervention in Sciencewise organisational structures: an attempt to imagine alternative ways of organising and orienting organisational activities, and to test how these changes would be received by actors in and around Sciencewise. Understanding the process in this way helps to describe the channels through which potentially lasting structural changes have occurred, but also suggests certain limitations to the experiment, including the scope of what was actually open to change within Sciencewise structures, delineated in the BIS contract and in various other ways, and the lack of involvement of oversight and decision-making actors like steering group members and BIS actors in the final stages of the process, potentially limiting the acceptability of outcomes. More broadly all Sciencewise public dialogue processes could be called experiments, but perhaps in a slightly different sense from that used by authors like Bogner (2011) or even Lane et al (2011). The care taken by Sciencewise DES's, and in some cases the actors commissioning dialogue projects, to set up advisory and oversight structures around individual dialogue processes suggests that at least in some cases dialogues were not just laboratories for bounded experimentation: actors were actually engaged in a broader attempt to shift or challenge institutional structures as an experimental intervention in influencing the evidential and democratic outcomes for policymaking.

Within all of these experiments or threads of experimentation questions of learning and knowledge have been closely entwined with questions of democratic governance. The attempt to experiment with creating a more inclusive and systematic mode of Government horizon scanning was undermined by arguments about the appropriate form and categorisation of futures knowledges from powerful actors. The restrictions around who could be involved in the

experimental community of practice limited the range of inputs and kinds of knowledges within the community, but it was ultimately sustained by processes of learning and reflection around Sciencewise's advocacy work. The experiment with the Bioenergy Distributed Dialogue was simultaneously an experiment in developing novel forms of knowledge-making and an experiment in developing an inclusive yet substantively informed model for citizen deliberation. Furthermore the experiment iteratively influenced knowledge-making and democratic structures both within Sciencewise and the BBSRC. Sciencewise's experimental interventions in the open policy agenda rested on the programme's authority as a broker of expertise and guidance on democracy and dialogue, but was also essential to Sciencewise in presenting public dialogue as a credible source of policy evidence.

Conflicts over and negative interpretations of these different Sciencewise experiments often rested on different perceptions of the appropriate scale of experimentation. For example, criticisms of the horizon scanning process focussed only on its methodology and direct outputs, and scepticism about whether the Bioenergy Distributed Dialogue allowed for a great enough depth of deliberation also focussed only on the immediate process. Therefore both sets of criticism conceived of the experimental system at a small scale, focussing on the procedure or event itself. But conceiving of them as interventions in a larger experimental system, at the scale of the Government approach to horizon scanning or the BBSRC's research governance, or even at the scale of the UK Government, gives the analyst a different perspective on the experiment's effects and potential influence. Due to the messy social processes going on around even tightly bounded experiments (cf. Dear 1995) it is important to understand the multiple scales at which an experiment operates to conceive of what can be learned from it and to draw attention to its multiple inclusions and exclusions.

As Matthias Gross's work has shown (see 2.5), the metaphor of experimentation can also be a productive one in terms of offering pragmatic guidance for those involved in the governance system, including attempts to stimulate organisational reflection and reflexivity. Viewing Sciencewise initiatives as experiments brings to light several possible ways in which the programme could seek to make the most of the diverse forms experimentation it is engaged in. Firstly, most of the experiments described in the thesis appear to have been pursued mostly for normative or

strategic reasons, rather than because Sciencewise actors were explicitly setting out to learn from such experiences. Thus, few direct and formal channels for learning were built into these experiments, which could have allowed both those included and excluded to register their responses to the experimental processes and outcomes. Where experiments were responsive, for example in the case of the adaptive community of practice or the explicitly ad hoc interventions in the open policy agenda, these were through informal mechanisms like the sense that certain key actors had of how things were going or through contingent and opportunistic uses of external projects and events. A more systematic, inclusive and formalised approach to monitoring such experiments and associated responses could have created more opportunities for such responsive governance and learning.

A more explicitly experimental approach to public dialogue projects would potentially help to create a productive bridge between public dialogue practice and Sciencewise's thought leadership activities. An acknowledgement of the experimental nature of public dialogue leads to the conclusion that methods of and modes of organising around public dialogues could be more consciously manipulated and monitored with an interest in the different consequences this might have for the shape of evidential and democratic outcomes. This work would not only potentially contribute to the more conscious evolution of public dialogue methods in practice, but would also provide material for Sciencewise thought leadership work in this area, building on earlier attempts to envision and provide leadership around public dialogue futures (document 107).

Conclusions

This chapter has offered an in-depth analysis of the substance, mechanisms, spatialities and temporalities of organisational learning processes, building on the empirical material discussed in chapters 3-5 and leading to a discussion of how reflection and reflexivity can be encouraged within organisations like Sciencewise. Section 6.1 discussed the different forms or mechanisms that the organisational learning processes observed have broadly taken, encompassing changes in standards and classification systems, narratives and understandings of organisational problems, and the travel and adoption of different models and ideas. Furthermore, this section

highlighted the constant interplay between the different scales of learning processes which chapters 3-5 are broadly organised around.

Section 6.2 explored the spatial and temporal dimensions shaping learning processes, by continuing the discussion of organisational spaces and their characteristics from chapter 3, but extending it to include new organisational spaces and new temporal dimensions, namely modes of accessing memory and dominant imaginaries of the future. This section demonstrated the co-productive relationship between organisational spaces and the kinds of learning processes which go on within them, and also moved towards some conclusions about the kinds and qualities of learning which are fostered within different kinds of organisational spaces, whether temporary or permanent, novel or based on old models and practices.

The remainder of the chapter addressed the topic of reflexivity, firstly drawing on the literature to explore different possible capacities for reflexivity and reflection which the Sciencewise programme and other policy organisations could embody. This discussion formed the basis for a broader consideration of the lessons for promoting reflexivity and designing academic interventions in organisations like Sciencewise. The final section developed the idea of experimentation as discussed in the literature review, and which formed part of my own interventions in Sciencewise, as a potential metaphor both for encouraging reflexivity and reflection, and for understanding attempts to promote them.

Through this the chapter has built a picture of Sciencewise as a learning assemblage (cf. McFarlane 2011a), made up of diverse but connected organisational spaces, feeding into and shifting as a result of organisational learning processes. Power relations, active spatialities, and multiple temporalities are woven through this assemblage, and are inseparable from the learning processes which result. Furthermore, the analysis in this chapter suggests that concerns about institutional reflexivity and reflection might be best addressed through attending to and understanding the ways in which different organisational spaces are connected and influence one another.

7

Conclusion: telling stories about science and democracy

Any attempt to identify and trace a learning process, like this thesis, is an act of story-telling. Certain connections or lines of causation will be emphasised and others ignored in order to create a coherent and useful narrative. Drawing on qualitative data collection and analysis through a multi-sited ethnography approach, the thesis has told multiple interconnected and multi-scalar stories of learning about democracy and policymaking, placing emphasis on the contrasting contexts and forms of these learning processes. A further story has been told about the research process itself, about my role as researcher in the processes studied, and the role of social scientific concepts and practices in promoting organisational reflection and reflexivity. This chapter aims to further explore and reflect on the act of story-telling this thesis has embarked on, revisiting the research questions and objectives listed in the introduction, and addressing several further questions raised by the subsequent chapters. In doing this I outline the major conceptual, empirical and normative contributions of this thesis before exploring the avenues for future research opened up by this project.

7.1 Conceptual contributions

The first objective of this thesis was to ***'develop a co-productionist framework for understanding organisational learning'***, which formed the basis for answering my research questions and meeting the other objectives. This framework took inspiration from existing literature in STS, geography and beyond and was laid out in detail in sections 2.3-2.5. This framework takes as a starting point the concept of organisational spaces, which are located in and around formal organisational

structures with diverse characteristics and multiple connections to other spaces and bodies. Learning is understood as a change or movement of knowledge – broadly defined – including organisational standards and ways of classifying knowledge, organisational narratives, models and ideas, or definitions of organisational problems. In this framework then organisational learning is a co-productive process concerning the relationship between organisational spaces and learning processes, where each object exerts a powerful influence on the other.

One of the primary conceptual contributions of the thesis has therefore been to the co-productionist literature, in its novel adoption of the idiom of co-production and associated STS literature in order to describe organisational learning in terms of processes of categorisation, standardisation, translation and transformation. The application of the co-productionist idiom specifically to understand an organisation also helps to develop this approach normally used to describe either discrete processes (e.g. Miller 2004) or the general relationship between science and society (e.g. Jasanoff 2004a). By bringing recent geographical theorisations of the active organisational role played by space into this co-productionist framework (e.g. Beyes & Steyaert 2012) the thesis contributes to work aiming to demonstrate the role of space in processes of co-production (e.g. Mahony 2014; Beck et al 2014), and highlights the situatedness of learning processes against an organisational learning literature which generally ascribes little role to geography and spatiality. The concept of organisational spaces drew upon the existing literature, which has tended to focus on specific kinds of organisational space like 'shadow spaces' (e.g. Pelling et al. 2008) or to theorise the role of spaces within organisations more generally (e.g. Beyes & Steyaert 2012; Conradson 2003). This study has developed the concept further by explicitly linking organisational spaces to processes of organisational learning, and suggesting a co-productive relationship between organisational spaces and their characteristics, and the kinds of organisational learning processes which form and occur within them.

The use of the co-productionist idiom also contributes much to the literature on organisations and organisational learning, by offering a theorisation of the mutually constitutive relationship between micro organisational processes and practices, and broader organisational or national trends. Such processes are not linked as explicitly in other accounts (e.g. Rothstein 2013; Bickerstaff et al. 2010). By

understanding learning through the co-productionist idiom the thesis has also been able to bring the emerging agnotology literature (e.g. McGoey 2012) into conversation with theorisations of learning, positing that non-knowledge is itself part of learning processes. This is potentially the first attempt to use the concept of agnotology in this way, and to adopt it within an explicitly co-productionist framework.

