CRANFIELD UNIVERSITY

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Knowledge brokering at the science—policy interface: Designated knowledge brokers or scientists as boundary spanners in practice?

School of Applied Sciences
Cranfield Water Science Institute

PhD
Academic Year: 2012 - 2013

Supervisor: Professor Paul Jeffrey
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ABSTRACT

The environmental sector has witnessed a steep increase in the number of published studies promoting knowledge brokering as a solution for bridging the alleged science—policy gap. A critical review exposed knowledge brokering as an ambiguous concept of contested meaning; imputed to a prevailing conceptualization of science and policy as two distinct homogenous entities, which originated from positivism of the natural sciences paradigm.

This thesis challenges the knowledge brokering concept further by showing how thirty scientists within a UK university constructed the practice of spanning a boundary between science and policy. Three discursive constructions of scientists-cum-boundary spanners emerged (*Contractor, Confidant, Educator*), which differed in the type of relationship between a scientist and a (policy) client and a project stage involvement. A thematic analysis revealed key influences on boundary spanning practice: access, experiential knowledge, reciprocity, trust, and repeat work. The scientists did span boundaries; the practice was strongly dependent on social relationships that were enduring and could not be reduced to the economic transaction of goods (due to the equal importance of cultural and social capital). The preferred construction was of boundary spanning as a cyclical, rather than a linear process.

The research contributes to knowledge by drawing from Sociology of Scientific Knowledge and research on Higher Education, and boundary spanning. Firstly, it supports the view that science is a social practice; for its study the model of science as competition is considered most appropriate. Secondly, it adds to the understanding of scientific practice by identifying three distinct modi operandi influenced by ideologies of neoliberalism: *Trust-based practices*, *accountable and transparent practices*, and *risk-taking practices*. Thirdly, the study refutes the call for designated knowledge brokers as simplistic. It explores feasibility of both designated and informal boundary spanning roles within Higher Education.

Keywords: knowledge brokering, knowledge broker, scientific practice, symbolic capital, trust, commodification of scientific knowledge.

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Dedicated to my grandmothers: One, a teacher who did not see her work as a job, but as her life's mission. She taught me so much. The other, whom I never met, could not fulfil her educational ambitions. Due to her family's lack of money, only her brother was chosen to continue studying. I hope her granddaughter's achievement would alleviate some of the frustration she must have felt.

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LIST OF ABBREVIATIONS AND ACRONYMS

BIS	Department for Business, Innovation and Skills
CA	College of Aeronautics
CHSRF	Canadian Health Services Research Foundation
DECC	Department of Energy and Climate Change
Defra	Department for the Environment, Food and Rural Affairs
EA	Environment Agency
DFID	Department for International Development
DfT	Department for Transport
EC	European Commission
ERFF	Environment Research Funders' Forum
EUROFORIC	European Urban Forestry Research and Information Centre
FCO	Foreign and Commonwealth Office
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HESA	Higher Education Statistics Agency
L&D	Learning and Development
LKM	Learning and Knowledge Management
LWA	Land and Water Australia
MoD	Ministry of Defence
NPM	New Public Management
PI	Principal Investigator
RAE	Research Assessment Exercise
SAS	School of Applied Sciences
SEPA	Scottish Environment Protection Agency
SKEP	Scientific Knowledge for Environmental Protection
SSK	Sociology of Scientific Knowledge
STEM	Science, Technology, Engineering, and Mathematics
STS	Science and Technology Studies
UK	United Kingdom
WRAP	Waste and Resources Action Programme

CHAPTER 1: INTRODUCTION

1.1 Knowledge brokering: reinventing the wheel?

The interaction between science and policy had been described as inadequate, symbolised by a low uptake of research findings by policy makers who were frustrated by the lack of policy-relevant research (McNie, 2007). It was often attributed to the diverging characteristics of science and policy practice (e.g. different time constraints, different objectives, and different language spoken by scientists and policy makers), leading to generalised characters of policy makers being mocked by scientists (see Choi *et al.*, 2005), whilst scientists have been accused of producing information "too little and too late" (Hoppe, 2005, p. 206).

In relation to the environmental sector, a number of solutions have been proposed to address the issue of inadequate interaction between science and policy:

- *Boundary organisations*, a term used in *The Global Environmental Assessment Projec*t that was launched in 1995 in the USA and that generated the first literature on environmental boundary organisations (e.g. Guston, 2001). These were special types of intermediary organisations that had as a main purpose not the production of knowledge, but rather knowledge interpretation and translation.
- The use of *horizon scanning* by policy makers was to allow a preventative type of policy making by forecasting new risks through scanning techniques instead of simply reacting to problems as they occurred (Sutherland and Woodroof, 2009; van Rij, 2010).
- *Knowledge brokering*, the enabling function of which was to facilitate a bidirectional flow of knowledge between science and policy (van Kammen *et al.*, 2006). Knowledge brokering was advocated as a means for improving the interaction between the two domains, ultimately leading to

the formulation of more informed, evidence-based decisions and better informed science.

Knowledge brokering has been a relatively new concept in published literature on environmental issues. Its rise in popularity could be attributed to two recent studies in the field of environmental policy. The first was *The honest broker: making sense of science in policy and politics* by Pielke Jnr. (2007) that was primarily concerned with communication of scientific information and the role of scientists in general. Pielke Jnr. (2007) used the term "honest broker of policy alternatives", but did not explicitly refer the knowledge broker and knowledge brokering. This was also the case in the study by McNie (2007), which was a broad-sweeping literature review on the topic of "reconciling the supply and demand of scientific information and the production of useful information". She utilised the terms "boundary spanning individuals", rather than knowledge brokers (McNie, 2007, p. 32); whilst boundary organisations were described as "honest brokers", defined as types of organisations that "are accountable to both sides of the boundary" (McNie, 2007, p. 28).

Environmental studies that utilised and promoted knowledge brokering drew from the health sector, where the concept was first established and where it had been firmly embedded within prominent organisations such as the Canadian Health Services Research Foundation (CHSRF). However, given that knowledge brokering was a new concept, many questions surrounding it remained unanswered. Therefore, in the area of health, knowledge brokering was associated with an ambiguity of meaning, intensified by a confusion arising from the vast range of other labels in use (e.g. Straus *et al.*, 2009). Furthermore, there was a lack of evidence on the effectiveness of knowledge brokering, as noted by Mitton *et al.* (2007), Dagenais *et al.* (2009) and Gagnon (2009).

Such shortcomings were evident in the environmental sector. There was a paucity of studies that demonstrated the advantages of adopting a knowledge brokering approach; those benefits were mostly only hypothesised. Additionally,

many of these studies focused solely on highlighting the existence of a science—policy gap and then suggesting knowledge brokering and knowledge brokers as solutions for bridging this gap (e.g. a study by Holmes and Lock, 2010; Pereira *et al*., 2009; Holmes and Savgård, 2009; Konijnendijk, 2004). Equally, these studies were missing the voice of knowledge brokers operating at the science—policy interface. Instead they rely on authors' own past experiences working at the science—policy interface (e.g. a study by Bielak *et al.*, 2008; Shaxon, 2009; Holmes and Harris, 2010). These issues with the reviewed studies from the environmental sector that utilised the term "knowledge brokering" suggested opportunities for further research.

However, I would argue that what was needed as well was the adoption of a markedly different approach to knowledge brokering – one that took a critical stance towards the concept. A critical lens was chosen by Greenhalgh and Wieringa (2011), when reviewing the usage of the *knowledge translation* metaphor in the health sector. Such a critical examination of knowledge brokering as promoted in the environmental sector would be timely, considering that Land and Water Australia (LWA), an organisation that listed knowledge brokering as being at the heart of its activities according to Bielak *et al.* (2008), was abolished in 2009 (LWA, undated). Back in the health sector a dedicated knowledge broker at the Centre for Innovation in Health Management at the University of Leeds was made redundant in 2010 (Mendeley.com, undated). This raised the question: was knowledge brokering simply an example of a fashionable concept – a "hot topic" that was to come and go?

In addition, the occurrence of the term knowledge brokering might be intrinsically linked to the preferences of the research funder, explicated by the language in use. Greenhalgh and Wieringa (2011) raised this issue of the research funder's influence, which was described as "potentially sinister forms of symbiosis between government, industry and science" (p. 507, citing Etzkowitz and Leydesdorff, 2000). As the authors noted:

> "Research is increasingly a policy issue, its priorities set at national level with overt government influence: it must be programmatic, collaborative, relevant, cost-effective and generate 'innovations'" (Greenhalgh and Wieringa, 2011, p. 507, quotation marks original).

This suggested that the increase in popularity of the term knowledge brokering in the environmental sector might be an outcome of scientists concerned with the need first and foremost to accommodate research funders and their priorities. For example, the study by Holmes and Clark (2007), which called for the introduction of knowledge brokers, was funded by The Environment Research Funders' Forum (ERFF). Those interviewed for the purpose of this study were from the ERFF member organisations, with only a minority of the interviewees comprising other scientists. Thus it could be argued that the findings of Holmes and Clark (2007) apply only to a particular context and cannot be generalised. Similar research funders' influence might be found in other studies in the environmental sector that promoted knowledge brokering, such as those funded by the European Commission (EC):

- Konijnendijk (2004) – funded by European Urban Forestry Research and Information Centre (EUFORIC);
- Holmes and Lock (2010) – funded under MariFish ERA-NET;
- Holmes and Savgard (2009) – funded under Scientific Knowledge for Environmental Protection (SKEP) ERA-NET; and
- Pereira *et al.* (2009) – funded under The ACCENT Network of Excellence.

Consequently, that raised a suspicion that the rise of knowledge brokering occurred mainly through a top-down approach, imposed by policies set by the government and reinforced by research funding mechanisms. Would knowledge brokering be reported as a finding of scientific research without such interference? These concerns about the authenticity of knowledge brokering highlighted the need to turn attention instead to actual practices of science and

policy work: what scientists and policy makers do as they interact with each other and what language they themselves use to describe these interactions. A similar conclusion was made by Tuunainen (2005), following his review of a number of models of science-industry interaction. These included the concept of Mode 2 science advocated by Gibbons *et al.* (1994) and Nowotny *et al.* (2001). [1] Whilst Tuunainen (2005, p. 281), acknowledged that the theoretical models of science-industry interaction he reviewed, including Mode 2 science, did contain "some relevant trends with respect to the dynamics in the current academe"; overall, he found that they used "indistinct and totalizing language" (p. 293) and engaged in what he described as ""diagnosis-of-the-era" type of theorizing" (Tuunainen, 2005, p. 283, quotation marks original; citing Miettinen, 2002; and Tuunainen, 2002). He suggested that such theoretical models ignored the character of science as a sociocultural practice; instead, what was needed was to examine the work of scientists and policy makers as "local practical actions" (Tuunainen, 2005, p. 293).

The need for studies that examined the practice of science—policy interactions resonated in some of the studies in the environmental sector that utilised the concept of knowledge brokering (e.g. Bielak *et al.*, 2008; Sheate and Partidário, 2009; Petit *et al*., 2011).

The scientific discipline that examines science-as-practice is the Sociology of Scientific Knowledge (SSK), which developed as a branch of Science and Technology Studies (STS). Yet a majority of the studies from the environmental sector that promoted knowledge brokering appeared to be unaware of this body

[1] Mode 2 represented a different means of knowledge production to the traditional scientific pursuit bounded by disciplinary norms and carried out within the walls of universities (Mode 1): in Mode 2, scientific knowledge was produced "out in a context of application" whilst being much more "socially accountable", with a strong problem solving focus that called on expertise across a range of scientific disciplines (Gibbons et al. 1994, p. 3). The new Mode 2 corresponded with the need for knowledge production to accommodate key drivers of influence, such as massification of Higher Education, globalisation and new developments in technology (Gibbons et al., 1994). See Chapter 4 for an overview of the recent developments within the UK HE sector.

of research, although such lack of recognition given to SSK scholarship was not uncommon. The words of Edge (1995), a prominent STS scholar, might be more than three decades old, but with the recent emergence of concepts such as knowledge brokering they are still worth repeating:

> "…the insights we have gained still seem, too often, to be almost wantonly disregarded. The potential audiences for our "messages" are stubbornly unreceptive. Sadly, I see others (mainly outside the STS community) refinding the old sense of practical urgency and unease at the social status and role of science and technology, and then, in attempting to relieve that unease, "reinventing the wheel" in blissful ignorance of the fact that a solid body of scholarship now exists that suggests that the simple "wheel" cannot bear the strain they wish to put upon it. ... For the "wheel" that is continually rediscovered and reapplied is the "received view" of science and technology as asocial, impersonal activities – a positivistic, even mechanistic, picture of an endeavour that defines its own logic and momentum, its own values and goals, and legitimates its progress by appealing to the assumption that the authority of nature is independent of, and prior to, the authority of society" (Edge, 1995, p. 4-5, quotation marks original).