Finally, whilst there have been many calls for the theorisation and close study of organisational learning processes related to public participation and engagement (e.g. Wynne 2006; Bickerstaff et al. 2010), this is the first study to attempt to conceptualise organisational learning around these practices and within the specific grouping of organisations of participation. The in-depth ethnographic approach undertaken to study organisational learning in and around Sciencewise therefore contributes new conceptual insights about the forms, characteristics and contexts of organisational learning processes, as well as making empirical contributions.

7.2 Empirical and interpretive contributions

Chapters 3-5 answered research question 1 – ***what did Sciencewise actors learn from and about public participation in science policymaking in 2013?*** – in a multitude of ways, from the micro to the national scale, and in relation to different contexts and topics. From the programme's involvement in processes related to public participation in science policy, programme actors learned much about the strengths and weaknesses of their own organisational structures and procedures, about the feasibility of new organisational activities like the business insight group, the community of practice or the social intelligence work, and about specific science policy topics from the use of animals in research to the importance of leap seconds in the workings of transnational corporations. The programme also learned much about UK Government agendas and debates like open policy and evidence-based policy – including how to influence and play into such debates – as well as other topics of broader thought and debate like digital engagement or definitions of the public. These learnings in some cases also prompted deeper self-learning or reflection about the programme's central definitions, aims and narratives leading to some changes in how these were expressed.

What Sciencewise actors learned *about* public participation in science policymaking during 2013 is arguably more ambiguous and difficult to capture, and was often highly specific to particular programme actors and groupings, or particular projects and organisational spaces. All Sciencewise public dialogue projects produced new knowledge in the form of project and evaluation reports, case studies on the Sciencewise website, ideas in the heads of those involved in the processes, and in some cases new inscriptions, like the quadrant produced from the horizon scanning public dialogue workshops. However, the extent to which this new knowledge travelled or had further impacts on organisational ways of doing, thinking and categorising is more ambiguous and varied. Public dialogue projects resulted in topic specific learning, for example around the level of connectivity between different Government agencies around disaster response, or about citizen responses to technologies related to processes of mitochondrial transfer or bioenergy production. The programme's failures to instigate public dialogue projects around some of the topics they felt warranted them also led to learning concerning what topics and questions public engagement was permitted or prohibited around. Problems which were identified by Sciencewise actors and others involved in all stages of public dialogue projects, from initial framing and procurement, to the facilitation skills of contractors and the report-writing skills of evaluators, were also constantly incorporated into organisational routines and procedures, resulting in changes such as the creation of a 'concept note' stage in the dialogue commissioning process before partner organisations were required to submit their business cases.

But there were also more general changes in organisational knowledge around public participation in science policy, for example related to the use of new methods for public dialogue, or the emergence of more general themes from Sciencewise public dialogue projects and thought leadership reports related to organisational transparency and competence in science policy issues. The horizon scanning public dialogue project also stimulated learning about the assumptions that policymakers and others made about public dialogue projects. Organisational definitions of public dialogue itself also shifted during the period of research to include a wider variety of topics (potentially encompassing social science), actors ('decision-makers' rather than 'policymakers'), methods (including digital methods),

and approaches (through the reimagining of the programme's aim in terms of engaging public voices). Greater awareness of other forms of citizen involvement and engagement with policymaking, through the involvement of new partners in the programme and through debates about objects like open policy, also changed organisational understandings of the role and status of public dialogue, with it being increasingly seen as one among many ways of bringing public voices into policymaking.

The generation of detailed ethnographic insights into processes of organisational learning has therefore been an important empirical contribution of this thesis, in contrast to other studies which have relied more extensively on document analysis (e.g. Rothstein 2013) or on shorter periods of engagement with organisations (e.g. Bickerstaff et al. 2010; Pelling et al. 2008). This has allowed this thesis to focus not only on changes in discourse, but also more tacit changes in organisational practices, assumptions and categories. The more extended period of research also enabled the detection of longer-term trends and transformations. Whilst other accounts of organisational learning have tended to focus either at the micro (e.g. Conradson 2003; Stark 2012), organisation (e.g. Bickerstaff et al. 2010) or national (or even international) scale (e.g. Pelling et al. 2008; Miller 2004), this thesis has developed a multi-scalar picture of the organisational learning processes in and around Sciencewise, emphasising the interrelationships between processes at multiple scales (cf. Owens 2010). Furthermore, this multi-scalar account is not just a feature of the organisation chosen for study, but rather is a broader function of the empirical and conceptual approach taken. These insights also contribute to perspectives on democracy, affirming the importance of Healey's (2012) micro practices of democracy-in-action, and illustrating some of the ways in which these practices are linked to and influence broader democratic processes at the level of the state. The discussion of constitutional moments (Jasanoff 2011a) in the UK context is also a novel empirical contribution, and one which also contributes to understandings of organisational learning processes as multi-scalar.

Beyond the specific focus on Sciencewise this thesis has also contributed empirical insights on recent developments around public participation and policymaking in the UK and beyond. For example, chapter 5 in particular offers early interpretation of the open policy agenda and of the most recent debate around evidence-based

policy, and their influences on learning processes related to public participation and science policy.

Answering research question 2 – '***did different kinds of learning occur in different kinds of organisational spaces?'*** – required me to first fulfil objective 2 – ***'to identify and characterise different organisational spaces within Sciencewise, including the kinds of learning taking place in them'***. Chapter 3 identified and described four contrasting organisational spaces: the Sciencewise management space(s); the horizon scanning expert and public dialogue process; the 'Future directions for scientific advice in Whitehall' seminar series; and Sciencewise's newly developed community of practice. Further contrasting organisational spaces were described in subsequent chapters and brought back into a comparison with the original four organisational spaces identified in section 6.2. Tables 3.2, 6.1 and 6.2 were used as heuristics to present the different characteristics of the organisational spaces studied and to aid a discussion of the different kinds of learning these spaces fostered.

This analysis showed a rich and complex relationship between learning processes and the characteristics of organisational spaces, including their material (and human) content, their adoption of new or existing models and practices, their modes of storing and accessing organisational memory, and the dominant imaginaries in each of these spaces. Broadly speaking, novel, temporary and less routinized organisational spaces tended to coincide with more transformative and reflective learning processes, allowing for the trial of new practices, for example in the community of practice or the Bioenergy Distributed Dialogue spaces, or reflective discussions around organisational aims, definitions and categories, as in the theory of change process. More routinized, permanent and formal organisational spaces, like the Sciencewise management spaces and other procedures such as most of the public dialogue projects and social intelligence reports, tended to foster more superficial learning processes concerned with the production and management of new knowledge through existing organisational understandings and categories.

Permanent and highly routinized organisational spaces did however sometimes support more transformative learning processes, for example when stimulated by their connections to external spaces and actors, as is the case with the Sciencewise

management spaces' transforming perspective towards the Government's open policy agenda, or when new ideas successfully travelled and were embedded in these spaces from other more experimental organisational spaces like the seminar series or the theory of change. New ideas, however, travelled more successfully from some organisational spaces than others. For example, the 'Which publics? When?' report and webinar introduced challenging new ideas and categories, but whilst they were persuasive to some Sciencewise management actors they did not become embedded in more permanent structures and practices, due to a general lack of connectedness between thought leadership work and internal Sciencewise activities, and perhaps also due to a clash of dominant imaginaries or definitions of organisational problems.

Organisational spaces which had more means of accessing organisational memories, or which had more malleable and therefore contextually shifting ways of accessing and interpreting these memories, also tended to foster more reflective and transformative learning processes. For example, the horizon scanning process and the policy seminars had relatively limited modes for storing and accessing memory, relying on what could be immediately recalled by individuals or on the circulation of a number of thin inscriptions and frameworks which had different degrees of resonance in different contexts. This limited the passing of rich and complex ideas and information between different spaces and processes and also reduced capacities for reflective and responsive thought and discussions based on earlier experiences. In contrast, the theory of change process drew on existing organisational documentation, and the memories of individuals which were elicited through formally facilitated processes, and re-consulted several times over a period of several months in order to check the credibility and clarify the meanings of collected ideas and memories. Furthermore, the importance of collective discussion and deliberation in this process helped to encourage the accessing of further relevant memories, as well as the constant reinterpretation of this memory in light of contextual factors identified and the reformulation of present aims and objectives.

Organisational spaces which were adaptive and attempted to create new practices and procedures, such as the Bioenergy Distributed Dialogue and the social intelligence work, were often able to foster richer learning and reflection through

their attention to context and close monitoring of the effectiveness of the new models. Spaces which more rigidly imported existing models and practices, such as the horizon scanning process's use of the standard 'Delphi' and public dialogue processes, or the community of practice's attempt to import an 'off-the-shelf' definition and tool, tended to limit the communication of new knowledge and ideas as well as opportunities for broader reflection, because the models functioned differently in these new contexts and were sometimes less able to generate meaningful outputs. However, the theory of change space and the policy seminars also drew extensively on existing models and practices but were still able to foster new ideas and reflection, perhaps due to effort put into adapting the models for their specific contexts, and clearer visions amongst those orchestrating them of what they hoped to achieve.

The in-depth empirical exploration of different kinds of organisational spaces and their links to learning here builds on earlier studies which have focussed on particular kinds of organisational spaces (e.g. Pelling et al. 2008). This has allowed for a discussion of a broader set of characteristics of these spaces and their potential influences on learning, as well as adding a comparative dimension to the analysis, which contributes new insights on organisational learning processes. For example, my analysis not only confirmed the potential for more informal organisational spaces to promote more reflective forms of organisational learning (cf. Pelling et al. 2008), but also the similar role sometimes played by novel or temporary organisational spaces. Furthermore, the analysis strongly points towards the importance of connections between different kinds of organisational spaces, particularly those connections allowing influence between 'shadow spaces' and more formal organisational spaces, in order to encourage the translation of new practices, ideas and categories into everyday activities. This perspective also develops the notion of a learning assemblage, which McFarlane (2011a) applies to understanding processes of urban learning and change, by using it to explain organisational learning processes, capturing a diversity of spaces and practices as in McFarlane's account, as well as drawing attention to the multiple temporalities and scales of learning processes.

The focus on the role of memory, particularly modes of storing and accessing memory, within organisational spaces is also novel, developing ideas from the

literature on organisational memory and narrative (e.g. Linde 2009; Schatzki 2006), but suggesting a more explicit link between memory and processes of organisational learning. In particular, this thesis has highlighted the usefulness of malleable forms of memory, and narratives in particular, as the basis of more generative (cf. Garud et al. 2011) and potentially reflective forms of learning.