As SSK traditionally focused on the micro processes of scientific fact construction, the research would adopt additional theoretical lenses to enable a broader context to be taken into account, especially in light of the concerns expressed by Greenhalgh and Wieringa (2011) about the increasing influence of research funders in determining what counted as useful research. This view of the need to link the micro (local) and macro (broad) levels of focus was shared by Albert and Kleineman (2011) who, in their call for more STS scholars to draw from the ideas of sociologist Pierre Bourdieu, proposed that "it is impossible to gain a compelling understanding of the scientific field today without understanding the relationship between the local and something more global" (p. 265).

There are three further sections in this chapter. The research purpose is included in Section 1.2 as well as information on research design and method. Section 1.3 outlines the intended contributions of this research, whilst Section 1.4 includes information about the overall structure of the thesis.

1.2 Research Outline

The purpose of this research was to explore new avenues related to the concept of knowledge brokering, which had been promoted in the environmental sector as a solution for inadequate science—policy interactions.

There has been a call for the introduction of a new cadre of designated knowledge brokers operating between science and policy to perform tasks such as interpretation, translation, and communication of scientific knowledge.

A review of the literature from the environmental sector that advocated knowledge brokering implied there was a need for a non-positivist study of the practice of science—policy interactions that would adopt a multifaceted research design. Such research would consider both constructions of local practices at the science—policy interface and a broader context into which the study would be embedded. Subsequently I adopted multiple theoretical lenses: SSK to focus on the study of science-as-practice and local constructions (micro level); HE research to paint the picture of the wider setting into which the study would be embedded; boundary spanning that was considered an analogical concept to knowledge brokering; and theoretical concepts attributed to sociologist Pierre Bourdieu. The research approaches and methods considered for the purpose of this study are outlined in Chapter 3

1.3 Intended contributions

This thesis is intended to contribute to our knowledge of knowledge brokering and the knowledge broker role functioning at the science—policy interface. These two concepts had been increasingly advocated by authors within the

environmental sector as solutions for bridging the alleged science—policy gap. The research design of the majority of these studies, vested within positivism of the natural sciences paradigm, did not examine the practice at the science—policy boundary, nor consider a broader context that might have had an influence on local practices. This was despite these elements being considered paramount for understanding the practice of science—policy interactions, as argued by SSK scholars (e.g. Albert and Kleineman, 2011; Tuunainen, 2005).

1.4 Thesis structure

There are a further six chapters in this thesis. Chapter 2 is a review of knowledge brokering as a concept that has recently emerged in published studies, across disparate disciplines within the environmental sector. To make sense of the diversity of publications promoting knowledge brokering I divide them, with the help of Callon's (1995) four models of science, to three main groups. These represent distinct theoretical streams, of which each put forward a different understanding of knowledge brokering and scientific practice. I critique the dominant group of reviewed studies. I turn to research on science as practice that leads me to adopt a multifaceted research design by utilising ideas from SSK, HE, and boundary spanning research. I formulate a research question that is set to challenge the knowledge brokering concept further.

In Chapter 3, I discuss the philosophical and theoretical underpinning of SSK and constructionism, in which this research was positioned. I describe the choices made in relation to research and empirical design, mode of enquiry, how my interviewees were selected and interviews were conducted, and how data was analysed and interpreted. Research ethics and research validity are discussed.

In Chapter 4 there is contextual information. The structure of this chapter was originally inspired by Mulkay and Gilbert (1984) and their Chapter 2 on a history of a specific academic field (i.e. an area of biochemistry called oxidative phosphorylation): the chapter was constructed from the interviewees' accounts and their own version of the history of the field. In this thesis, Chapter 4 has three

distinct parts, ordered according to its main sources of information. It starts with a broad overview of recent historical changes taking place in the UK HE sector, as depicted in the HE research literature. Into this broad context a single case study is embedded. I classified the university where my research was conducted by utilizing Barnett's (2011) typology of *entrepreneurial universities*. The classification was supported by information provided on the university's external website and internal documents. A brief history of the university is included. The third part of the chapter is constructed using the interviewees' accounts.

In Chapter 5, the results are presented. Three emerging discursive constructions of the practice of spanning the reputed science—policy boundary are compared and contrasted. A thematic analysis revealed five key elements of the practice of relationship building across science—policy boundaries that scientists collectively engaged in. I show how the components were causally interlinked. Barriers to the practice of relationship building were discerned.

Chapter 6 brings together results from Chapters 4 and 5. The discussion revisits ideas presented in Chapter 2 in light of my findings. The understanding of science—policy interaction is expanded by identifying three distinct practices for science—policy interaction and by drawing on the additional theoretical concepts developed by Latour and Woolgar and Bourdieu. The chapter ends with claimed contributions to knowledge.

Chapter 7 contains a summary of the results. Implications are articulated. Acknowledgement of limitations of the study and suggestions for future research finish the chapter.

CHAPTER 2: KNOWLEDGE BROKERING IN THE ENVIRONMENTAL SECTOR

2.1 Introduction

When Bouma (1997) in his discussion paper urged soil scientists to become 'knowledge brokers' (Bouma, 1997, p.2, quote marks original[2]), the terms knowledge broker and knowledge brokering were mostly unheard of in the published literature on environmental issues. A decade later, the number of scientific studies utilising these expressions had risen sharply. Knowledge brokering has been hailed as the solution to bridging the alleged science—policy gap and there have been many calls for the introduction of dedicated knowledge brokers to operate at the science—policy interface (e.g. Holmes and Savgård, 2009; Shaxon, 2009; Surridge and Harris, 2007). But what exactly is knowledge brokering and where did the term originate? The purpose of this chapter is to review the concept as depicted in published studies in the environmental sector, and identify a research opportunity.

2.2 Knowledge brokering in the environmental sector

Knowledge brokering is a relatively new concept that has attracted the attention of the scientific community within the last ten years. Figure 2.1 has a list of reviewed studies within the environmental sector that explicitly used the term knowledge brokering or related terms in their body of text. These studies were identified through a Scopus database search that was first undertaken in December 2009 and then repeated again at the end of November 2012. For a

[2] The way the terms knowledge broker and knowledge brokering are written in the reviewed literature varies significantly, from the usage of single or double quotation marks to no quotation marks. For the purpose of this thesis, I uniformly write these terms with no quote marks.

full list of reviewed studies see Appendix A. Before the year 2000, four published studies (i.e. Cullen, 1990; Litfin, 1994; Bouma, 1997; and Owens and Rayner, 1999) were identified that utilised the term knowledge brokering and associated terms (e.g. knowledge broking). Since the year 2000, more than 30 such scientific articles have been published.

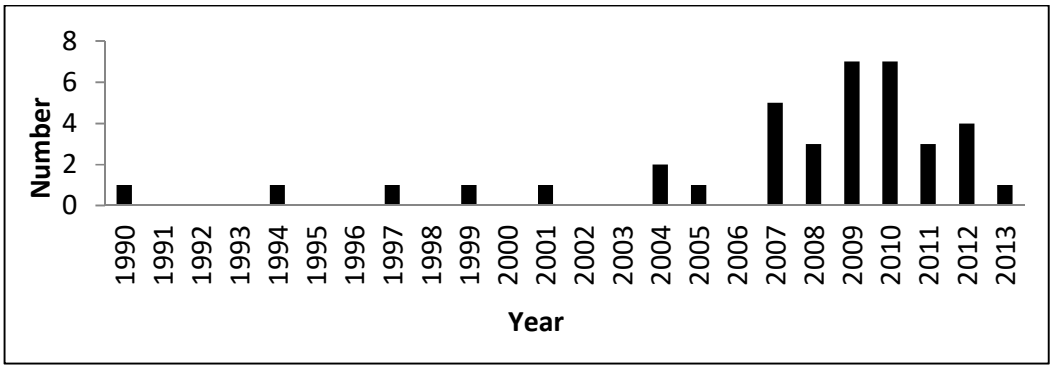


Figure 2.1 Published environmental sector studies utilising knowledge brokering
Source: Appendix A.

2.2.1 The origin of knowledge brokering

Knowledge brokering was found to be a multidisciplinary concept that was not confined to a single scientific field, but falls into twelve research topic areas, some of which were disparate (e.g. marine policy and fisheries versus urban forestry, see Appendix A) whilst others were overlapping (e.g. catchment management, water resources and agriculture). The reviewed studies were published in thirty-one different journals (e.g. *Environmental Science and Policy, Biotropica, Acta Sociologica, Advances in Agronomy, Environmental Impact Assessment Review*).

There were marked differences per research topic area. For example, knowledge brokering and knowledge broker in the research areas of agriculture and soil science were discussed mainly in relation to the perceived need for revitalisation of the agricultural extension services to aid the use of innovation by farmers (Feng *et al*., 2007; Eastwood *et al*. 2012). Subsequently, knowledge brokering was discussed more in relation to scientists versus farmers, as opposed to scientists

versus policy makers. Feng *et al.* (2007, p.5662) called these agricultural extension officers "field knowledge brokers." Petit *et al.* (2011), reporting on a year-long experience of a knowledge brokering trial from a Catchment Knowledge Exchange project on the topic of soil health, remarked:

> "The best extension officers have always operated as knowledge brokers, mediating between science and practice, and having an influence on both. However, the extension landscape in agriculture and NRM is changing rapidly, and traditional extension officers are increasingly rare. We would suggest that knowledge brokering is a better conceptualisation of the rationale for public investment in specialist intermediary roles to leverage the public investment in science" (Petit *et al.*, 2011, p. 244).

The variety of research areas in which the term appeared indicated that knowledge brokering did not originate within the environmental sector.

2.2.2 Definition of knowledge brokering

Linguistically, a broker (noun) and brokering (verb) are terms commonly used in English language. Examples of broker definitions identified in online dictionaries include:

> "Person who buys and sells goods or assets for others" (Oxford Dictionary a, undated)
> "One who acts as an intermediary" (Merriam-Webster Dictionary, undated)

Brokering was defined as to "arrange or negotiate" (Oxford Dictionary a, undated). The synonyms listed for the word broker included: mediator, middleman and go-betweener (Merriam-Webster Dictionary, undated). In general, the role of a broker or an intermediary was well established elsewhere. For example, in the stock market as a stockbroker or in real estate as a mortgage broker. The historical roots of the intermediary role could be traced to the trade of "middlemen", who acted in the UK as a link between wool merchants and cloth

making industries and the public as far back as the 16th century (Howells, 2006). Thus brokering implied an exchange of a commodity that was mediated via a third party. The fusion of the words brokering and knowledge as two compound nouns into the single expression knowledge brokering therefore suggested that knowledge was a commodity that could be brokered.

However, this was not the universally ascribed meaning of knowledge brokering in the literature reviewed. Whilst in some studies knowledge brokering was portrayed as an intermediary activity that involved the mechanical transfer of knowledge from its place of production to its place of consumption (e.g. Owens and Rayner, 1999; Holmes and Clark; 2008; Kiparsky, 2009), others spoke of knowledge co-production (e.g. Lövbrand, 2007) and of how the crucial aspect of knowledge brokering was found to be social, through interpersonal contacts and networks (e.g. Petit *et al*., 2011). Examples of definitions were identified in the reviewed articles:

- The term knowledge broker was preferred by Litfin (1994), because, according to the author, it "highlights the broad range of information that is translated and underscores that interpretation is more important than fact. Implicit in the term is the recognition that injecting science into policy is itself a political act requiring strategy of information transfer" (Litfin, 1994, p. 37; citing Caldwell, 1990, p. 23).

- Scientists as knowledge brokers "should have excellent communicative skills and a broad understanding of agri-ecological production systems, while being able to define the need for and perform cutting-edge soil research", writes Bouma (1997, p. 2).

- "The key aim of knowledge brokers (alternatively interpreters, intermediaries, boundary organisations and individuals) is to actively manage the interface between research users and researchers, building

social capital in the form of robust and durable relationships" (Holmes and Savgård, 2009, p. 718; citing McNie, 2007; and Bielak *et al*., 2008).

- "Knowledge brokering is one means to lessen the information deficit of users that may result from particular information needs not being fulfilled or that potentially useful information exists that users do not know about (Michaels 2009, p. 996; citing McNie, 2007).

- "Knowledge brokering is an emerging approach with the potential to improve knowledge sharing and exchange" (Petit *et al*., 2011, p. 233).

Overall, knowledge brokering in the reviewed literature was used, in the words of Michaels (2009, p. 1008), as an "umbrella term". It therefore encompassed a range of activities that included, for example, communication, transfer, and synthesis of scientific knowledge (Table 2.1).

Table 2.1 Activities encompassing knowledge brokering in the published environmental sector studies

Function	Reference
Communication	Holmes and Lock (2010)
Dissemination of research findings	Konijnendijk (2004)
Knowledge exchange	Petit *et al*. (2012)
Facilitation	Holmes and Harris (2010)
Interpretation	Litfin (1994)
Lobbying for the purpose of uptake/implementation	Gutiérrez (2010)
Networking – relationship building	Cullen (1990)
Knowledge synthesis	Owens and Rayner (1999)
Knowledge transfer	Kiparsky (2009)
Knowledge transformation	Rydin *et al* ., (2007)
Knowledge translation	Lövbrand,(2007)

No single definition of knowledge brokering was identified. A number of reviewed studies either did not provide an explicit definition of knowledge brokering or offer it only implicitly. For example, the study by Phadke (2005) was entitled *"People's Science in Action: The Politics of Protest and Knowledge Brokering in India",* but the term knowledge brokering did not appear in the body of the article, nor was it further defined or referenced. In other studies the term knowledge brokering also

appeared only once (e.g. Verweij and van Densen, 2010; Pietri *et al*., 2011; Krueger *et al.*, 2012; Hegger *et al*., 2012; Klerx and Proctor, 2013).

Other studies (e.g. Litfin, 1994; Bouma, 1997; Kiparsky, 2009) did elaborate to a greater or lesser degree about the term knowledge brokering, but then did not reference the origin of the term to another source. These studies could then become themselves an important reference source for future articles, such as the study by Litfin (1994) that was cited by Owens and Rayner (1999), Konijnendijk (2004), Lövbrand (2007) and Gutiérrez (2010). In further instances, the definitions provided were referenced to authors' own earlier articles (e.g. Bouma *et al*., 2011 citing Bouma, 1997; or Holmes and Lock, 2010, citing Holmes and Savgård, 2008).

Some studies borrowed definitions of knowledge brokering from different sectors and disparate scientific disciplines. Definitions from the health sector were popular, in particular that provided by CHSRF, for example, referred to by Bielak *et al*. (2008) and used by Shanley and López, as well as Sheate and Partidário (2009):

> "Knowledge brokering is one of the human forces behind knowledge transfer. It's a dynamic activity that goes well beyond the standard notion of transfer as a collection of activities that helps move information from a source to a recipient. Brokering focuses on identifying and bringing together people interested in an issue, people who can help each other develop evidence-based solutions. It helps build relationships and networks for sharing existing research and ideas and stimulating new work. Knowledge brokering supports evidence-based decision-making by encouraging the connections that ease knowledge transfer" (CHSRF, 2003).

Finally, knowledge brokering could be exhibited in different forms: through individual knowledge brokers (e.g. Bouma, 1997; Konijnendijk, 2004; Rydin *et al*.,

2007), through organisations that acted as knowledge brokers (e.g. Owens and Rayner, 1999; Holmes and Savgård, 2009; Michaels, 2009) or as knowledge brokering practices, strategies, techniques or tools (Sverrisson, 2001; Michaels, 2009; Sheate and Partidário, 2009).

2.2.3 Multiple theoretical streams

The interpretation and definitions of knowledge brokering in the reviewed literature were very diverse. However, the diversity and apparent incongruity of knowledge brokering in literature from the environmental sector could be minimised by recognising three distinct philosophical and theoretical streams from which the majority of the reviewed studies drew. These streams are outlined in the subsequent sections. The first two streams differed in terms of the philosophy of science they adopted and represented, both ontologically and epistemologically (the former being concerned with the nature of social reality; the latter with how this social reality can be known, according to Blaikie, 1993). The third stream represented a particular disciplinary view of structural sociology.

The differences between the first two theoretical streams of knowledge brokering could be traced to their view on scientific knowledge and science itself, i.e. whether science was about the disinterested pursuit of objective facts, or whether science was predominantly a human achievement. These were important facets to consider because they determined the possibilities for the study of interaction between science and policy.

In terms of the model of science the reviewed studies adopted, I drew from the ideas of Michel Callon (1995), who distinguished four models in which science could be perceived as: *rational knowledge*, *competition*, *sociocultural practice* and *extended translation* (Table 2.2).

Table 2.2 Callon's models of science

Science as:	Detail
Model 1: Rational knowledge	▪ Aligns with positivism, which considers scientific facts superior to other knowledge production processes.
Model 2: Competition	▪ One version draws on economic theory and associated with the work of French sociologist Pierre Bourdieu.
Model 3: Sociocultural practice	▪ Emphasises social processes and tacit skills in scientific practice. Scientific practice is like any other social practice.
Model 4: Extended translation	▪ Forms the basis of the actor-network theory developed by Michel Callon and Bruno Latour.

Source: Callon (1995)

A majority of the reviewed studies were found to fall under the rational knowledge model of science, whilst a smaller number adopted the view of science as sociocultural practice. These two groups of studies are discussed in the following sections.

2.3 Rational view of science—policy interactions

The studies included in this group were those authored by Holmes (i.e. .Holmes and Clark, 2008; Holmes and Savgård, 2009; Holmes and Harris, 2010; Holmes and Lock, 2010), and those associated with Bielak (i.e. Bielak *et al.*, 2008; Shaxon, 2009; Sheikheldin *et al.*, 2010). The theoretical studies of Michaels (2009) and Kiparsky (2009) also fell into this group, as well as Owens and Rayner (1999), Konijnendijk (2004), Sheate and Partidário (2009) and Shanley and López (2009) (Appendix A). Thus a majority of the reviewed studies were found to represent this model of science. This was not surprising given the environmental sector was dominated by the technical and rational research mentality; similar to the medical field, as noted by Greenhalgh and Wieringa (2011).

2.3.1 Knowledge brokering as a solution to bridging the gap

In studies that represented the rational knowledge model, knowledge brokering was described as an intermediary activity between the two separate and

homogenous worlds of science and policy; it was seen overwhelmingly as fulfilling a dual purpose: 1) to increase the use of scientific information in policy making and 2) to ensure that policy-relevant research was undertaken by the scientific community. Two key metaphors in use were of a science—policy gap and the need to bridge this gap. Knowledge brokering was then promoted as a solution to bridging the science—policy gap. The verb associated with this view of knowledge brokering was that of knowledge transfer, and what was transferred was (scientific) knowledge. Given that in this view, the nature of scientific knowledge was not viewed as problematic, knowledge brokering became about moving scientific knowledge from one place to another. The main direction of knowledge transfer was from science to policy. This view of knowledge brokering thus resonated with the traditional linear model of science—policy interaction, now supposedly outdated, described in the words of American political scientist Aaron Wildawsky (1979), as “speaking truth to power”.

The reason why authors of the reviewed studies mentioned or promoted knowledge brokering was because they identified a range of outstanding issues hindering successful interaction between the worlds of science and policy, for which knowledge brokering was perceived as a suitable remedy (e.g. see Holmes and Lock, 2010; Sheate and Partidário, 2009). These factors were identified to stem from multiple sources:

- **In the domain of science**: The performance measurement in academia with its bias towards publishing in peer-reviewed journals (e.g. Holmes and Savgård, 2009); communication of science and dissemination of results not being given a priority in academia (e.g. Shanley and López, 2009) and even having a negative connotation as a solely “altruistic activity” (cf. Pereira *et al.*, 2009, p. 5426); institutional barriers in academia and its structure’s emphasis on narrowly defined disciplines (Pereira *et al.*, 2009), dissimilar technical language in use by different scientific disciplines adding to the complexity in communication (Michaels, 2009).

- **In the domain of policy**: Policy makers were described as "information satisficers rather than optimizers" (Michaels 2009, p. 996, quoting Simon, 1957); a lack of time, skills, or understanding that policy makers have in doing their work (e.g. Sterk *et al*., 2009); subsequently leading to a deficiency in research planning, information translation, and interpretation capacity of policy making organisations to engage with the domain of science (e.g. Michaels, 2009; Holmes and Lock, 2010); lack of transparency in policy making (Holmes and Savgård, 2009); institutional barriers that stemmed from an emphasis on verticality in organisational structure and thus strong departmentalism in policy organisations (e.g. Rydin *et al*., 2007);

- **In both science and policy domains**: the divergent nature of the roles of a scientist and a policy maker (e.g. Holmes and Clark, 2008);

- **Issues that fell between science and policy**: A shortage of professionals who worked as knowledge brokers (Konijnendijk, 2004; Rydin *et al*., 2007; Surridge and Harris, 2007; Holmes and Clark, 2008; Holmes and Lock, 2010), a poor visibility of these professionals (Shanley and López, 2009), and a deficiency in the information translation and interpretation capacity of policy making organisations (Rydin *et al*., 2007; Holmes and Clark, 2008; Holmes and Savgård, 2009). An urgent need for a "safe and authorised space" where scientists and policy makers could meet and develop a "constructive dialogue and building of mutual trust" (Pereira *et al*., 2009, p. 5427; Michaels, 2009);

- **External factors**: The high level of uncertainty associated with many environmental issues (e.g. Konijnendijk, 2004).

The incompatibility of science and policy, together with these barriers that hindered science—policy interaction were collectively described as a science—policy gap. The main benefit of knowledge brokering, as advocated in these reviewed studies, was to overcome the barriers to science—policy interactions, described in the section above.

Knowledge brokering was envisaged to bridge the alleged gap in a process that could be summarised as follows: there will be an increased utilization of research (that becomes more policy-relevant), thus promoting evidence-based policy. Through the use of intermediaries (i.e. knowledge brokers), the communication within science and between science and policy will flourish. Policy makers will be freed of the burden of having to search for information, having to choose between many conflicting options or freed of the temptation to choose knowledge selectively; information will be synthesised, translated, interpreted, framed and presented to them in a format suitable for them, on demand. Scientists will be freed of the burden of disseminating research and communicating with the public and policy makers. Policy makers will be aware of the latest research, and scientists will be aware well in advance what questions policy makers need addressing. The main beneficiary here is science and hopefully the environment; this improvement in science communication and transfer – through the help of knowledge brokers, knowledge brokering tools and strategies etc. – will ultimately lead to better decision-making that will introduce environmental policies that will successfully tackle complex environmental issues, thus preventing unnecessary environmental disasters, the depletion of resources and loss of human lives.

Overwhelmingly, the reviewed studies that represented the model of science as rational knowledge depicted science and policy as two distinct homogenous entities. The justification to introduce knowledge brokering at the science—policy interface in these studies, as outlined in Section 2.3.1, was done through painstakingly listing shortcomings in the current science—policy interactions and highlighting the existence of a science—policy gap that had to be bridged.

2.3.2 Model of science and nature of scientific knowledge

The reviewed studies that took a rational view of knowledge brokering were firmly embedded in the realist ontology and empiricist epistemology of positivism. Positivism had been the central philosophy of science during much of the 20th century (Alvesson and Sköldberg, 2009; Gergen, 2009). In some scientific

disciplines, especially those concerned with natural sciences and the environment, positivism remained mainstream, and often the only credible means of scientific enquiry. The Royal Society in the United Kingdom (UK), for example, defined science as "natural knowledge", stemming from the natural sciences, mathematics and engineering (Royal Society 2011, p. 12); other types of knowledge were excluded.