Research question 3 – ***'through which mechanisms did learning occur and what qualities did this learning have?'*** – and objective 3 – ***'to identify the main mechanisms of learning within Sciencewise and characterise the qualities of learning they foster'*** – can also be addressed together. One way of answering this question is that, as argued in chapter 4, formal organisational learning mechanisms appeared to foster very little learning, due to their tendency to focus more on self-audit and proving impact, foreclosing opportunities for broader learning and reflection. Furthermore, chapter 4 also showed how such mechanisms sometimes actively produced forms of non-knowledge, due to difficulties in codifying and conveying complex or tacit knowledges, concerns around commercial and political confidentiality, and the emergence of new knowledge not accounted for or captured within existing organisational categories. Instead, as chapters 4 and 5 showed, organisational learning processes often resulted from more ad hoc confluences and events, such as the UK Government's civil service reform plan or criticism from a steering group member, or from much more gradual and diffuse trends, such as accumulated challenges to the accepted definition of public dialogue from various sources. Therefore it is very difficult to identify a set of mechanisms for organisational learning, or to identify connections between mechanisms and qualities of learning.

Section 6.1 offers an alternative answer to this question, by categorising mechanisms of learning on a more conceptual level, based on the STS and organisational learning literatures, and taking co-production as the central mechanism of learning. Taking this approach it is possible to identify several broad mechanisms of learning, namely: changes in organisational standards, like the definition of public dialogue; changes in organisational classification systems, like the identification of new organisational aims, or the changing classification of public dialogue either as a source of evidence for policy, or as a democratic tool; the travelling and translation of models and ideas, such as open policy or the concept of

multiple publics; changes in definitions of organisational problems, such as the new long-term organisational aim derived from the theory of change process; and finally, the travel or change of organisational narratives, such as the failure of 'GM Nation?' or the narrative of Sciencewise's increasing influence on and profile within Government. All of these mechanisms identify what could be thought of as more reflective and transformative learning processes, which go beyond the mere accumulation and management of knowledge through existing processes and assumptions. More specifically, some of these learning mechanisms – such as changes in standards, classification, and the definition of organisational problems – are concerned essentially with changes in definitions and frames of reference as a quality of learning. The mechanism of the travel and translation of ideas and models is concerned with the ways in which these objects are given new meanings in different contexts, and also how they bring new meanings to these contexts. Finally, the change and travel of organisational narratives entails self-reflection in the form of changing interpretations of 'how we got here' and 'what our role is'.

While other studies of organisational learning processes have tended to offer typologies of learning (e.g. Bull et al. 2008; Petts 2007), this thesis has taken a more inductive approach to understanding the different forms, contexts and effects of learning processes. This has been achieved through a primary focus on process – a common approach in the STS literature – but one which has challenged perspectives taken in studies of knowledge management (e.g. Cook & Brown 1999; Gilson et al. 2008) or learning mechanisms (e.g. Armitage et al. 2008). The thesis has done this by not taking for granted the apparent learning mechanisms as labelled and practiced by the organisation itself, but rather aiming to identify sometimes unexpected learning processes through analysis and comparison, utilising concepts of standardisation, categorisation and translation from the STS literature. The focus on situated organisational practices builds on existing understandings of communities of practice (e.g. Amin & Roberts 2008; Lave & Wenger 1991; Schatzki 2006), but also adds nuance to these perspectives by showing how organisational practices are not monolithic, but rather are expressed in a range of ways in different organisational contexts and may differ more dramatically across different organisational spaces. Furthermore, the thesis has given examples of how such

practices may change over time in response to new ideas, apparent failures, or translation from elsewhere.

The answers to research question 4 – ***'what visions of the past and future of science and technology innovation, democracy and publics are at play in these learning processes, and what role do they play?'*** – and the response to objective 4 – ***'to identify important memories and visions of the future at play in the Sciencewise network and explore their influence on learning processes'*** – are to an extent woven through the answers to earlier questions, with concerns about the storage and accessing of memories and the role of imaginaries of the future having a significant influence on organisational spaces and learning mechanisms. My analysis also shows that memories and imaginaries were significant in organisational learning processes at multiple scales, from individual organisational spaces to the level of the state. Section 6.2 shows that dominant imaginaries in different organisational spaces were significant in shaping and sometimes limiting learning processes. For example, spaces where there were strong shared imaginaries such as the theory of change, often allowed for easy communication between groups and sometimes created opportunities for broader reflection. In contrast, spaces where imaginaries were contested, ambiguous or contrasting, such as the horizon scanning process or the community of practice, were generally less successful at communicating meaningfully or creating collective discussions. However, the dominance of prominent (national) imaginaries in some organisational spaces, such as the strength of open policy and evidence-based policy imaginaries in the policy seminars, arguably limited opportunities for learning by excluding certain actors and perspectives, or rendering them unintelligible within that space.

At the level of the Sciencewise programme, section 4.4 describes prominent justificatory memories and imaginaries influencing organisational learning processes. The memories of controversies around BSE and the widely acknowledged failure of the 'GM Nation?' public dialogue are both central to how the Sciencewise programme justifies itself internally and to others. They also provide nodes of comparison against current activities and learning processes, meaning that the lessons of these past events are constantly re-learned and reinscribed, for example in developing perspectives on objects like open policy, or evaluating recent public dialogue projects.

The need to create a repository of institutional memory for Government was also an important justificatory narrative or even an imaginary within the Sciencewise programme, resulting in the creation of multiple different modes of storing memory, and justifying Sciencewise's focus on best practice sharing, and the new social intelligence initiative. The imaginary of increasing the practice and quality of public participation in science policymaking was a central driver of Sciencewise activities and learning processes. Emerging increasingly strongly during the period of research was the imaginary of Sciencewise itself needing to gain increased influence in Government, resulting in a shift towards focussing on advocacy work, and understanding more Sciencewise activities through the frame of advocacy. This imaginary encouraged learning and reflection about prominent Government agendas like open policy and evidence-based policy, contributing towards transformations in organisational understandings of the definition and role of public dialogue. In other ways however, this imaginary potentially limited opportunities for learning by focussing efforts in public dialogue projects and thought leadership work heavily towards advocacy rather than introducing new ideas and reflection into the programme.

Many of the prominent imaginaries and memories at the national level, as discussed in 5.4, clearly fed into learning processes in organisational spaces and the programme as a whole. For example, the imaginary of openness was significant in shaping and stimulating programme level learning processes around the meaning of open policy, how to engage with Government agendas, and how to develop relationships with key Government actors. It also contributed significantly to learning processes within individual organisational spaces, such as the reframing of Sciencewise aims in the theory of change process. Imaginaries of the central need for scientific and technological progress, and of the public as a threat, strongly shaped Sciencewise activities and learning processes, and were present in some of the organisational spaces, including the horizon scanning process and the policy seminars. The strength of these imaginaries limited certain kinds of reflection and perspectives, foreclosing alternative visions of the role of science policy and the public, and sometimes limiting the way the benefits and outputs of public dialogue projects could be presented to Government actors. These factors contributed to the need of the Sciencewise programme to continually engage in practices of self-

audit and self-justification, to the detriment sometimes of more reflective learning processes. The power of such imaginaries also begins to explain the challenge of translating practices and ideas from more open and experimental organisational spaces like the theory of change and the Bioenergy Distributed Dialogue – some of which directly challenge these imaginaries – into more formalised organisational spaces with closer connections to Government.

Prominent memories at the level of the state were arguably more malleable and mobile, for example with the memories of 'GM Nation?' and the Phillips Inquiries being evoked very differently in different contexts, and therefore being taken up in learning processes in very different ways. However, dominant imaginaries had a strong influence on how these memories were interpreted, explaining for example why Lord Krebs' interpretation of the 'GM Nation?' dialogue as showing the danger of public engagement was taken up much more broadly than the interpretation of the same process in the 'Which publics? When?' thought leadership piece, which suggested it had been a success.

A significant contribution of the thesis has been in drawing on concepts of (socio-technical) imaginaries (e.g. Jasanoff & Kim 2009) and memory (e.g. Jasanoff 2005a; 2005b) from the co-productionist STS literature, which are usually used to describe national processes of change and features of national political culture, to make sense of multi-scalar processes of organisational learning. The exploration of memories and imaginaries in this thesis has, however, also shown how important imaginaries and memories at a national level are, as facets of civic epistemologies or political cultures, in shaping processes of organisational learning, thus adding further nuance to these earlier accounts. This approach has emphasised the malleability of some memories and imaginaries in how they travel and are interpreted, as well as also confirming their power to shape and direct processes of organisational learning. This also draws upon existing literature on the malleability of organisational memories and narratives (e.g. Linde 2009; Schatzki 2006), but brings visions of the future much more explicitly into the understanding of learning processes, and explores the role of these objects at a range of different scales. The explicit consideration of imaginaries and memories as part of organisational learning also contributes to the literature which aims to offer a more nuanced account of organisational temporalities (e.g. Cook & Wagenaar 2011; Schatzki 2006),

demonstrating the continual re-construction of the past and future through present practices.

7.3 Contributions to academic practice

Research question 5 – ***'were there any opportunities for broader reflection and reflexivity, and what could be done to encourage this in Sciencewise and similar organisations?'*** – and objective 5 – ***'to explore opportunities for institutionalised processes of broader reflection and reflexivity'*** – were addressed in chapter 6, drawing on insights from chapters 3-5. This analysis showed that there were significant examples of deeper reflection in and around the Sciencewise network during the period of research (as described in the previous section), and that the programme also exhibited some of the capacities for institutional reflection and reflexivity discussed in the literature. For example, the programme was able to reflect on some of its key objects, like the public and public dialogue, and also consider to some extent its own impacts on these objects. Furthermore, this contributed to the conscious reformulation of key programme aims and definitions, which could be described as reflexive processes. The programme also displayed the capacity to connect to external processes and actors, thus importing new ideas and perspectives, like open policy, and relatedly had some capacity to respond to diverse forms of public participation and public reason, such as instances of public protest around science policy topics. Many of these reflexive capacities were reflected most obviously in the more temporary, novel or experimental organisational spaces explored. Reflexive capacities which were more limited within the programme were the ability to acknowledge uncertainties and ambiguities, or to deal with unexpected events or apparent failures. These capacities were strongly challenged by the need for the programme to constantly audit itself and justify its role and impact in order to secure future funding and projects.