The realist ontology is based on a postulation that "[b]oth natural and social phenomena are assumed to have an existence that is independent of the activities of the human observer" (Blaikie, 1993, p. 13). Facts are products of observation; they ''are consequently something that *exists, is (already) there*, and the task of the researcher thus becomes to gather and systematize them.'' (Alvesson and Sköldberg, 2009, p. 17, italics in original). Thus, true descriptions of a phenomenon could be obtained by a researcher who had been adequately trained into the role of a "neutral observer" and who applied "reliable methods and procedures" for observation and measurement (Blaikie, 1993, p. 19). Positivism is therefore strongly normative in character; what can count as scientific knowledge. In this view, the metaphor of a mirror, or mirroring, is adopted for the function of language that is perceived to be able to project truth – "truth exists when our language accurately depicts the world" (Gergen, 2009, p. 6). In that aspect, "some languages are closer to the truth than others" (Gergen, 2009, p. 9).

Positivism is represented by the model of science as rational knowledge, where, according to Callon (1995), science comprises the continuous production of statements – scientific facts – that are confirmed and invalidated by scientists who are seeking universal truth, whilst re-drawing science and non-science boundaries:

> "Putting the universe into words is the essential task of scientific knowledge. Science is thus developed in the form of a dual dialogue, first between scientists and Nature (observational statements and theoretical

statements) and second between scientists themselves" (Callon, 1995, p. 35).

Positivism in the reviewed studies was evident in the way the authors presented the uncomplicated nature of scientific knowledge; the content of scientific knowledge was not viewed as an issue, but moving the knowledge between the worlds of science and policy was seen as problematic and this was what knowledge brokering was supposed to address. For example, Owens and Rayner (1999), in their review of the work of the Royal Commission for Environmental Pollution in the UK, defined the knowledge broker role as an intermediary "between the original researchers, or the producers of knowledge, and the policy makers who consumed that knowledge" (Owens and Rayner, 1999, p 10: quoting Litfin 1994, p.4). According to the authors, the Royal Commission for Environmental Pollution, in its role as a trusted knowledge broker, "synthesized, re-packaged and transmitted existing knowledge in ways that had helped to set the policy agenda, and bring about policy change" (Owens and Rayner, 1999, p 18). So the authors referred to scientific knowledge as a discrete entity that can be packaged as a product suitable for policy makers' consumption.

Similarly, in Kiparsky's (2009) theoretical study, knowledge brokering was described as one of the "mechanisms or pathways through which scientific information had been transferred from the scientific to the policy communities" (Kiparsky, 2009, p. 116). Scientific knowledge was thus described as a distinct entity that could be separated from knowledge production and transferred, mechanically, into the world of policy. The author stated:

> "Scientists divide their limited time between theoretical and applied research, disseminating that research to the scientific community and helping to transfer it to policy and management, but are not always given professional credit for the latter function. Because transfer of knowledge may be a bottleneck in the adoption of science into policy, both the science and policy communities could benefit from an increased role for knowledge

brokers. Resource managers and policymakers might do well to increase support for scientific communication designed to speed up the sedimentation process" (Kiparsky, 2009, p. 122).

The majority of the reviewed studies in this group appeared to have been conducted by scientists with natural science training and this was reflected in the usage of research methods; these trends were discerned in the positivist studies:

- Use of questionnaires for collection of data – as in Holmes and Clark (2007); Sheikheldin *et al*., (2010); Shanley and López (2009);
- Focus on generalisation of findings as opposed to focusing on detail within a particular context – as in Bouma (1997); Holmes and Clark (2007), Shanley and López (2009).

The implication of the positivist stance dominant in these reviewed studies was that the authors tended to project their views on their subjects and frame the discussions in their own interests (e.g. labelling something as knowledge brokering); these studies were missing the voice and language of those operating at science—policy interface. I illustrate this with one example:

Shaxon (2009) reported on two policy teams in the Department for the Environment, Food and Rural Affairs (Defra): these teams took up "a more relational approach in the provision of evidence, focusing on building multi-stakeholder networks rather than relying solely on expert academic advice" (Shaxon 2009, p. 2147). The author discussed a range of activities that were collectively described as a knowledge brokering approach: "creating and managing multi-stakeholder networks, developing cost-effective tools to improve knowledge management in a resource-constrained policy environment and looking across evidence bases within Defra and elsewhere" (Shaxon, 2009, p. 2147). Thus the justification for the usage of the term knowledge brokering was based on the authors' choice to collectively label something as such. The voice of the policy makers was missing; this article's content was based primarily on

the author's own experience of working with the policy teams. The author concluded that "policymaking around plastics demanded a knowledge-brokering approach"(Shaxon, 2009, p. 2148) and there was a need for internal knowledge brokers to be working in Defra as interpreters between policy makers and scientists (Shaxon, 2009).

2.4 Co-construction view on science—policy interactions

A smaller group of the reviewed studies was found to have a markedly different view on science—policy interactions compared with the first group that was introduced in the previous section: the study by Litfin (1994), as well as Lövbrand (2007) and Gutiérrez (2010), who quoted Litfin (1994). Non-positivist views influenced the sociological study into environmental innovation by Sverrisson (2001) and the article by Rydin *et al.* (2007). The study by Kingiri and Hall (2012), about knowledge brokering performed by boundary organisations with influence on regulatory policy making in the field of agricultural biotechnology in Kenya, was also considered non-positivist.

2.4.1 Knowledge brokering as politically motivated construction

In these studies, knowledge brokering was depicted as a complex dynamic social endeavour, not a mechanical transfer of knowledge. Such a view of knowledge brokering challenged the linear model of science—policy interaction as idealistic and impractical (Lövbrand, 2007). Knowledge brokering was portrayed as an active process in which those engaged in the activity were pursuing specific goals. Studies in this group discussed knowledge brokers mainly as individuals who not only transferred scientific knowledge but contributed to its construction and ensured its uptake.

For example, Gutiérrez (2010) used water resources management and policy changes in three Brazilian states as a backdrop to show how some staff, including civil servants, consultants and scientists, actively played key roles in the style of political entrepreneurs – knowledge brokers. For Gutiérrez (2010), knowledge

brokering was not just about feeding scientific knowledge to the world of policy; he identified two knowledge brokering strategies that actors engaged in: 1) getting appointed to managerial positions related to water policy and 2) programmatic packaging. Whilst the first strategy was self-explanatory, the second was described as “a personal accomplishment of the reformist experts and other individuals, as they can skilfully move the reform up the governmental agenda by showing how intimately connected the reform was to the government’s programmatic goals” (Gutiérrez, 2010, p. 81). Similarly, Kingiri and Hall (2012) identified key tasks that boundary organisations engaged in as: embedded brokering, proactive activism and boundary spanning.

The study by Lövbrand (2007) focused on Swedish carbon cycle scientists and their experiences of boundary work between pure and applied research, and also of government officials interacting with these scientists at the science—policy interface in both national and international arenas. Knowledge brokers were described as those who are “not active scientists themselves, but had the skills necessary to understand the work of academics and to frame it in a language accessible to decision-makers” (Lövbrand, 2007, p. 43). These skilful and politically ambitious individuals possessed the power to “determine what counts as useful facts in the decision process” (Lövbrand, 2007, p. 40).

The image of a knowledge broker as an active change-agent made these authors question the issue of power. Rydin *et al.* (2007), who scrutinised how staff of the planning departments in the local authorities of London were successful (or not) with encouraging environmentally sustainable construction among their clients, highlighted that consideration must be given to potential power dynamics that may lead to appointed knowledge brokers fiercely protecting their position as experts on knowledge, in ways that could be detrimental to the learning of their colleagues. The power issues could be reinforced through the use of language. As Litfin explains:

> "The power of scientists to interpret reality has itself become a productive source of political power, regardless of how knowledge gets translated into technology. Scientists' power derives from their socially acceptable competence as interpreters of reality. Yet they are not simply powerful agents wielding an arsenal of knowledge; rather, discourse itself is a source of power, facilitating the production of identities and interests" (Litfin, 1994, p. 29).

Litfin (1994), in her in-depth case study into the international arena of environmental decision-making, found knowledge brokers as intermediaries working in both governmental and non-governmental organisations. Knowledge brokers, according to the author, were powerful individuals who possessed "discursive competence" to interpret and manoeuvre scientific information for particular means and ends (Litfin, 1994, p. 188). She drew on the concept of power as a disciplinary force that stemmed from the work of French philosopher, Michel Foucault, noting: "As political problems have become increasingly entwined with questions of scientific evidence and proof, the ability to interpret reality has itself become a major source of political power" (Litfin, 1994, p. 8).

According to the discursive approach, language was viewed as having constitutive power to shape reality. Thus knowledge brokering between science and policy was inherently an activity driven by individual interests and not a neutral transmission of disinterested scientific knowledge.

2.4.2 Model of science and nature of scientific knowledge

The study of knowledge brokering as a source of discursive power required a markedly different approach to the one represented by the model of science as rational knowledge, because it challenged that view of science as limited to the pursuit of objective facts. The reviewed studies that represented this model of science fell into the idealist ontology and constructionist epistemology. The first category had several forms, but it generally presumed "that what we regard as

the external world is just appearances, and has not independent existence apart from our thoughts" (Blaikie, 1993, p. 13). At the heart of the second concept lies the notion of facts as socially and culturally constructed.

Litfin, whose research was originally strongly positivist, recalled how, through the process of her research, she changed its trajectory: "It became increasingly evident that "knowledge" was not simply a body of concrete and objective facts but that accepted knowledge was deeply implicated in framing and interpretation and that these were related to perceived interests" (Litfin, 1994, p. 6, quote marks original). Such a view of knowledge was shared with the model of science as sociocultural practice, which recognised the importance of social elements and tacit knowledge in the construction of scientific facts – perceived as a craft-like activity – and where scientists, as knowledge co-creators, came to the forefront instead of being deemed to be invisible "statement utterers", as in the model of science as rational knowledge (Callon, 1995, p. 32). The model of science as sociocultural practice has commonly been adopted by SSK studies.

The reviewed studies from the environmental sector that adopted the model of science as sociocultural practice payed attention to the language in use as a source of discursive power. In terms of research methods, this led some to utilise a form of discourse analysis (e.g. Litfin, 1994). There was also an emphasis on context and localised constructions in these studies, as opposed to the generalisation of findings. Therefore these studies tended to be in-depth case studies.

2.5 From knowledge brokering to boundary spanning

The theoretical origins of knowledge brokering could also be traced to the discipline of structural sociology in which knowledge brokering is considered effectively a relational property within an interpersonal network. The analogical concept to knowledge brokering - that of boundary spanning - then emerged within the business and management sector and has been of interest in its Learning and Knowledge Management (LKM) field.

2.5.1 Network view on knowledge brokering

In structural sociology, brokerage is perceived to be a social role within interpersonal networks. Its definition, according to the network view, is comparable to those introduced in Section 2.2.2. For example, Marsden (1982, p. 202; cited in Gould and Fernandez, 1989, p. 91) describes brokerage as a process "by which intermediary actors facilitate transactions between other actors lacking access to or trust in one another." Or to put it more bluntly, "the whole point of brokerage is to create an indirect relation where no direct relation exists," (Gould and Fernandez, 1989, p. 95). Brokers were then, due to their strategic position within a network, in effect weak ties (a term first attributed to Granovetter, 1973 and 1983) or individuals who spanned "structural holes" (Burt, 2004). This position gave them a significant advantage, whether it came to finding a job (Granovetter, 1974); or turning creativity in a workplace into a very successful "import-export business" (Burt, 2004, p. 388).

Gould and Fernandez (1989) developed "a theoretical conception of brokerage behaviour in social systems characterized by the exchange or flow of resources," (p. 89): a typology of brokerage types within a triad relationship (e.g. 2 parties and one intermediary), in which consideration was given to the affiliation of the broker and the affiliation of the parties that participated in brokering. This distinction was important due to its impact on the level of power and influence of the broker (Gould and Fernandez, 1989). Furthermore, the authors stressed that "…individual actors can perform any combination of the corresponding roles simultaneously" (Gould and Fernandez, 1989, p. 94). Finally, the concept of brokerage was not considered to be a passive activity, but a process that was either actively pursued by individuals or not (Gould and Fernandez, 1989). This broker typology developed by Gould and Fernandez (1989) was applied, for example, by Lissoni (2010) in his study of Italian scientists as brokers, in relation to innovation patents.

Social network analysis is most commonly utilised for the study of structural properties of an interpersonal network. This particular method, with its distinct

mathematical and statistical methodology and use of visual representations, emerged in the first half of 20th century from research on sociology, social psychology and anthropology (Wasserman and Faust, 1994). As the name suggests, the main analytic unit of interest is not an individual, but a social network – defined as a "set of actors and the ties among them" (Wasserman and Faust, 1994, p. 9). The size of a unit of analysis can range from two or three individuals and their mutual relationships (i.e. study of dyads or triads) to complex networks and their subgroups that include hundreds of individuals (Wasserman and Faust, 1994). The study of linkages within networks is paramount for determining a network's overall structure, which can be subsequently utilised to examine its effect on individuals within the network (Wasserman and Faust, 1994). The key concepts in social network analysis are summarised by Wasserman and Faust (1994, p.4) as follows:

- Actors and their actions are viewed as interdependent rather than independent, autonomous units;
- Relational ties (linkages) between actors are channels for transfer or the "flow" of resources (either material or nonmaterial);
- A network's structural environment provides opportunities for or constraints on individual action;
- Models of interpersonal networks conceptualize structure (social, economic, political, and so forth) as lasting patterns of relations among actors.

Social network analysis depends on the collection of sociometric data through questionnaires that ask questions such as: who are the people with whom you most often communicate about *x*? The collected data is then plotted into a matrix from which statistical calculations are derived and networks can be visualised via software such as UCINET and NetDraw, developed by Borgatti *et al*. (Analytic Technologies, 2002). Social network analysis can focus on a range of different structural properties within a network: e.g., density, centrality or brokerage.

Two of the reviewed environmental studies adopted a network view: Sverrisson (2001) in his study of entrepreneurial practice where he conducted interviews with industry employees involved in environmental issues, and von Malmborg (2004) whose theoretical discussion was concerned with the role of local authorities in regional environmental management networks as "knowledge banks"' or "knowledge brokers", based on a number of empirical case studies conducted in Sweden. The reviewed studies that fell into the agriculture and soil sciences research topic had a tendency to draw from business and management literature on innovation, some explicitly using social network analysis as a method (e.g. Feng *et al*., 2007; and Pettit *et al*., 2011).

2.5.2 The LKM perspectives

The LKM literature represents a vast body of research preoccupied with knowledge and its movement within internal and external organisational boundaries. For example, a Scopus database search undertaken in March 2018, using key words "learning" and "knowledge management" and restricted to subject area business management, yielded 28,941 document results.

The LKM literature encompasses diverse research applying diverse theoretical and philosophical approaches and methods. This is reflected in the terminology in use (boundary spanning, boundary crossing, knowledge transfer, knowledge sharing, knowledge production, knowledge exchange etc.), an issue noted, for example, in the review by Paulin and Suneson (2012). This is echoed in the comment by Easterby-Smith *et al*. (2008) who observed in their review: "the domain of inter-organizational knowledge transfer is complex" (p. 684)

The LKM literature broadly includes the product innovation and information technology transfer research that initially relied on collection of sociometric data and social network analysis. Examples of the application of a social network approach include: a study by Scanlan and Tushman (1981) on informational boundary spanning within an R&D environment and the characteristics of boundary spanners in relation to their technical competencies and internal and

external communication activities, a study by Nochur and Allen (1992) of boundary spanners within a mineral-exploration company where the well-functioning gatekeeping role was found not to be linked to a formal function but to an existence of a fully-fledged social network of contacts developed over time; research on the motivational and relational factors hampering knowledge transfer within organisations (termed as internal stickiness) by Szulanski (1996). Levin and Cross (2004) collected sociometric data for development of their model of interpersonal knowledge exchange. In their review Wang and Noe (2010) found that a network view was amongst the most common theories and research approaches adopted in studies on knowledge sharing within LKM.

Over time studies using mixed methods appeared, e.g. Ancona & Caldwell (1992) utilised semi structured interviews and hypothesis testing to create own typology of external boundary spanning activities of product development teams. Qualitative interviews with Information Technology professionals led Pawlowski and Robey (2004) to identify a range of brokering practices (crossing boundaries, surfacing and challenging assumptions, translating interpretation, relinquishing ownership) and examine how these work practices matched the knowledge brokers roles. Levina and Vaast (2005) undertook two ethnographic studies of IT professionals with focus on their work practices, with contrasting results on the usefulness of formally appointed boundary spanners. Carlile (2002, 2004) adopted an anthropological approach producing vignettes of knowledge in practice. The terminology in use within these studied was mainly boundary spanning and boundary spanners, and, to a lesser degree, knowledge brokers; although both terms appear to be used interchangeably.

The rise of the knowledge-centric view of the firm, as noted by Brown and Duguid (1998) in their highly cited essay knowledge organising, led to a recognition of knowledge as the mostly prized resource of a firm (Nahapiet & Ghoshal, 1998). The initial focus on product innovation and information technology transfer was then found to evolve and in some aspects coalesce with views of knowledge as socially constructed and not easily separated from the individual who possess it,

by drawing from e.g. the concepts of tacit knowledge attributed to the writing of Michael Polanyi (Paulin and Suneson, 2012). The concept of Communities of Practice within the business and management sector became popular. Communities of Practice were effectively flexible groups of individuals that formed to share knowledge and aid problem solving in organisations, described as "knowledge-based social structures" whose occurrence in societies dated to prehistoric times (Wenger *et al*., 2002, p.5).

"New knowledge always begins with an individual", argued Nonaka (1991, p. 97). This view corresponds with the "people perspective" within LKM (Ipe 2003, p. 338). It recognises individuals and the knowledge their share as critical to the success of an organisation (Nonaka, 1991; Abrams *et al*., 2003; Ipe 2003; Wang and Noe, 2010). Moreover, it acknowledges that knowledge sharing as a complex, value-laden and context-dependant process, that occurs often through informal exchanges difficult to formalise (Ipe, 2003; Wang and Noe, 2010). As a result research had set to identify and study enabling factors to individual knowledge sharing: in particular role of relationship building and trust (e.g. studies by Abrams *et al*., 2003; Renzl, 2008). Conversely the study by Connelly *et al*. (2010) is example of study examining barriers to knowledge sharing.

Recognition that presence of individuals who spanned boundaries between organisations and within organisations could have serious implications for business is also reflected in informational boundary spanning research that adopted a network view and considered the importance of ties in interpersonal networks as channels through which information, ideas and other resources flow. Such individual boundary spanning activity, then, through crossing boundaries and interlinking with new networks, had the potential to intensify the flow of resources. This could in turn lead to competitive advantage through better business performance, communication, information sharing, learning, diffusion of innovation, etc. (e.g. Nochur and Allen, 1992; Carlile, 2004; Easterby *et al*. ,2008).

2.6 Selecting theoretical lenses, formulating a research question

The literature review presented in this chapter showed knowledge brokering as an ambiguous concept of multiple meaning and origins. Overall, my experience of conducting a literature review on the topic of knowledge brokering in the environmental sector was very similar to that of Greenhalgh and Wieringa (2011, p. 501) who, in their study on the usage of the knowledge translation metaphor in the health sector, noted: “The literature on ‘knowledge translation’ presents challenges for the reviewer because different terms have been used to describe the generation, sharing and application of knowledge, and different research approaches embrace different philosophical positions on what knowledge is.”

These thoughts shaped the selection of theoretical lenses for the purpose of this research, based on the literature review conducted in this chapter:

Organising the reviewed studies from the environmental sector, by utilising the ideas of Callon (1995), led me to discern two fundamentally opposed views: in studies that took a rational view of science—policy interactions and those that accepted a co-construction view. These two contrasting perspectives in a way mirror those identified in the LKM literature; e.g. in a review by Paulin and Suneson (2012, p.81) who recognised research adopting “knowledge as an object” perspective versus “knowledge as a subjective contextual construction.”

None of the reviewed studies from the environmental sector appeared to adopt the model of science as competition. Another option could be adopting a network view to help to illuminate the position of actors within a network: e.g. those who acted as weak ties within a network of policy makers and scientists. Nevertheless the methods of data collection and analysis associated with the network view were acknowledged to have weaknesses. For example, Wang and Noe (2010), in their review of individual knowledge sharing, noted that quantitative studies relied on self-reported behaviours via questionnaires that constrained exploration of possible influences on the results. Hence it seemed to me that the choice, for

the purpose of this research, was between two dominant views of either a rational or a co-construction view. What led me to choose the approach I adopted?

The majority of the reviewed studies from the environmental sector represented the model of science as rational knowledge. They uncritically adopted the concept of knowledge brokering, often without demonstrating what it entailed in practice and evidence of its benefits and drawbacks. These studies appeared to project a simplistic view of science and policy as two homogenous, distinct entities, and perceived the nature of scientific knowledge as unproblematic. The studies were themselves the source of the idea of the alleged science—policy gap. Furthermore, the concept of knowledge brokering did not originate in the environmental sector, nor was knowledge brokering a natural phenomenon that can be discovered in nature, or a solution to a technical problem. Instead, my review showed it ought to be viewed as a mere construct that represented particular views on science—policy interactions.

In an attempt to avoid the pitfalls associated with studies taking a rational view on science—policy interactions described above I thus decided to embrace the co-construction view. A study with a co-construction view would consider scientific practice as a complex dynamic social endeavour; it would pay attention to language in use and its research design would enable paying close attention to context. Greenhalgh and Wieringa (2011) arrived at a similar conclusion to their review on the usage of the knowledge translation metaphor in the health sector. Such a study would satisfy the call for in-depth contextual studies that would illuminate how science—policy interactions worked in practice. For example, Michaels (2009, p. 996, quoting McNie, 2007) wrote: “Little is known about how boundary spanning individuals undertake the boundary work of communicating, mediating and translating, l*et al*one how they foster others to participate in the necessary supporting activities.″

Finally, an in-depth case study adopting a co-construction view on science—policy interactions would naturally be suited to the scientific discipline that

examines science-as-practice: SSK. Given that SSK traditionally focuses on the micro processes of scientific fact construction, the study would adopt additional theoretical lenses to enable a broader context to be taken into account – an arrangement strongly recommended by SSK scholars Albert and Kleineman (2011) and also by Greenhalgh and Wieringa (2011).

Paying attention not only to a fine-grained detail (micro level), but also to a broader context (macro level), I embedded my study within HE research. I viewed it relevant to discussions about science—policy interactions: science was carried out and advanced in the setting of academic institutions – universities – that were of primary focus in HE research, thus there was a clear link between these two.

An in-depth case study adopting a co-construction view on science—policy interactions would consider the label of knowledge brokering unbefitting, given its dictionary definition as an exchange of a commodity that was mediated via a third party. This depiction of knowledge brokering clashed with its portrayal in the reviewed studies that represented the model of science as sociocultural practice. In that aspect, the label knowledge brokering was an oxymoron.

The analogical concept of boundary spanning therefore appeared to be a suitable alternative to the label of knowledge brokering. I utilised the definition of Levina and Vaast (2005, p. 342) who defined boundary spanners in practice as those "agents, who with or without nomination, engage in spanning (navigating and negotiating) boundaries of diverse fields". For the purpose of my research, I thus conceptualised scientists as boundary spanners in practice.

Expanding the notion of boundary spanning into the world of science was not out of place if the view of Barnett (2011, p. 74) was shared that "[u]niversities are now nodes, concentration of flows of information generation and processing". Moreover, recent research examining the role of scientists acting as PIs utilised the boundary spanning lens (e.g. studies by Cunningham *et al.*; 2015; Mangematin *et al.,* 2014; Kidwell 2014).). In their study Mangematin *et al.* (2014)

highlighted that PI span not only boundaries between academics, and industry and government, but also within different academic disciplines in search for innovative cross-cutting solutions. Casati and Genet (2014, p. 23), in their study of practices that PIs engage in, observed: “Some act as Knowledge Brokers and implement very distinctive skills: they know how to operate partnerships with both institutions and individuals, they can define and modify knowledge models and adapt devices, and they know how to promote innovation by building blueprints and managing knowledge communities, designing knowledge architectures and making tacit knowledge explicit, etc..” Elsewhere public management scholar Williams (2002) focused on individual boundary spanners working in a partnership setting within the public sector: the “art of boundary spanning” was found to comprise a mix of competencies and behaviours such as trust and relationship building and an accumulation of social capital through networking.

Utilising a multifaceted approach to a study of science—policy interactions, I therefore adopted the theoretical lenses of SSK, HE research and boundary spanning to explore how scientists within one UK university span the boundary – i.e. interact – with individual employees from policy organisations. Hence my study focused on individuals and their boundary spanning activities.