Thus attempts to promote broader reflection and reflexivity in and around organisations like Sciencewise need to retain an awareness of relatively immovable features of these organisations and their context which act against reflexivity; for example, the prevalence of the model of outsourcing within Sciencewise and the broader Government context which is generally suspicious of attempts to foster

more direct citizen involvement in decision-making. My analysis also suggests that more formal and generally more influential organisational spaces are also difficult to change and alter substantially, due to the difficulties of fostering reflective learning within them, and due to some of these contextual factors. However, it was argued towards the end of chapter 6 that there are still several ways in which reflection and reflexivity can be consciously encouraged. The first way of enhancing reflexive capacities is to focus on the connections between organisational spaces with different characteristics. There are some indications from my analysis that some of the more experimental and open organisational spaces like the theory of change and the Bioenergy Distributed Dialogue had created ideas which were being translated and embedded into more formal organisational spaces. Therefore, an improved understanding of how such spaces are connected and how this connectedness and influence could be enhanced – whether through the involvement of particular personnel, or through changes in reporting and review procedures – would be likely to contribute towards greater reflexivity, and allow the travel of more experimental ideas and practices into formal organisational spaces.

The second way of improving reflexive capacities which I suggest is to work with the metaphor of 'experimentation', currently popular in Government and science policy circles, to improve the level of reflection and reflexive action resulting from diverse organisational experiences. The idea of experimentation sensitises actors towards the gap between the intended and actual effects of organisational initiatives, and also potentially towards broader responses to these initiatives, including from those not initially involved. Furthermore, experimentation suggests a more iterative approach to the definition of organisational goals and practices, allowing for constant review and refinement, and thus creating opportunities for broader reflection. Crucially, a consciously cultivated disposition of experimentation also potentially enables organisations to make the most of existing and ongoing organisational experiences, rather than requiring the contribution of often non-existent organisational resources to the task.

This thesis was an attempt to address interpretive, instrumental and normative functions of STS work (cf. Jasanoff 2011a), in the context of approaches to public participation in UK science policy. Furthermore, the findings and interventions

attempted make broader contributions to understanding academic practice and the role of social science in organisational processes. By adopting the co-productionist idiom, this study acknowledged from the start the role played by social scientific concepts and researchers within the processes studied, by highlighting the mutually constitutive relationship between processes of knowledge-making and processes of governance. For example, my research suggests that there is a clear co-productionist story to tell about the relationships between Sciencewise and UK practices of public participation on the one hand, and the development of ideas in the STS literature on the other. Public participation organisations like Sciencewise, and increasingly the domain of science policy, are infused with ideas and interventions originating in social scientific work, from modes of evaluating public participation, to ideas like the community of practice. Furthermore, the creation and evolution of Sciencewise was strongly influenced by advocacy work and other interventions from researchers working within my own academic disciplines and communities. Members of the Science and Democracy Network (a network I am also a member of), hosted by Sheila Jasanoff, are particularly prominent as actors in my story of Sciencewise, as well as in the bibliography.

Certain developments in the STS literature about participation – for example, the move away from 'consensus' as a key aim of processes (e.g. Horst & Irwin 2011) and arguments about the need to acknowledge the production of public reason through a more diverse set of invited and uninvited forms of participation (e.g. Hagendijk & Irwin 2006) – seem to have some correspondence with developments in the practice of public participation itself – for example, the disappearance of the word 'consensus' from Sciencewise documents, the tacit acknowledgement of instances of social protest as important articulations of public views, and the move towards thinking about more diverse methods for bringing public voices into decision-making. This is suggestive of a co-productive relationship, where the academic literature advances in part in response to developments in policy practice and the expression of public reason which have been observed, and policy practice responds to new ideas and arguments from the academic literature. However, this co-productive perspective also shows that academic impact and influence are far from linear and can also be difficult to follow, as it is impossible to say where

interventions like my own will end, or what broader processes they might become part of.

These findings have strong resonances with earlier reflections from STS scholars and geographers concerning engagement with policy practice in their emphasis on the ambivalent and non-linear nature of academic impact (e.g. Owens 2005; Stilgoe 2012; Wynne 2007), and are also strengthened by their derivation from in-depth empirical research as well as broader reflections from the researcher. This argument is also developed in terms of the responsibilities which it entails for engaged researchers, concluding that the complexity and unboundedness of the processes studied require a humble and careful approach to interventions (cf. Jasanoff 2003), as well as close attention to detail in designing and monitoring interventions. Thus the attempts of researchers to engage with policy processes and bodies are also attempts to understand and account for the diverse and sometimes unexpected effects of social scientific research. This requires critical and reflexive judgement on the researcher's part, in the way she engages with and describes the academic and policy work of peers, simultaneously attempting to contribute substantively to this literature. In many ways, my interventions have not just occurred in the form of feedback to the Sciencewise programme, but have also been made (and continue to be made) in the form of conference presentations, academic publications and more.

The topic of reflexivity has been a central concern in STS literature (cf. Lynch 2000), as well as in this thesis, based on a desire to try to account for and engage with the effects of different forms of knowledge-making and their implications for practice. Ideas about reflexivity are also clearly at the heart of recent influential social scientific work around responsible innovation (e.g. Owen et al. 2012; Stilgoe et al. 2013), as well as earlier work on public participation (e.g. Wynne 1993) and anticipatory governance (e.g. Schot & Rip 1997). My account contributes new insights to this work through my empirical and ethnographic analysis and testing of concepts about reflexivity from the literature, generating new recommendations for academics and organisations aiming to promote reflection and reflexivity. My recommendations in chapter 6 have clear parallels to work on responsible innovation, but there is also an added dimension to the reflexivity I envisage, in that I encourage organisations like Sciencewise to engage in processes of anticipatory

governance and foresight around their own practices of democracy and knowledge-making, as well as the more general objects of science and science policy.

Perhaps the primary novel contribution of the thesis to thought and practice around institutional reflexivity is the link I have drawn with emerging literatures on experimentation (e.g. Gross 2010a; cf. Bastrup-Birk & Wildemeersch2011) and the geographies of experiment (e.g. Lorimer & Driessen 2014). This offers a potential new frame for discussions around and initiatives to promote reflexivity, drawing extensively from insights from the history and philosophy of science (e.g. Hacking 1983), as well as observations of learning processes (e.g. Gross 2010a), and a more popular discourse around policymaking (e.g. Harford 2011). However, the account here also extends this literature by not only analysing one-off experiments in a mainly procedural sense, which is the primary focus of most of the existing literature (e.g. Bulkeley & Castán Broto 2013; Lorimer & Driessen 2014), but also describing multiple, interacting and ongoing experiments at various scales and highlighting their normative dimensions. So whilst the learning processes described in the thesis could be described as individual experiments, and viewing further organisational projects and activities as experiments could be a useful way of stimulating further learning and reflection, this account also showed how the Sciencewise programme itself could be considered as an institutional experiment or process of experimentation, interacting with larger experiments in policymaking like civil service reform or open policymaking, but also forming part of a much bigger constitutional experiment in British democracy (cf. Jasanoff 2011a). The lens of experimentation offers a powerful way of comprehending the multi-scalar co-production of organisations, knowledge and democracy.

7.4 Recommendations for future research

This thesis began with the aim of exploring organisational learning processes and opportunities for reflexivity within the Sciencewise organisational network, an aim which has been addressed at multiple scales and in multiple spatial contexts, with overlapping and sometimes contrasting stories of organisational learning. There are several questions raised by the above analysis which offer fruitful guidance and direction for future research, as well as addressing more foundational concerns. One of these more foundational questions is whether the above analysis would

look different if I had set out to explore organisational change instead of organisational learning. The framing of organisational learning in terms of co-production suggests either an equivalence between change and learning, or that organisational learning is a constituent part of organisational change. Furthermore, this thesis has described only learning processes resulting in changes in ideas, categories and practices, rather than the accrual of new knowledge. The focus on learning has however enabled the account to retain an emphasis on discursive, categorical and definitional changes (though these would be a feature of any co-productionist account), rather than only looking to concrete changes in organisational practices and structures.

In terms of substantive recommendations for future research, this thesis has shown the value of in-depth ethnographic research into organisations at the interface between science, policy and society, in terms of understanding forms and qualities of organisational learning, as well as broader trends and processes. However, due to limitations of time and resources this project only considered one such organisation, and there is much scope to enhance some of these insights through comparative work involving similar organisations in different national contexts or domains, or focussed on different policymaking or participative practices. For example, there are other organisations of participation in the UK and beyond which similarly to Sciencewise are attempting to promote and induce learning from and about public participation, from research councils to public sector bodies like the NHS, which could provide an interesting comparison with Sciencewise across different domains and topics. Furthermore, this research has indicated that conversations around openness and open policy in particular have the potential to engender broader changes and shifts around practices of policymaking and citizen participation, for example with the introduction in the UK context of a body to create 'policy labs' around policy issues. Thus new organisations around open policy in the UK, or prominent examples overseas such as Mindlab in Denmark would also provide fertile material for comparison, to understand learning related to different practices of public involvement and policymaking. Similarly, recent changes in the planning system, incipient moves towards regional devolution, and changes in practices of public involvement around research or public services, would also be productive topics for comparative study.

Throughout its life Sciencewise has been constantly compared with organisations internationally. For example during its initial creation it was self-consciously modelled on the Danish Board of Technology and the Rathenau Institute in the Netherlands, seen as exemplars of public engagement practice at the time. Increasingly, Sciencewise itself has been seen as an example of good practice around public participation and an organisation to emulate, for example, with the Japanese Government taking inspiration from Sciencewise reports and practices in the formulation of its public participation in science policy strategies, as well as governments and researchers across Europe and North America taking an interest in the programme. Building on insights from existing national comparative work which posits differences in certain national political cultures (e.g. Jasanoff 2005a; Horst & Irwin 2011), a comparative study could be imagined comparing prominent organisations of participation in the UK, Denmark, Germany, Japan and the US. Such a comparison would not only improve understanding of organisational learning processes in diverse kinds of organisations of participation, but would also contribute new insights on the role played by national political culture, including differing imaginaries, memories and potential constitutional moments, in organisational learning processes.