Numerous activities were found to be encompassing the knowledge brokering concept, as shown in Table 2.1. I proposed to focus on one aspect considered important for science—policy interactions: the practice of building relationships.

The practice of relationship building between scientists and their policy clients involved crossing the recognised science—policy boundary. Therefore it was considered an example of a boundary spanning practice. Moreover, an important aspect of relationship building recognised in this research is networking.
I formulated my research question as:

> ***How does the practice of building relationships aid effective science—policy interactions?***

Answering the research question was to be of immediate value to a discussion about the feasibility of the knowledge brokering concept and the appointment of designated knowledge brokers – all ideas advocated in the published studies from the environmental sector, reviewed in this chapter. If social aspects are negligible and interpersonal relationship building is found unhelpful for effective science—policy interactions, it would appear that impersonal forms of interaction between science and policy would be more suitable, leading to knowledge being best shared via a detached mode of mechanical transfer as advocated by the positivists. Conversely, if social aspects and interpersonal relationship building are critical for effective science—policy interactions but scientists do not carry out these activities in practice, such finding may serve as an impetus for introducing a new cadre of designated knowledge brokers for science—policy interactions.

2.7 Summary

Knowledge brokering was found to be a relatively new concept in the environmental literature yet the studies that utilised the term and advocated it were diverse (see Appendix A). The reviewed studies used knowledge brokering as an umbrella term for a range of activities. Ordering the reviewed studies according to their philosophical and theoretical underpinning, with the help of Callon's (1995) models of science, three distinct groups of studies emerged: those that either: 1) adopted the view of science as *rational knowledge*, or 2) adopted the model of science as *sociocultural practice*, or 3) were not concerned with the philosophical questions as the first two groups were, but which adopted the *network view* that considers knowledge as a resource to flow through an interpersonal network.

The model of science as *rational knowledge* was dominant in the reviewed studies. It offered an unproblematic view on scientific knowledge and portrayed science and policy as two distinct homogenous entities. At the core of knowledge brokering was a transfer of (scientific) knowledge across science—policy boundary. The smaller proportion of reviewed studies viewed knowledge brokering as a subjective co-construction activity. Their authors adopted a

markedly different ontological perspective that acknowledged a multiplicity of viewpoints as opposed to privileging one account, i.e. objective truth. Additionally, they perceived science as a social endeavour. A third group of reviewed studies drew mainly from structural sociology and application of social network analysis or utilised the concept of boundary spanning, viewed as analogical to knowledge brokering. Boundary spanning as a research topic was located within business and management in the LKM literature and in research examining the roles of scientists as PIs; as well as in the in the public management field.

The model of science as *rational knowledge* was considered to be limited for a study of the practice of science—policy interactions. Hence, for the purpose of my research, I opted for a multifaceted approach, selecting the theoretical lenses of SSK (that represented the view of science as *sociocultural practice*, i.e. a micro level), HE research (for embedding the fine-grained study into a wider context, i.e. representing a macro level), and the concept of boundary spanning. I formulated my research question, with the aim to explore one aspect of the practice of spanning a boundary between science and policy and that is building relationships between scientists, conceptualised as informal boundary spanners in practice, and their policy clients.

CHAPTER 3: FROM SSK TO METHOD

3.1 Philosophical and theoretical positioning

A research question was articulated in Section 2.6 of Chapter 2: it was formulated following a review of a number of theoretical approaches. The analytical approach to the methodological considerations impacting on the conduct of this research was covered in Chapters 1 and 2, in which I argued that to understand science—policy interactions it was most appropriate to study these by acknowledging science as a social practice. Methodologically, this argument led me to vest my study within SSK research. SSK research examines scientific practice and what scientists do, which is the topic of this study. Secondly, a body of research within SSK adopted a non-realist ontology that contributed to the rise of constructionism and which was compatible with my own worldviews as a researcher. Chapter 3 begins with a descriptive introduction to SSK research.

3.1.1 SSK studies

SSK emerged during the 1970s, branching out from STS. Indeed, SSK has been hailed as "one of the main achievements of STS scholarship" (Edge, 1995, p. 7). It is founded on key ideas of a number of influential authors. Gergen (2009, pp. 21 -24) lists them and their seminal work as follows:

- Karl Mannheim and *Ideology and utopia*, originally published in 1929: Scientific knowledge is an outcome of a scientist's social group and its social processes;
- Ludwick Fleck and *Genesis and development of a scientific fact*, originally published in 1935: A scientist has to be socialised into a particular social group first to know what to look for when conducting research;
- Thomas Kuhn and *The structure of scientific revolutions*, first published in 1962: Scientific knowledge is not about progression towards a universal truth, but a subject of acceptance within a paradigm – "a network of

interrelated commitments to a particular theory, a conception of a subject matter, and methodological practices" (Gergen, 2009, p. 24);

- Peter Berger and Thomas Luckmann and *The social construction of reality*, published in 1966: They focused on individual scientists' tacit experiences. The main question the authors explored: "How it is that we experience social institutions as natural and unchangeable when they are, after all, created by society and consist of social action and social knowledge?" (Knorr Cetina, 1995, p. 149).

SSK research challenged the previously governing view within STS research that it is not necessary for scientific knowledge to be a subject of social analysis itself, due to the natural origin of the phenomena that it studies. Indeed, SSK research rejected the notion that "a set of broad social norms will ensure the production of true knowledge, as well as the idea that the task of the social analyst is to account only for scientific errors" (Potter, 1995, p. 34).

It is exactly because SSK research – as a "full-blooded sociology of science" (Latour and Woolgar, 1986, p. 275) – turns its sociological analyses onto the content of scientific knowledge itself, it has been perceived as a radical branch of STS research. Knorr Cetina (1995) points out that suggesting that a common social phenomenon in everyday life is socially constructed can be accepted without much opposition. However, as Knorr Cetina (1995) continues to say, a proposition that scientific facts, deemed to mirror the one reality, are socially constructed can be seen as world shattering. According to Gergen, it is necessary to subject science to ideological critique precisely because:

> "…the gains of science are clear to all, they seem immune to such critique. Scientists don't seem to be ideologically invested; and their findings are open to public scrutiny. Yet, for the ideological critic, it is this seeming neutrality of science that is most misleading, most mystifying" (Gergen, 2009, p. 15).

SSK studies led to uprooting the entrenched view of scientific knowledge as a unique representation of truth. Instead, they showed scientific knowledge as constructed and negotiated, thus revealing that science's authority could not be justified on the basis of being epistemologically special because that was not the case (Bowden, 1995; Knorr Cetina, 1995; Gergen, 2009).

Type of SSK research

SSK studies emerged in the UK at university departments in Bath and Edinburgh, with European scholars joining in. Yet as with STS studies, SSK research should not be viewed as a "benignly homogenous "broad church"" (Edge, 1995, p. 12, quote marks original). Since its inception, the discipline grew to include a range of overlapping philosophical positions and analytical techniques, which can contribute to a lively debate (see Part 2 *Arguments* in *Science as practice and culture* by Pickering (ed.), 1992). Three main original areas of SSK research include the empirical relativist programme, constructionist studies, and studies of the theory of social interests (Table 3.1). Subsequently, the scholarship has diversified to include studies of *social worlds* drawing from symbolic interactionism such as carried out by Fujimura and Star, *actor-network theory* and studies of socio-technical systems developed by Latour and Callon, *reflexivity* and *new literary forms* as advocated by Ashmore, and studies of *scientific discourse* performed by Mulkay (Pickering, 1992).

There have been SSK studies conducted within the environmental sector e.g. examining critically the various models of science—policy interactions by focusing on the operation of scientific advisory committees in the United States (Jasanoff ,1994); examining the creation of the European Environment Agency and its identity as a muddled and contested process of science—policy interactions (Waterton and Wynne, 2004).

Table 3.1 Streams in SSK scholarship

Name	Detail
The empirical relativist programme	▪ Key author: Harry Collins ▪ So called “Bath School” ▪ Study of controversies ▪ Combined emphasis on social realism and rhetoric; treating controversy as social fact ▪ The end of controversy is the moment when a fact is finally stabilised ▪ Microsocial approach: focus on rhetoric ▪ Stresses the flexibility in dealing with scientific findings and the central role of rhetoric in ending (or sustaining) controversies
Constructionism	▪ Key authors: Karin Knorr Cetina, Bruno Latour, Steve Woolgar ▪ Study of “unfinished knowledge”, of knowledge manufacture ▪ Microsocial approach: the study of scientific process of fact construction ▪ Approaching fact making through ethnographic and observational studies of scientists work in laboratories. ▪ Stresses the local and ad hoc nature of scientific work
The theory of social interests	▪ Key authors: Barry Barnes, David Bloor and Steven Shapin ▪ So called “Edinburgh School” ▪ Macrosocial approaches to SSK ▪ Reconnects scientists to their broader social allegiances by suggesting that their choice of theory is related to their understanding of society

Source: Potter (1995, pp. 25-41) and Pickering (1992, pp. 1-2).

SSK studies contributed to a rise of constructionism as a mainstream movement across scientific disciplines. Constructionism is described in the subsequent section.

3.1.2 SSK studies and study of boundaries

Boundary work and boundary object theory are two prominent concepts that emerged from SSK studies.

Boundary object theory is attributed to the work of Star and Griesemer and their seminal study, in which knowledge production within a natural history research museum environment was found to be an outcome of cooperation between members of different “social worlds”: of communities divided by the putative science—non-science boundary. This collective knowledge production was achieved by overcoming omnipresent boundaries with the help of boundary objects – artefacts of diverse meaning and often of interim nature, either material or intangible, utilised by multiple social groups for a range of purposes, often moving them back and forth between settings. In that effect, within a multifaceted

environment of multiple “social worlds”, boundary objects acted as “a means of translation” and as “anchors or bridges” (Star & Griesemer, 1989, p. 393 and p. 414). The authors, drawing from Latour’s ideas of “the *flow* of objects and concepts through the *network* of participating allies and social worlds” (Star & Griesemer, 1989, p. 389, italics original), offered this definition: “Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across site” (Star & Griesemer, 1989, p. 393). Boundary objects thus show how boundaries, in the words of Lamont and Molnár (2002, p. 181), “are conditions not only for separation and exclusion, but also for communication, exchange, bridging, and inclusion.”

STS scholar Gieryn (1983, 1995), in his examination of the demarcation of science and non-science, observed fuzzy, blurred, and arbitrary characteristics of boundaries. Subsequently, the author noted, STS studies focused on “examinations of when, how, and to what ends the boundaries of science are drawn and defended in natural settings often distant from laboratories and professional journals – a process known as “boundary-work” “ (Gieryn (1995, p 394, quotation marks original). Indeed, Lövbrand (2007), whose article was reviewed in Chapter 2 and who quoted Gieryn, in the title of her article refers to the specific example of boundary work she studied as “ambiguous”.

Sociological research then distinguishes between boundaries of a symbolic and/or social nature: the first is not a prerequisite but upon general acceptance can potential develop into the latter (Lamont and Molnár 2002). In their review the authors detail these two types of boundaries as follows:

- Symbolic boundaries – Man-made conceptual distinctions created to categorize objects, people, practices, time and space. Tools by which society contests and constructs its understanding of reality. Utilised to enforce, maintain, normalize, or rationalize social boundaries – as well

dispute and redraw the meaning of social boundaries. Divide individuals into groups, leading to a feeling of group membership.

- Social boundaries – Emerge upon general acceptance of symbolic boundaries. Defined as “objectified forms of social differences manifested in unequal access to and unequal distribution of resources (material and nonmaterial) and social opportunities” (p. 168). Of socially-restricting character, exhibited in behaviour. Result in e.g. class exclusion or racial segregation (Lamont and Molnár 2002).

For Acckerman and Bakker (2011), a boundary is, then, about “a sociocultural difference leading to discontinuity in action or interaction.” Such a definition again recognises the nature of boundaries equally as real as “malleable and dynamic constructs” (Acckerman and Bakker, 2011, p. 152).

For Acckerman and Bakker (2011) the key characteristic of a boundary is also its ambiguity. The author observe:

“On one hand, these people and objects enact the boundary by addressing and articulating the multiple meanings and perspectives following from sociocultural diversity (representing both–and). At the same time, boundary objects and boundary-crossing people move beyond the boundary since they are not fully defined by this multivoicedness but rather are in a middle ground and have an often unspecified quality of their own (neither–nor)” (p.150).