Comparative work concerning organisations of participation and policymaking would help to identify commonalities and contextual differences around organisational learning processes, gathering new perspectives and insights on the promotion of organisational reflection and reflexivity. Thus work in this vein would also contribute towards understandings of shifting meanings and practices of democracy in the UK and beyond, and a broader and continued assessment of the current 'constitutional moment'.

My ability to orchestrate experimental interventions in the Sciencewise programme was again limited due to constraints on time and resources, and due my own status and relationship with the organisation. My discussion of the concept of experimentation in the thesis suggests however that larger scale planned and carefully monitored interventions in organisations, when combined with in-depth ethnographic understanding and research, would also generate important new insights about organisational learning and reflexivity. This approach to research would not only generate new conceptual insights, by allowing researchers to test

their ideas and potentially conduct comparative experiments, but would also potentially have significant impacts on the partner organisation in accordance with the normative stance of the researchers. The trial of novel, contextually specific and interpretively informed experiments in organisations could also lead to new insights into organisational reflexivity and reflection, creating models and frameworks which are useful for other organisations and researchers. Such interventions would be enhanced by the creation or existence of much longer term relationships between researchers and specific partner organisations (such as Rothstein's relationship with the FSA, cf. Rothstein 2013), improving the researcher's sensitivity to the tacit and complex organisational norms and processes they would be engaging with.

A final productive avenue for future research which this thesis suggests is the need for research which gives a better understanding of the connections between different organisational spaces and how they influence one another. This would offer a still richer and more dynamic picture of the organisational learning assemblage, and indicate new ways in which organisational capacities for reflection and reflexivity could be enhanced. Furthermore, this work would be a useful complement to the existing literature on co-production, by exploring specific kinds of co-productive processes (i.e. the connections between spaces) in the context of diverse organisations.

This thesis has told several interrelated and co-produced stories of organisational learning and reflection around the Sciencewise programme and beyond. They have been concerned with the co-production of organisational learning with organisational spaces, memories, imaginaries, practices and ideas, and have also drawn attention to broader processes of co-production, between organisational spaces of various characters, between micro and constitutional democratic processes, and between academic social science and policy organisations. The act of research has produced ripples of its own, some of which are discussed in-depth here, and many of which are as yet ongoing or unknown, continuing to travel towards new unexpected confluences and spaces of resonance.

Appendix I: data sources

Field notes

	Event	Location	Date
1	Broadening the evidence base: science and social science in social policy	NESTA, London	08/01/2013
2	Experts, publics and open policy	House of Commons, London	15/01/2013
3	Credibility across cultures: the international politics of scientific advice	University of Sussex, Falmer	06/02/2013 – 07/02/2013
4	Horizon scanning expert workshop	Churchill college, Cambridge	27/03/2013
5	CSaP annual conference 2013: Future directions for scientific advice in Whitehall	The Royal Society, London	18/04/2013
6	Horizon scanning public dialogue	Homerton college, Cambridge	18/05/2013
7	'Which Publics? When?' webinar	Hosted by Sciencewise	25/07/2013
8	1st community of practice face-to-face meeting	BIS conference centre	19/09/2013
9	Dialogue and Engagement specialists quarterly meeting	Ricardo-AEA offices, London	15/10/2013
10	Horizon scanning POST workshop	House of Commons, London	22/10/2013
11	Citizen group meeting	Ricardo-AEA offices, London	24/10/2013
12	Steering group meeting	Ricardo-AEA offices, London	24/10/2013
13	'Open data and public dialogue' webinar	Hosted by Sciencewise	06/11/2013
14	2nd community of practice face-to-face meeting	BIS conference centre	21/11/2013
15	Sciencewise team day	Etc @ Paddington, London	17/12/2013

16	Community of practice online space	Yammer	Throughout

Documents

	Title	Author	Date
1	Steering group agenda July 2012	Sciencewise	July 2012
2	Steering group introductions July 2012	Sciencewise	July 2012
3	Steering group progress July 2012	Sciencewise	July 2012
4	Steering group SW evaluation July 2012	Sciencewise	July 2012
5	Steering group minutes July 2012	Sciencewise	July 2012
6	Steering group agenda November 2012	Sciencewise	November 2012
7	Steering group cross-cutting issues November 2012	Sciencewise	November 2012
8	Steering group working with business November 2012	Sciencewise	November 2012
9	Steering group key activities November 2012	Sciencewise	November 2012
10	Steering group minutes November 2012	Sciencewise	November 2012
11	Steering group agenda February 2013	Sciencewise	February 2013
12	Steering group evaluation February 2013	Sciencewise	February 2013
13	Steering group strategic priorities February 2013	Sciencewise	February 2013
14	Steering group social intelligence February 2013	Sciencewise	February 2013
15	Steering group minutes February 2013	Sciencewise	February 2013
16	Steering group agenda May 2013	Sciencewise	May 2013
17	Steering group evaluation May 2013	Sciencewise	May 2013
18	Steering group thought leadership and social intelligence May 2013	Sciencewise	May 2013

19	Steering group minutes May 2013	Sciencewise	May 2013
20	Steering group agenda July 2013	Sciencewise	July 2013
21	Steering group projects July 2013	Sciencewise	July 2013
22	Steering group digital engagement July 2013	Sciencewise	July 2013
23	Steering group minutes July 2013	Sciencewise	July 2013
24	Steering group agenda October 2013	Sciencewise	October 2013
24	Steering group theory of change October 2013	Sciencewise	October 2013
25	Steering group projects update October 2013	Sciencewise	October 2013
26	Steering group minutes October 2013	Sciencewise	October 2013
27	Steering group agenda February 2014	Sciencewise	February 2014
28	Steering group cross-cutting issues February 2014	Sciencewise	February 2014
29	Steering group strategic priorities February 2014	Sciencewise	February 2014
30	Steering group steering group February 2014	Sciencewise	February 2014
31	Steering group minutes February 2014	Sciencewise	February 2014
32	Steering group agenda May 2014	Sciencewise	May 2014
33	Steering group governance May 2014	Sciencewise	May 2014
34	Steering group convening role May 2014	Sciencewise	May 2014
35	Steering group evaluation priorities May 2014	Sciencewise	May 2014
36	Steering group minutes May 2014	Sciencewise	May 2014
37	Background materials, CSaP Horizon scanning workshop	Centre for Science and Policy (CSaP)	March 2013
38	Invitation to tender for horizon scanning public dialogue workshops	Sciencewise/BIS	January 2013

39	"Hearing and Being Heard": the public's views on their future involvement in policy-making related to emergent science and technology	Ipsos MORI	August 2013
40	Evaluation of Public input to the Sciencewise horizon-scanning workshop project	Richard Watermeyer & Gene Rowe	March 2014
41	Horizon scanning exercise report	Parliamentary Office of Science and Technology	January 2014
42	Case study: Science, Policy Making and Public Dialogue: New and emerging issues	Sciencewise	Last accessed August 2014
43	Evaluation of Sciencewise-ERC: final report	Diane Warburton	May 2011
44	Sciencewise – Interim Evaluation 2012	Diane Warburton	March 2013
45	Sciencewise dialogue projects – impacts summary 2012	Sciencewise	March 2013
46	Cambrian Mountains Initiative evidence summary	Sciencewise	March 2014
47	HRA Patient and Public Engagement evidence summary	Sciencewise	July 2013
48	Learning from practice (webpage)	Sciencewise	Last accessed August 2014
49	Longer term impacts of dialogue projects (webpage)	Sciencewise	Last accessed August 2014
50	Sciencewise evaluation (webpage)	Sciencewise	Last accessed August 2014
51	Sciencewise programme evaluation (webpage)	Sciencewise	Last accessed August 2014
52	Invitation to tender for the independent evaluation of the Sciencewise programme 2012-2015	Ricardo-AEA/Sciencewise	August 2014
53	Summary of evaluation approach	Diane Warburton	August 2012
54	Evaluation metrics	Diane Warburton	August 2012
55	Guidance on project funding	Sciencewise	June 2013

56	Requirements for funded projects	Sciencewise	June 2013
57	Business case template	Sciencewise	June 2013
58	Example tender specification	Sciencewise	June 2013
59	Project progress report	Sciencewise	March 2013
60	Guidance for final project report	Sciencewise	June 2013
61	Requirements for Evaluating Sciencewise-ERC Projects	Sciencewise	June 2013
62	Requirements for funded projects	Sciencewise	June 2014
63	Business case template	Sciencewise	January 2014
64	Example Invitation to tender	Sciencewise	June 2014
65	Guidance for final dialogue project report	Sciencewise	June 2014
66	Evaluating Sciencewise public dialogue projects	Sciencewise	March 2014
67	Evaluation in Sciencewise	Sciencewise	October 2013
68	Project grant: support provided and summary of requirements	Sciencewise	June 2014
69	Guidelines for running meetings and workshops	Sciencewise	May 2014
70	What is public dialogue? And other frequently asked public dialogue questions	Sciencewise	October 2012
71	Sciencewise reader survey (online survey)	Sciencewise	October 2012
72	Citizens and science (webpage)	Sciencewise	Accessed January 2013
73	About the citizen group (webpage)	Sciencewise	Accessed July 2014
74	Aims and objectives (webpage)	Sciencewise	Accessed January 2013
75	Aims and objectives (webpage)	Sciencewise	Accessed July 2014
76	Ambassador (webpage)	Sciencewise	Accessed January 2013
77	Background (webpage)	Sciencewise	Accessed January 2013

78	Background (webpage)	Sciencewise	Accessed July 2014
79	Business stakeholders (webpage)	Sciencewise	Accessed January 2013
80	Community of Practice (webpage)	Sciencewise	Accessed January 2013
81	Department for Business Innovation and Skills (webpage)	Sciencewise	Accessed July 2014
82	Dialogue and engagement specialists (webpage)	Sciencewise	Accessed January 2013
83	How to do public dialogue (webpage)	Sciencewise	Accessed January 2013
84	How to do public dialogue (webpage)	Sciencewise	Accessed July 2014
85	The programme board (webpage)	Sciencewise	Accessed January 2013
86	Management (webpage)	Sciencewise	Accessed July 2014
87	Sciencewise programme steering group (webpage)	Sciencewise	Accessed July 2014
88	Sciencewise-ERC support (webpage)	Sciencewise	Accessed January 2013
89	Sciencewise-ERC support (webpage)	Sciencewise	Accessed July 2014
90	Scientists, experts and academia (webpage)	Sciencewise	Accessed January 2013
91	Value and benefits of dialogue (webpage)	Sciencewise	Accessed January 2013
92	Value and benefits of dialogue. A route to better policy. (webpage)	Sciencewise	Accessed July 2014
93	Sciencewise, policy-making and public dialogue	Sciencewise	July 2014
94	What is public dialogue? (webpage)	Sciencewise	Accessed January 2013
95	What is public dialogue? (webpage)	Sciencewise	Accessed July 2014
96	What we offer (webpage)	Sciencewise	Accessed January 2013

97	What we offer (webpage)	Sciencewise	Accessed July 2014
98	The Government's Approach to Public Dialogue on Science and Technology	Sciencewise	Last accessed July 2014
99	Sciencewise management tender	Department for Business Innovation & Skills	October 2011
100	Mapping the new terrain: public dialogue on science and technology	Simon Burall and Tim Hughes (eds.)	2013
101	Which publics? When? Exploring the policy potential of involving different publics in dialogue around science and technology	Alison Mohr, Sujatha Raman & Beverley Gibbs	2013
102	Experts, publics and open policy-making: Opening the windows and doors of Whitehall	Simon Burall, Tim Hughes & Jack Stilgoe	2013
103	In the goldfish bowl: science and technology policy dialogues in a digital world	Susie Latta, Charlotte Mulcare & Anthony Zacharzewski	2013
104	Changing hats: how deliberation impacts citizens	Tim Hughes & Amy Pollard	April 2014
105	Convincing the public of the merits of dialogue: A hard sell?	Richard Watermeyer and Gene Rowe	2014
106	Dialogue for governance and regulation: engaging citizens for the long-term	Ingrid Prikken & Simon Burall	June 2013
107	Public Futures: Using public dialogue to develop policy options on emerging, cross-cutting issues	Sonia Bussu	April 2014
108	Responsive research: putting the innovative back into agendas for innovation	Sujatha Raman	2014
109	Social media-based public dialogue: potential, theory and practice	Eric Jensen	2014
110	Public views on open data	Sciencewise	June 2013

111	Public views on advanced materials: nanomaterials and grapheme	Sciencewise	March 2013
112	Public views on agri-technologies	Sciencewise	May 2014
113	Public views on energy infrastructure	Sciencewise	June 2013
114	Public views on the commercial application of space	Sciencewise	June 2013
115	Public attitudes to quantum technology	Sciencewise	May 2014
116	Public views on regenerative medicine	Sciencewise	April 2014
117	Robotics and Autonomous Systems: What the public thinks	Sciencewise	July 2013
118	Public views on energy storage	Sciencewise	April 2014
119	Big Data: public views on the collection, sharing and use of personal data by government and companies	Sciencewise	April 2014
120	Public views on synthetic biology	Sciencewise	June 2013
121	Engaging with academics: how to further strengthen open policy making	Government Office for Science	January 2013
122	The Civil Service Reform Plan	HM Government	June 2012
123	Test, Learn, Adapt: Developing Public Policy with Randomised Controlled Trials	Laura Haynes, Owain Service, Ben Goldacre & David Torgerson (Cabinet Office)	June 2012
124	Evidence and evaluation in policy making: a problem of supply or demand?	Jill Rutter (Institute for Government)	2012
125	Public Administration Select Committee: Public engagement in policy making	Involve	2012
126	Making Evidence Useful: the case for new institutions	Geoff Mulgan & Ruth Puttick (NESTA)	March 2013
127	State of Uncertainty: innovation	Hasan Bakhshi, Alan Freeman &	April 2011

	policy through experimentation	Jason Potts (NESTA)	
128	Using Evidence to Improve Social Policy and Practice	Ruth Puttick (ed.) (NESTA)	October 2011
129	Why we need to create a 'NICE for social policy'	Ruth Puttick (NESTA)	May 2012
130	The Government's new approach to consultation – "Work in Progress", 22nd Report of Session 2012-13	House of Lords Secondary Legislation Scrutiny Committee	January 2013
131	What Works: evidence centres for social policy	HM Government	March 2013
132	Civil service social media guidance	Cabinet Office	May 2012
133	UK Charter for Science and Society (webpage)	Department for Business Innovation & Skills	Last accessed January 2014
134	Introducing the Charter for UK Science and Society (BIS blog post)	Joanne Hodges and Karen Folkes	March 2014
135	UK Charter for Science and Society	Department for Business Innovation & Skills	December 2013
136	Terms of reference community of practice (internal document)	Sciencewise	August 2012
137	Sciencehorizons summary report	Dialogue by Design	September 2007
138	Identifying the Science and Technology Dimensions of Emerging Public Policy Issues through Horizon Scanning	Miles Parker, et al	May 2014
139	Hard facts vs soft values: one mustn't trump the other (blog post)	Simon Burall on the Alliance for Useful Evidence blog	June 2013
140	Windows or Doors? Experts, publics and open policymaking (blog post)	Jack Stilgoe on the Guardian 'Political Science' blog	April 2013
141	Open policy-making and public dialogue (blog post)	Roland Jackson on the Sciencewise blog	January 2013
142	Open Policy Making and Public Dialogue - What are they, how do	Sciencewise	Accessed February 2014

	they work and can they work for me? (web page)		
143	Culture clash – bridging the divide between science and policy (web page with embedded video)	Institute for Government	November 2012
144	Culture clash – bridging the divide between science and policy (collection of tweets from during the event)	Storify	Accessed January 2014
145	Future directions for scientific advice in Whitehall	Robert Doubleday and James Wilsdon (edited collection)	April 2013
146	Sciencewise Theory of Change for Strategic Planning: 2014-2015	Diane Warburton, Sciencewise	April 2014
147	Sciencewise strategy planning day, December 17th	Penny Walker and Helen Fisher	January 2014
148	Research: A standard for policy-relevant science	Ian Boyd, DEFRA Chief Scientist	September 2013
149	Outside the Goldfish Bowl: facing up to the challenges of digital engagement (PART 1) (blog post)	Eric Jensen on the Sciencewise blog	January 2014
150	Outside the Goldfish Bowl: facing up to the challenges of digital engagement (PART 2) (blog post)	Eric Jensen on the Sciencewise blog	February 2014

Appendix II: Research proposal, February 2013

Proposal for Research into Sciencewise

I am a PhD student at the University of East Anglia working in the disciplines of geography and science & technology studies (STS). My specific interests are in public participation in UK science policy and organisational learning about participation, and my master's thesis (completed 2011) looked at the historical trends of organisational learning 2000-2010 around Sciencewise's initial creation and later re-launching as Sciencewise-ERC. My research is fully-funded by a PhD studentship from the Economic and Social Research Council (2010-2014) and is supervised by Dr Jason Chilvers.

My research

I am interested in building on my previous research on Sciencewise to explore the current processes of organisational learning around the new Sciencewise programme from April 2012. My working research questions are:

- **What are the main mechanisms for organisational learning in the Sciencewise organisational network?** Are they always the same or do they differ between contrasting projects, sites and groups?
- **What is involved in these learning processes?** Which actors and objects? Which practices? Which visions of policy-making and public dialogue? Does learning happen slowly over a long period of time or does it happen only at specific times and in particular situations?
- **How might organisational learning be further promoted or its quality improved within Sciencewise and other organisational networks?**

This research would involve following several key sites of learning and innovation within the Sciencewise network January-December 2013, and exploring how these interact with and influence other parts of the organisational network. Research methods would include: analysis of relevant documents from Sciencewise and other sources; interviews with key Sciencewise staff and contractors, and related actors; and observation of relevant meetings and events. I would use non-intrusive research methods where possible to minimise disruptions to staff time, only employing interviews and observation where it is necessary to achieve a more in-

depth understanding of particular processes, and where it is acceptable to all those involved. I anticipate being able to start offering feedback and reflections to Sciencewise actors and associates based on my findings from April 2013 and would present research findings more formally in December 2013, perhaps through a written report or workshop.

Specific plans

Particular initiatives which could potentially be explored in the research include: the development of the Community of Practice; the new Citizen Group; organisational developments arising from the 'Future directions for scientific advice in Whitehall' seminar series; the annual evaluation of the Programme and other evaluation procedures; forthcoming public dialogue projects; and the horizon scanning process which CSaP is running. The eventual choice of 3-4 specific initiatives to focus on will be guided by the following considerations: the potential usefulness of my feedback on the initiative to Sciencewise; the accessibility of the initiative and the amount of relevant data available; achieving coverage of initiatives with contrasting characteristics; and the occurrence of interesting and novel events related to a particular initiative during the period of research. Thus there would be a need to retain some flexibility about my precise research plans during the first few months of research.

I see this research project as something which could be of mutual benefit to my own academic work – as this would be the first time such an in-depth study of learning within an organisation engaging with publics has been carried out – and to Sciencewise as it enters a new organisational phase and develops innovative new projects. As an external observer of these new initiatives I would be able to bring an alternative perspective to discussions with Sciencewise staff and contractors about the monitoring and future development of such projects. Feedback and reflections on the research would be given to the Programme through formal meetings and documents in December 2013, but can also be given more frequently throughout the research project if this is desired. The task of giving feedback to Sciencewise would not be merely a 'bolt-on' to an otherwise entirely academic research project; rather it is an integral and essential part of my research approach,

as Sciencewise's reception of and response to feedback will also inform my analysis and understanding of organisational learning processes.