The study of boundaries is not confined to SSK. Moving knowledge across boundaries has been of interest to LKM research, for example in the study of boundary crossing objects within new product development (Carlile, 2002). Levina and Vaast (2005) applied boundary object theory to study emergence of organisational competence in boundary spanning practice. Zietsma and Lawrence (2010) drew from boundary object theory to explore linkages between boundaries and practices within the context of organisational stability and

change. A need for further research on the nature of knowledge boundaries was highlighted in the review on the topic of knowledge transfer between organisations by Easterby-Smith *et al*. (2008).

3.1.3 Constructionism

Constructionism emerged from a confluence of developments, taking place not just in the studies of science but also in other areas of scholarship that included seminal works of the Swiss linguist Ferdinand de Saussure, French literary theorists Roland Barthes and Jacques Derrida, Austrian-born philosopher Ludwig Wittgenstein, and French philosopher Michel Foucault. The profound effect of these confluences has led them to be viewed collectively as a new area of *postmodernism* – undermining the modernist world dominated by reason, quest for one universal scientific truth and objectivity.

Constructionism versus constructivism

The terminology associated with this approach varies. Blaikie (1993) and Gergen (2009), for example, distinguish between whether it is viewed as an individual or a social activity:

- Constructivism (radical constructivism) – is about "the meaning-giving activity of the individual mind and how it interprets the world, to cognitive processes" (Blaikie, 1993, p. 22; citing Schwandt, 1994, p. 127);

- Social constructionism – is concerned with shared meaning within a social group, its emergence and transfer (Blaikie, 1993; Gergen, 2009).

In this research I was not interested in cognitive processes, but in the collective understanding of the practice of boundary spanning as shared by a particular group of scientists. Furthermore, some SSK scholars (e.g. Latour and Woolgar, 1986) dismiss the adjective *social* used with constructionism; they see such practice as futile. Thus I refer to constructionism, as opposed to social constructionism.

Constructionist ideas

Constructionism is an epistemology associated with a relativist ontology that acknowledges multiple perspectives and realities, as opposed to the realist perspective of seeking and privileging one objective truth: for relativists, even if such a single reality does exist, it is accessible to human beings only through representations (Burr, 2003). Nor does constructionism encompass a set of norms or wishes to replace other approaches. As Gergen posits, constructionism:

> "…recognises that constructionism is itself socially constructed. Constructionism is not then, a candidate for the truth. Nor is it a belief system. Rather, the constructionist dialogues represent invitations to a way of understanding" (Gergen, 2009, p. 29).

Constructionism and its ideas are then to be perceived as resources to be used, "not maps or mirrors of the worlds" (Gergen 2009, p. 166). The other key ideas of constructionism are outlined as follows:

1. **Facts have social and cultural origin**

At the heart of constructionism lies the notion of facts as socially and culturally constructed. Instead of rejecting other positions as non-valid, constructionism invites us to recognise that all facts presented as truth are constructed from certain standpoints that favour particular versions and dismiss others (Gergen, 2009).

2. **Constructions arise from social interaction**

Construction emerges out of social interaction; constructions are shaped by social practices. As Burr (2003, p. 9) explains: "Knowledge is therefore seen not as something that a person has or doesn't have, but as something that people do together." Therefore our understanding also derives from social interactions.

3. Importance of language in use

Language used in social interactions is actively reinforcing meaning, practices and values (Gergen, 2009). The focus on language in use is paramount in constructionist studies. Thus they often examine micro processes of fact construction; use of rhetorical devices and other linguistic forms, such as metaphors; as well as representations of wider societal discourses (Potter, 1995; Burr, 2003; Kvale and Brinkmann, 2009).

4. Doubting and critique

Constructionism is an incitement to a dialogue and about "a bold invitation to build new futures" (Gergen, 2009, p. 12). It requires us to step back, to review and question what we know and how we know it. It calls for us to examine what is being presented as given facts and what interests may lay behind these presentations. It asks us to adopt a critical stance.

5. Context

Constructions, enacted through social interaction, are heavily bounded by context, including the researcher's background, experiences and worldview, as well as by dominant moral conventions and beliefs held in a particular society or culture (Blaikie, 1993; Flick, 2004).

3.1.4 Criticisms of constructionism

Constructionism has been subject to critique – described as an approach where anything goes and as ethically controversial. According to Edwards *et al.* (1995), this is the *moral relativity* argument that raises the issues of ethicality of constructionism, in particular when used to study sensitive topics such as the Holocaust. If, according to constructionism, you cannot privilege one account over another, but instead see different viewpoints as equal, how can we then justify morally what is right and what is wrong? Constructionists have been accused of denying what is real. However, as Burr (2003) explains, constructionists do not deny reality per se, but instead focus on its properties as socially and culturally constructed entities. Edwards *et al.* (1995) also make this

point when dismissing accusations by realists that relativism is ethically contentious: instead they see constructionists as having an advantage because the attention they pay to language means that they can deconstruct any argument as rhetoric.

For some, critique of constructionist ideas is not productively resolved through counter-attack. Instead, constructionism seeks to open new avenues; it "does not itself seek to be a final word, but a form of discourse that will help us to avoid building worlds in which claims to Truth put an end to dialogue" (Gergen, 2009, p. 166).

3.2 Empirical design: choice of method

Method could be defined as "a procedure, tool, or technique used by the inquirer to generate and analyse data" (Schwandt, 2007, p. 191). Constructionism developed out of scholarship from a range of disciplines (e.g. STS, sociology and history) and due to its lack of a normative set of rules, there are no specific research techniques that one has to apply (Burr, 2003; Gergen, 2009). In terms of SSK studies, Bowden (1995) outlines a number of methods and their suitability for this type of research, within the broader field of STS:

> "In general, the strength of STS comes not from innovations in methods of collecting and analyzing data but from the ability of an inclusive approach to open up the deficiencies in understanding that flow from the ways that different disciplines collect data" (Bowden, 1995, p. 66).

However, Bowden (1995) examines the various methods not in relation to their suitability for data collection, as is most commonly the case, but in terms of their appropriateness for data explanation. This is because "choices about the explanatory structure frequently carry implications for the types of data one uses. Thus choices about the method of explanation take analytical precedence over the details of data collection" (Bowden, 1995, p. 66). Examinations of scientific discourse as a topic, such as in the study by Mulkay and Gilbert (1984), that found

scientists using an empiricist repertoire to justify their work as purely driven by forces stemming from the natural phenomena under study, is deemed to fall outside of STS methods of explanation, according to Bowden (1995). This excludes studies into fact construction that fall within the discipline of discursive psychology as represented by Jonathan Potter (1996)

According to Bowden's (1995) review of methods for STS (including SSK), my research falls into *topic* focused methods, with a multidisciplinary vision of the field. These methods follow the precepts of the multiple disciplinary perspectives of SSK research, boundary spanning and HE research that are argued to collectively give a better understanding of the topic under scrutiny. According to Bowden (1995), such an approach, that requires drawing from number of scientific fields in order to gain understanding of a topic under study, is the most common form of research in use within the broader field of STS studies.

Next, three methods for data collection/explanation that were considered are presented:

3.2.1 Laboratory studies and participant observation

Constructionist research within the SSK field comprises mainly micro studies of scientific processes. These are specifically called laboratory studies, due to their focus on scientific fact construction within a particular setting where "unfinished knowledge" is examined, i.e. "the knowledge that is yet in the process of being constituted" (Knorr Cetina, 1995, p. 141). Key authors of laboratory studies are Karin Knorr Cetina, Bruno Latour, and Steve Woolgar. Laboratory studies opened the black box of science – an expression that is associated with the work of Latour unveiling how scientific facts are produced through a range of activities that are not merely technical but also social, political, symbolic and rhetorical (Knorr Cetina, 1995; Potter, 1995). Laboratory studies drew attention to the importance of context, i.e. that construction takes place in a local setting – "construction appears to be, always, local construction" (Knorr Cetina, 1995, p. 156).

Ethnographic studies traditionally rely on observation as a main mode of enquiry and data collection. Laboratory studies aim not at detailed description of reality, but rather how scientific facts are negotiated and constructed (Knorr Cetina, 1995). As Gilbert and Mulkay (1984, p. 8, quotation marks original) point out, "social action is not 'directly observable'" and "[t]hus so-called 'direct observation' of social action as it takes place in no way frees the observer from reliance on the potentially variable discourse of participants". However, it was not possible to include participant observation as part of this research. It is not only policy making that occurs behind closed doors: meetings between academics and clients are also guarded. My request to be allowed to attend such meetings was rejected due to confidentiality issues and the existence of non-disclosure agreements with clients.

3.2.2 Discourse analysis

Constructionist approach explores how social reality comes into being through language in use. This is where discourse analysis comes in, as a way of examining "the relationships between text, discourse, and context" (Phillips and Hardy, 2002, p. 6).

What is discourse? There is not a single agreed definition of discourse. According to the French philosopher Michel Foucault, cited in Burr (2003, p. 64; cf. Foucault, 1972, p. 49) discourses are "practices which form the objects of which they speak". The concept of discourse therefore draws attention to the "constitutive and situated qualities of languages" (Taylor, 2001, p. 6 and 7). The Foucauldian view on discourse is then focused on wider societal dynamics whilst the field of discursive psychology considers discourse as more localised social practices of fact construction (Potter, 1995). Burr then defines discourse as:

> "…a set of meanings, metaphors, representations, images, stories, statements and so on that in some way together produce a particular version of events. It refers to a particular picture that is painted of an event, person or class of persons, a particular way of representing it in a certain light." (Burr, 2003, p. 64)

Furthermore, discourses are said to “facilitate and limit, enable and constrain what can be said (by whom, where, when)” (Parker, 1992, p. xiii). Thus the diversity of discourses stems from “conflicts over meanings and uses of language” (Parker, 1992, p. 126). This draws attention to discourse as a source of power, not a physical force but a mental one, “exerted by a powerful majority who are thus able to impose their ideas of the right, or the true, on the majority” (Fillingham, 1993, p. 7). The concept of discursive power was discussed in Chapter 2, in relation to the reviewed studies from the environmental sector that utilise the co-construction view (e.g. Litfin, 1994).

The Foucaldian type of discourse analysis, for example, was applied in a study into the physical workplaces of American corporations as portrayed in popular films: discursive power was found to be reinforced through workplace design which gave those with status offices with doors that could be closed and windows that opened out on the outside world (Panayiotou and Kafiris, 2011). This specific example shows that discourse analysis does not have to be constrained to text, but can be applied to images and spatial environment.

It must also be noted that discourses are not found per se (Parker, 1992; Gergen, 2009; Phillips and Hardy, 2002). “Texts are delimited tissues of meaning reproduced in any form that can be given an interpretative gloss” (Parker, 1992, p. 6). Subsequently, bodies of text must be studied, as “discourses are shared and social, emanating out of interactions between social groups and the complex societal structures in which the discourse is embedded” (Phillips and Hardy, 2002, p. 4).

Why is the study of discourse important? Because social reality is constituted through discourses, “social interactions cannot be fully understood without reference to the discourses that give them meaning” (Phillips and Hardy, 2002, p. 3). By utilizing discourse analysis, it allows us to reconceptualise an object and

“treat it not as truth, but as one ‘truth’ held in place by language and power” (Parker, 1992, p. 22).

3.2.3 Template analysis

I was looking for an alternative method that I could present alongside my attempt to carry out discourse analysis. One flexible approach, compatible with a constructionist type of research, is *template analysis*, as described by King (1998). This is a thematic type of analysis that involves initial coding of data using *a priori* selected categories. The categories form an initial template that is applied to raw data (e.g. interview transcripts). The initial template is then iteratively modified, until the researcher decides that it is sufficient. Template analysis includes these steps:

- Producing an initial template
- Modifying the template through insertion, deletion, change of scope and/or change of higher-order classification
- Interpreting findings

3.3 Research design and mode of enquiry

This section outlines the research design and the decisions made regarding the selected mode of enquiry.

3.3.1 Research design

Flick (2004) distinguishes two important dimensions of research design. One dimension is time. According to this distinction, a research project could be retrospective, focused on snapshots, or longitudinal. Retrospective studies that reconstruct what happened in the past are common in biographical research whilst longitudinal study focuses on collecting data at various points of a process. I interviewed scientists mostly once but my interviewees often relied on reconstruction of past events. Therefore, this research project could be perceived, using the dimensions suggested by Flick (2004), as a combination of retrospective accounts and snapshots.