Benefits to Sciencewise

I anticipate that my reflections would contribute to Sciencewise's core aims of promoting public dialogue across Government and improving the quality of public dialogues and associated processes. My research has potential to do this through several avenues, by: aiding the development of new initiatives within Sciencewise, such as the community of practice, by offering critical reflections or other assistance; prompting reflection around key organisational understandings of public engagement and dialogue; helping to strengthen existing organisational learning mechanisms or suggesting new ones; contributing to Sciencewise's research on what constitutes 'best practice' in public dialogue and how this can be promoted; feeding into to Sciencewise's internal evaluation processes; and helping to extend and improve existing organisational mechanisms for reflective practice. The findings of my work could also be used to demonstrate the value of public dialogue to Government policy-making and the positive effects of Sciencewise more broadly, which could be written into a report in December 2013. I have discussed the project with Edward Andersson and Diane Warburton and have responded to their initial feedback in this proposal. We have also discussed the potential for me to contribute to Sciencewise's thought leadership activities, for example by writing a few reflective blog-posts based on my research for the Sciencewise blog.

With my distinct focus on organisational learning, I see this proposed research project as something distinct from but complementary to the programme evaluation being undertaken by Diane Warburton. Whilst learning is included in the programme evaluation, this project would be able more deeply explore instances of learning within the Sciencewise network and reflect on this learning with the aid of the academic literature. As an external observer I would also have the opportunity to consider themes related to but outside of Sciencewise's direct remit, such as the potential to promote culture change in favour of public dialogue within government departments. This work could potentially then be drawn upon in future evaluations and inform future organisational practices and initiatives.

Appendix III: Commercial confidentiality agreement

All information gained through Helen's PhD research that could be used for commercial competitive advantage in terms of bidding for future Sciencewise work will not be shared beyond our research group, the 3S Group (www.3s.uea.ac.uk) - i.e. it will not be shared with or communicated to any other parties at UEA, the wider Norwich Research Park, and beyond, without prior approval by Sciencewise. The supervisory team will be responsible for ensuring whether information is in the public domain before it is shared more widely.

By working with the Sciencewise programme, UEA agrees to strive to avoid any conflict of interest between the interests of the programme on the one hand, and personal, professional, and business interests on the other. This includes avoiding actual conflicts of interest as well as minimizing the risk of perceived conflicts of interest. The purpose of this is to protect the integrity of Sciencewise's decision-making process, to enable stakeholders to have confidence in its integrity, and to protect the integrity and reputation of those who work on the programme. To ensure that there can be no perceived conflicts, the supervisory team and the 3S research group will ensure that any possible opportunities for 3S working with Sciencewise are discussed in advance to ensure for the benefit of both parties that there can be no perceived conflict. Any other bids for Sciencewise work which are forthcoming from UEA during the period of Helen's PhD would not have been party to any commercially sensitive information gained through the PhD research and would not be subject to any involvement from the supervisory team or members of the 3S group. Should such a bid arise the Sciencewise Programme Manager (Alan Mercer) should be able to confirm our non-participation with the principal bidder.

Appendix IV: Sciencewise team day hand-out, December 2013

Organisational learning within & around Sciencewise

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Feedback

I am really interested to hear your perspectives on my research so far, in particular:

- Anything you think I have missed or misunderstood?
- Anything I have mentioned that you think should be particularly emphasised?
- How, where & when should I present my more detailed findings to Sciencewise?
- Any other insights into learning processes around Sciencewise or about how Sciencewise learns

Headline findings

- ✓ Actors within and around the Sciencewise programme feel strongly that the promotion of learning and internal learning and reflection are central to Sciencewise's mission
- ✓ It is felt that there could be a more explicit focus on stimulating and reflecting on *internal* learning processes, to enhance Sciencewise's ability to promote learning more broadly and meet its stated goals

Some initial lines of thought

1. ***Reflective practice***
   Reflective learning and practice are going on constantly within Sciencewise at an individual level and is a crucial source of learning. Could this be more actively encouraged and done more systematically in group settings as well? What kinds of practices and procedures could support reflection?
2. ***Third party modest witnessing***
   Drawing on the long history of interplay between external voices and the internal practice and thinking of public engagement bodies, Sciencewise is improving its capacity to include and listen to these 'modest witnesses' with some notable recent examples. How can Sciencewise actors ensure that these voices are listened to and understood, and to what extent are Sciencewise structures able to negotiate and formulate responses?
3. ***Dialogue futures***
   For most of its lifetime the Sciencewise programme has been playing a leading role in defining and innovating public participation practice and thought. To cement this position and demonstrate the continuing value of the programme, how can Sciencewise stimulate important conversations about potential future methods, philosophies and contexts of public

participation? Building on the theory of change process, which visions of the future of public participation do Sciencewise actors wish to promote?

4. ***Shadow spaces of learning***

   The shadow spaces outside of formal organisational structures have been a key source of instances of more reflective learning within Sciencewise. How can Sciencewise ensure it is open to learning coming from these unexpected places and what can the programme learn from the conditions under which these instances of reflection have emerged?

Thank you!

Pallett & Chilvers (2013) A decade of learning about publics, participation and climate change: institutionalising reflexivity? *Environment & Planning A* 45(5): 1162-1183

Pallett & Chilvers (forthcoming) Organisations in the making: learning and intervening at the science-policy interface *Progress in Human Geography*

Appendix V: Sciencewise feedback report, November 2014

Organisational learning in and around the Sciencewise programme in 2013

Helen Pallett, November 2014

A report summarising the key findings and recommendations resulting from in-depth qualitative research into organisational learning mechanisms within Sciencewise throughout 2013.

Background and justification for the project

A strong argument in recent academic literature has emphasised the need to look beyond individual instances of public participation in science policy to gain a more systemic understanding of their multiple forms and effects. This argument also comes in the context of the increased institutionalisation of public participation methods within governing bodies in the UK, Europe and beyond, over the past decade – a development which has not yet been extensively described and analysed by academics. The current widespread use of the language and practice of public participation and engagement within government raises new questions for academics and practitioners alike, such as:

- what effects have public participation processes had on policy and on the cultures and routines of important decision-making bodies?
- do such bodies learn anything new about public participation and citizens through these processes, and does this learning result in any changes in shared assumptions and routines?
- what are the limitations to or influences on these organisational learning processes, and are there any ways that these organisations can improve their ability to learn and reflect?

Sciencewise is an important body in understanding the evolution of the UK Government's approach to public participation. It was initially launched in 2004 in the wake of high profile calls for public participation to become an integral part of science policymaking. Since Sciencewise's re-launch in 2007 as the Government's Expert Resource Centre for public dialogue, the programme has carried out public dialogue processes around a wide-range of high-profile science policy areas from stem cell regulation to regional flood responses and an international decision about the use of leap seconds. In the most recent programme contract, which began in 2012, Sciencewise has built on its existing reputation, enjoying a higher profile and influence within Government. This has been supported by an increasing number and range of public dialogue projects and supporting activities, as well as the development of key strategic relationships with a number of important bodies in

and around Government. Furthermore, Sciencewise's new-found profile has enabled members of the programme to play an important role in recent debates about significant concepts and policy practices such as open policy, localism and evidence-based policy.

In many ways then, 2013 seemed like an appropriate time to take stock of Sciencewise activities and learning processes, in the context of new programme partners, a refreshed programme structure, and the accompanying broader set of public dialogue processes and other activities. Its position as an increasingly significant body in defining and experimenting with approaches to democratic representation and policy-making in the UK also made it an ideal case study to answer broader questions about shifting meanings and practices of liberal democracy in twenty-first century Britain.

Research approach

For my PhD thesis I undertook in-depth qualitative research into organisational learning processes in and around the Sciencewise-ERC programme from January to December 2013. This research involved interviews with 30 actors related to the Sciencewise programme, participant observation of Sciencewise events and management meetings, and the analysis of around 300 documents from Sciencewise and other relevant bodies. These data were analysed using an interpretive coding structure, guided by a focus on organisational learning and reflection but largely inductive in approach, using the ATLAS.ti software package. The thesis was supervised by Jason Chilvers and Peter Simmons at the University of East Anglia, and submitted in December 2014. There will be a number of academic papers written from this research which I expect to be published in 2015.

Headline findings:

My research unsurprisingly uncovered a series of rich, complex and intricately connected organisational learning processes in and around Sciencewise, concerning science policy topics, public participation approaches, Government approaches to policy-making, citizens and more. Below I summarise the 6 most important findings for Sciencewise and those working in similar or related bodies.

1. **All Sciencewise actors feel that constant organisational learning and reflection is central for the programme's continued success. However, the programme's main procedures and measures of learning tended to focus more on the learning of other bodies over internal learning processes.**

Interview respondents unanimously felt that learning was central to the programme's activities and success. For example:

'I think it's critical because we have to be improving what we are doing all the time, […] in order to make it more effective, I guess also in order to make it more attractive'

'I mean, everything we do I guess is learning, because you know, it's all contributing because one of our other objectives is to develop best practice in everything we do, so whether it's the project, whether it's the events, whether it's the high-level networking, whether it's the website, whatever it is, it is one of our objectives to develop best-practice. So you take what you've learned and put that into practice'

'it's very important, I mean, the idea of Sciencewise is basically to help government to do public dialogue better, and you obviously can't do that if you're not watching your own processes and trying to learn how to do it'

Though learning is a key focus of the evaluation processes for individual projects and the whole programme, this tends to be understood in terms of Sciencewise's success in encouraging other bodies such as Government departments or research councils to learn. Similarly, the motivations behind Sciencewise thought leadership and social intelligence reports are directed more towards stimulating learning and reflection outside Sciencewise, and are often not discussed or even read by all those working for the programme. Whilst stimulating the learning of other bodies is central to Sciencewise's aims and mission, a more explicit focus on Sciencewise's own learning or potential for learning as a result of public dialogue projects, reports and other activities would create new opportunities for deeper learning and the consolidation of lessons learned by individual actors within the programme.

2. The increased size of the Sciencewise programme in the 2012-2015 contract created new challenges for the management and promotion of learning within and around the programme.

The increased number of employees and activities in the Sciencewise programme from 2012 onwards led to the creation of a more formalised management structure based around different teams of people carrying out different parts of the programme. This in some cases reduced the amount of face-to-face contact between programme actors, raising new challenges for decision-making within the programme as well as for the communication of key strategic decisions and activities.

Shared databases have been developed to help with the sharing of organisational documents and information, but these were under-utilised during the period of research due to a number of factors including: technical difficulties; lack of fit with some employee's working styles and routines; and the limited formats in which information could be shared. This led to some actors in and around the programme feeling dislocated from others in the programme and sometimes meant that they were unaware of more diffuse processes within the programme, such as the engagement of some actors with debates about 'open policy'. This also created a

burden on key individuals tasked with creating a link between different Sciencewise management groups and ensuring that activities were sufficiently coordinated.

There have been several changes to the management structure of the programme since the period of research, which I suspect have gone some way to address some of these problems of communication and coordination, thus improving the management and promotion of learning across the whole programme. However, within the larger and more ambitious programme which Sciencewise has become there are likely to be ongoing challenges to communication and collective learning.

3. The 2012-2015 programme contract saw an increased focus on advocacy work within Sciencewise, which has had both positive and negative effects on organisational learning processes.

The Sciencewise programme's increased profile and influence within Government has both resulted from and fostered a greater focus on advocacy work in the programme. This advocacy work encompasses the promotion of public dialogue in policy-making, advocacy around the outcomes of public dialogue methods, the promotion of democratic engagement or citizen inclusion more generally, and more recently, the promotion of the Sciencewise programme itself as a centre for excellence and best practice around policy-making.

On the one hand this advocacy work has promoted important organisational learning processes through increased contact with policy- and decision-makers. This has led to learning within the Sciencewise programme about specific policy areas and opportunities for public dialogue projects, as well as learning about how to tap into and influence important policy debates, such as open policy, evidence-based policy, and significant agendas like the 'Eight great technologies' announced in 2013. On the other hand, this focus on the external image of the Sciencewise programme means that other opportunities for learning and reflection might be missed. An increasing proportion of Sciencewise activities, including public dialogue projects and thought leadership, are thought about primarily in terms of how they could be used to influence external actors, playing down their potential to help Sciencewise actors learn and reflect on the practice of public dialogue, science policy topics, or how to influence policy actors. This has potentially held back advances in the practice of public dialogue across the programme, amongst other learning outcomes.

4. The Sciencewise programme's approach to evaluation has changed significantly creating the potential for evaluation to stimulate increased reflection and high-level learning.

Towards the end of 2013 all members of the Sciencewise programme were involved in a 'theory of change' process based around the collective identification of key long-term and then short-term goals for the programme, working backwards to defined key future activities and measures of success. This process provided an

important forum for discussions about the current context of the programme, and for the solidification of incipient changes in practices and ways of thinking within the programme. The process will also form the basis for the next whole-programme evaluation, providing a considerably more expansive scope than previous evaluations, and foregrounding Sciencewise's learning and development more prominently. Furthermore, the decision taken to employ an external team to carry out the evaluation, means that the evaluation may generate entirely new insights and ideas about the programme.

5. Many significant instances of learning and reflection in and around Sciencewise have come from unexpected places and processes, rather than from formal learning mechanisms.

Some of the most significant and impactful learning processes that I observed during the period of research did not come from formal learning mechanisms like evaluations or thought leadership work, but had more diffuse or unexpected origins. For example, the engagement of several Sciencewise actors in the debate about defining and demonstrating open policy, was initially informal and opportunistic but it lead to a number of significant and transformative changes, including: the strengthening of relationships with the Cabinet Office; an improved understanding of current concerns in Government and how to influence them; and increasing Sciencewise engagement with issues related to the digital agenda, and attempts to incorporate digital methods into public dialogue projects. This process also contributed to a broader discussion which is ongoing within Sciencewise about the relationship between public dialogue and other methods for democratic participation, and how Sciencewise could have a role in promoting public voices in policy debates more generally.

Another example of this kind of learning is the sometimes unexpected ways in which Sciencewise actors have learnt from public dialogue projects. The Bioenergy Distributed Dialogue was a project carried out by the BBSRC (Biotechnology & Biological Sciences Research Council) 2012-2013 with Sciencewise support. The project adopted an unusual methodology by running much shorter deliberative events than conventional dialogue exercises, and developing a set of materials which could be downloaded by anyone in order to run a deliberative process anywhere in the country and then feed their outputs back to the BBSRC. The project experienced several challenges in practice, such as how to encourage broader uptake of the materials, and was met with some scepticism amongst dialogue professionals who felt that some of the deliberative sessions were too short to be meaningful. However, the more experimental methodology adopted in this project has prompted broader discussions around the future of public dialogue methods within Sciencewise, including the potential to 'scale-up' dialogue projects and create a more iterative and ongoing relationship between citizen input and policy-making in institutions like the BBSRC.

6. **The model of outsourcing the work of public dialogue, thought leadership and other activities from the Sciencewise programme can potentially undermine opportunities for organisational learning.**

Many of the activities Sciencewise supports and carries out, including public dialogue projects and project evaluations, are outsourced to third parties. This has always been part of the programme's delivery model, and is necessitated by a number of factors, including: the relatively small size of the programme; the need to generate a neutral third party assessment of funded activities (in the case of project evaluations); and the desire to increase the quality of project delivery through competition between different bodies. Whilst this outsourcing model is a common feature of similar Government-funded bodies and may have learning benefits, such as bringing in new insights and ideas from third parties, there are also ways in which this model potentially limits opportunities for learning from and holistically reflecting on Sciencewise projects.

Outsourcing means that very different people and bodies will be involved in different stages of a public dialogue project, from its initiation, to approving a business case, and then carrying out, reporting on and evaluating the public dialogue. This potentially creates a situation where, depending on the specific role of the Dialogue and Engagement Specialist overseeing the project, no one individual has a full overview of the project which is underway. It also creates challenges for the communication of more diffuse information, such as the initial impulses which led to the creation of the project, or the subtleties of the policy area which the dialogue is hoping to influence.

Though Sciencewise has developed productive relationships with some of its contractors over time, leading to a general increase in the quality of their public dialogue work, concerns about damaging competition or giving certain bodies an unfair advantage prevent Sciencewise actors from offering in-depth training in public dialogue methods directly to contractors, or suggesting major alterations to the proposals they submit. Furthermore, the contractors themselves are often dissuaded from suggesting more experimental or novel process designs for public dialogue processes due to the competitive tender process, and are potentially less likely to fully disclose perceived problems or failures in their work due to the fear of losing future business, though these may be important opportunities for learning.

Recommendations

Based on my research findings I have the following suggestions to help to sustain and develop Sciencewise's expertise in public dialogue and engagement and its position within Government.

1. **Sciencewise can build on its current expertise and institutional memory to position itself at the fore-front of imagining and anticipating the possible futures of public dialogue and engagement**

Due to its increasing profile and influence in Government, Sciencewise is now in a good position to offer practical and intellectual leadership around the futures of public dialogue and engagement. The programme already has a wealth of material to draw on here, from the considerable expertise of programme staff, to its now extensive library of thought leadership and social intelligence reports. These resources could be further consolidated through a more explicit and focussed attempt to imagine and anticipate potential futures of public dialogue and engagement, drawing both on internal and external expertise. This would provide a focal point for future thought and practice in the public participation community, as well as distilling important insights for the benefit of policy actors. Such a process would also be useful in identifying potential future stumbling blocks or negative unintended consequences, as well as more positively laying out key milestones or watershed moments which may lie ahead.

2. The success of the 'theory of change' process during 2013 suggests that creating periodic organised opportunities for collective reflection and learning are constructive

The 'theory of change' process as described above created a constructive opportunity for broader learning and collective reflection amongst Sciencewise actors, and crucially crystallised a number of shifts in practice and understanding which were already occurring in and around the programme. The results of this process have the potential to inspire and direct activities in Sciencewise for the remainder of the current project and beyond, benefitting from the new ideas and insights which were generated and collected. This suggests that though potentially time-consuming, organised processes for reflection and learning play an important role in stimulating high-level learning and new insights within the programme, and should be conducted periodically.

3. Adopting a conscious disposition of 'experimentation' would potentially help Sciencewise actors and the programme to reflect on and learn more systematically from current Sciencewise activities

In any programme trying to get the most out of its budget and staff there are likely to be few opportunities for times and activities exclusively focussed on promoting organisational learning. However, Sciencewise actors can make the most opportunities for learning and reflection which arise from existing activities by being conscious of how these opportunities can emerge from unexpected places or even from perceived mistakes and failures. Furthermore, procedures could be put in place to more reflexively monitor and therefore iteratively and responsively modify current activities against pre-defined dimensions or against the reactions of particular stakeholder groups. The metaphor of 'experimentation' is one way of

capturing such an approach and reflecting a disposition which is open to new learnings, however surprising their origins or forms.

List of abbreviations

ANT – Actor-Network Theory

BBSRC – Biotechnology and Biological Sciences Research Council

BIS – Department for Business Innovation and Skills

BSA – British Science Association

BSE – Bovine spongiform encephalopathy (Mad cow disease)

CoPUS – the Committee on the Public Understanding of Science

CSaP – Centre for Science and Policy (University of Cambridge)

DECC – Department for Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs

DES – Dialogue and Engagement Specialist

GMO – Genetically Modified Organism

IfG – Institute for Government

IPCC – Intergovernmental Panel on Climate Change

ITT – Invitation to Tender

MMR – Measles, Mumps and Rubella (vaccine)

Nesta – National Endowment for Science, Technology and the Arts

NGO – Non-governmental Organisation

NHS – National Health Service

NICE – National Institute for Health and Care Excellence

OUGO – Office of Unconventional Gas and Oil

PES – Public Engagement with Science

POST – Parliamentary Office for Science and Technology

PUS – Public Understanding of Science

RCEP – Royal Commission on Environmental Pollution

RCT – Randomised controlled trial

SPRU – Science Policy Research Unit (University of Sussex)

STEM – Science, Technology, Engineering and Maths (refers to academic disciplines)

STEPs – Social, Technological and Environmental Pathways to Sustainability (Centre at University of Sussex)

STS – Science and Technology Studies

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