The other dimension distinguishes between single case studies and comparative studies. A case study “is a special something to be studied, a student, a classroom, a committee, a program, perhaps, but not a problem, a relationship, or a theme” (Stake, 1995, p. 133). The research process chosen so far highlights the importance of context; in this respect, the focus is on “particulization” as opposed to generalization, a term used by Stake (1995, p. 8).

Opting for a single case study enabled me to adopt a tailor-made research design (Figure 3.1). I had the capacity to add an extra dimension to my data by embedding my research within a broader context, as depicted in HE research (Chapter 4). I considered incorporating such linkages between micro (represented by SSK) and macro (represented by HE research) levels in my research design as more significant than comparing between two or more case studies. I stressed the importance of exploring linkages between micro and macro levels in Chapter 1 by drawing on arguments by Albert and Kleineman (2011) and Tuuinamen (2005), and also by Greenhalgh and Wieringa (2011) and Edge (1995).

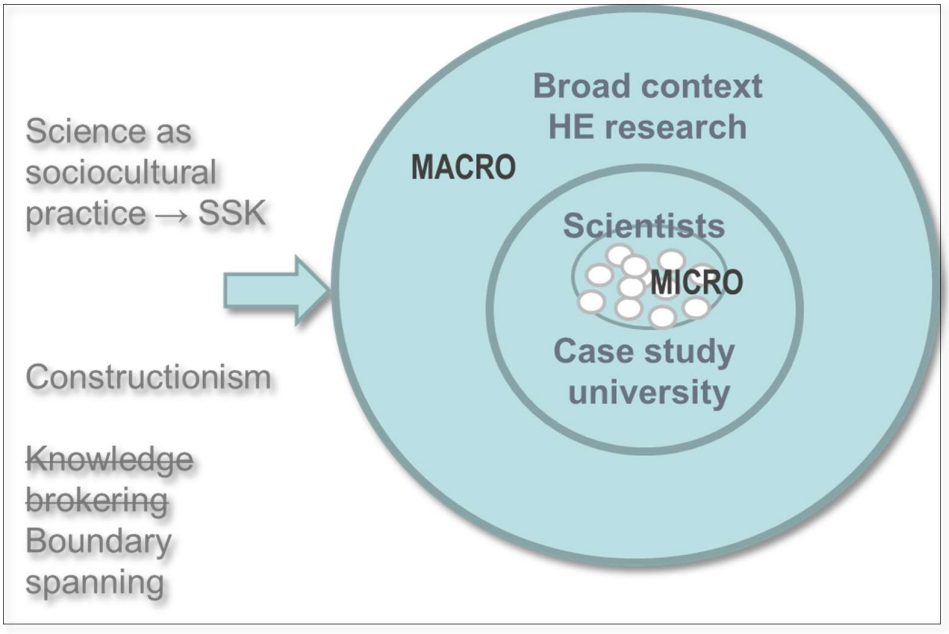


Figure 3.1 Multifaceted research design adopted

3.3.2 Mode of enquiry

Laboratory studies rely on observation as a key mode of enquiry, whilst other SSK research utilise interviews (e.g. Gilbert and Mulkay, 1984). As stated earlier in Section 3.2.1, the focus of such an ethnographic approach within SSK is not about producing a detailed (and thus valid) description per se but on revealing how science is constructed and negotiated (e.g. Latour and Woolgar, 1979). Direct observations was impossible to materialize due to confidentiality issues and the existence of non-disclosure agreements with clients – a point that I also make in Section 3.2.1. Moreover, scientific practice at Cranfield University was mainly based on scientists working as individuals, as opposed to the model of scientists working together in a research group (i.e. the model of research typically studied in laboratory types of SSK studies), so a mode of inquiry that would enable me to focus on each individual as opposed to a group was needed. Discourse analysis and template analysis can be carried out on a body of text, whether interview transcripts or other written material. Therefore I opted for individual interviews as the main mode of enquiry. To add a macro dimension to the analysis, I reviewed HE research literature and a number of internal documents produced by the university where the study took place (e.g. a strategy document), paying attention to language in use in these documents.

Interview design

The interview design comprised a number of stages. Firstly, key interview types and interview metaphors were reviewed and assessed against the selected ontological and epistemological approach. Next, the main themes and topics were identified from the literature. Finally, influenced by Patton (2002) and Kvale and Brinkmann (2009), who view interviewing as craftsmanship, I focused on crafting the interview questions based on those authors' suggestions.

Key interview types

The standard interview classification distinguishes between interviews as structured, unstructured or semi-structured. Each has its advantages and disadvantages. For example, whilst a very structured interview design allows for

data to be relatively easily compared, its format may deform meanings that interviewees would assign to the phenomenon under study, whereas unstructured interviews, which can be tailored to individual interviewees and their specific circumstances, may produce data that could make a comparison across all of the interviews very time consuming and difficult (Patton, 2002).

Considering the pros and cons of each type of interview, semi-structured interviews were selected for the purpose of this study, which Patton (2002) labels as “the general interview guide approach”. The two potential disadvantages of this type of interviewing are: 1) the interviewer missing important clues; 2) flexibility of question sequencing can lead to variability in data to the extent that their comparison could become unduly complicated. Nevertheless, this interviewing style was still deemed to be still advantageous over all other options of producing a rigid interview template or an unstructured one.

Interview metaphors

Different viewpoints exist regarding interviews utilised for research purposes and these align to specific philosophical and theoretical perspectives.

A positivist style of research tends to focus on the technical aspects of an interview, ensuring that validity is achieved through perfecting the neutrality of interview questions and the interview instrument. The interviewer’s focus during the interviews is then on not contaminating interviewees’ responses. For example sticking rigidly to the working of interviews questions neglect the variability of language used by interviewee and will affect the responses given, it will minimise the occurrence of stories in the interviewees’ accounts (Mishler, 1996). The metaphors associated with this type of interviewing include: “archaeological” (Bogner and Menz, 2009), “passive vessels” and “repositories of facts” (Holstein and Gubrium, 1995), “pipeline approach” and “interviewer as the miner” (Kvale and Brinkmann, 2009). This style of interviewing assumes that data exists out there and the task of the interviewer is to bring these data uncontaminated to the surface (Kvale and Brinkmann, 2009). Yet according to Mishler (1996):

> “This way of doing research takes away from respondents their right to “name” their world (cf. Freire, 1970). Stated somewhat extremely and from the perspective of respondents, interview research by excluding the biographical rooting and the contextual grounding of respondents’ personal and social webs of meaning bears a resemblance to a “degradation ceremony” (cf. Garfinkel, 1956) or an “identity-stripping process” (cf. Goffman, 1961) (Mishler, 1996, p. 122, quotation marks original).

Mishler (1996) in his detailed review of the positivist type of interview research found that up to 40% of interviewers still deviated from the exact wording of interview questions. Moreover, it was not possible to establish how this deviation determined the understanding of the meaning of the questions by interviewees; equally, the context of the interview situation was not commonly recorded in studies reviewed and thus it was not possible to establish what factor this could play in the interview encounters (Mishler, 1996).

There are alternatives to the research interview approach described above. Some view research interviews as a meaning-making encounter, where concern with contamination is replaced by “awareness of activeness” (Holstein and Gubrium, 1995, p. 76). This form of interviewing is based on the premise that “…the perspective of others is meaningful, knowable, and able to be made explicit. We interview to find out what is in and on someone else’s mind, to gather their stories” (Patton, 2002, p. 341).

Examples of alternative metaphors in use describe an interview as a “craft” (Kvale and Brinkmann, 2009), as “a speech event” where meaning and understanding are negotiated (Mischler, 1996), interviewing as “the art of hearing data” (Rubin and Rubin, 2004).

For the purpose of this study, I adopted the model of interViews, as developed by Kvale and Brinkmann (2009). According to this metaphor, interviewees are not perceived in the words of Holstein and Gubrium (1995) as “passive vessels” and “repositories of facts”. Instead, interviewees are viewed as “co-constructors of knowledge” (Kvale and Brinkmann, 2009, p. 18).

Terminology

The need for the researcher to be sensitive to the vocabulary she or he uses in interviewing is highlighted by Patton (2002, p. 348) i.e. how can the interview template serve as a useful “framework within which respondents can express their own understanding in their own terms?” In this research, I excluded the explicit use of the following terms: knowledge brokering, knowledge broker, knowledge transfer, knowledge exchange and boundary spanning. The term knowledge user was initially used when introducing the study to potential interviewees but was soon discounted; instead, I simply asked my interviewees about their clients. This aligned with a shift in the language used within the particular context e.g. universities becoming managerial-type, market oriented institutions.

Wording of interview questions

The wording of the interview questions in the interview template was mainly influenced by Patton (2002), who stressed the importance of this task and the need for questions posed in interviews to be truly open ended, singular and clear. The interview template is included in Appendix C.

Format of interview questions

Another important aspect in interview design is the format of interview questions, as examined in detail by Patton (2002) e.g. applying *illustrative example extremes format, role playing and simulation questions, presupposition questions, use of prefatory statements and announcements*. Patton’s (2002) suggestions were applied to formatting my interview questions. I illustrate this with one example

that involved applying *illustrative extremes example format* to the question about relationships with clients outside of work:

> Interview question: What forms of communication do you have with research clients outside work? Some scientists told me that their industry clients have their personal mobile number and are free to call them anytime. Some play squash with their government contact once a month. Some said they have their alumni in a client company and they keep in contact about new opportunities via email. Some said they have no other communication with research clients outside of a specific research project. What about you?

This format includes a number of extreme examples, which illustrate the range of possible answers. Structuring the interview question in this way was aimed to make the interviewees comfortable in disclosing freely anything that they felt was relevant, and to relieve concern that their answer might lead me, as the interviewer, to express a visible shock or disapproval. The complete interview template that I used for the purpose of this study is enclosed in Appendix C.

3.4 Fieldwork preparation

This section outlines further steps that were undertaken in order for the fieldwork to materialise, notably, the issue of research ethics, selection of a case study and selection and access to interviews.

3.4.1 Research ethics

An *informed consent form* was drafted because there was no standard form available at Cranfield University. I thus followed the suggestions of Patton (2002) in drafting my own version of the document. Following Cranfield University's procedure, I was required to submit a research ethics proposal, together with the devised informed consent form, to the university's committee. This research ethics proposal was subsequently approved on 24th November 2010.

I was mindful of suggestions by Glesne (2011) on what the interviewer's attributes should be when conducting interviews i.e. being able to ask further questions in a non-threatening way, and showing interest, care and appreciation for the interviewees' time and their account.

To ensure that confidentiality of the interviewees is protected, only a limited demographic information was included in Appendix F (and also in Appendix E). Job title categories were amalgamated as well as years of experience. Demographic information that was purposively excluded was the name of the research centre to which individual interviewees belonged at the time of this study, and interviewees' gender. In the interview excerpts, references to names of client organisations were mostly excluded, as well as references to the particular disciplinary fields of the interviewees.

One decision I had to make was how to reference my interviewees in the interview transcripts. Many social sciences researchers see numbering of interviewees as compatible with surveys and other types of positivist enquiry and prefer to use pseudonyms (e.g. Glesne, 2011; Lucas, 2006). However, for the purpose of this study, I found it more straightforward to number interviewees. To further preserve confidentiality of interviewees, when I reported findings I used '*they*' to avoid revealing whether it was a female interviewee or a male interviewee.

3.4.2 Selection of a case study

One of the dimensions of my research design was the choice of a single case study. I did not go through a selection process to establish an ideal case study, e.g. by reviewing different types of UK universities. Instead, I opted to use the university where I was studying and thus this research was 'opportunistic'. The university where I was a PhD student had a department where relevant research

and science—policy interactions took place: the newly named[3] Department of Environmental Science and Technology. Its staff engaged in research on environmental topics such as those described in Chapter 2 and, equally, their research required engagement with policy making and policy implementation organisations.

Choosing to carry out a case study at the university where I was studying had its advantages and disadvantages. Advantages included ease of access and keeping the cost down by avoiding the need to travel. Disadvantages could stem from my inability to see things in a new light and thus take them for granted as opposed to an outsider who would be unfamiliar with these settings. Although an insider, my knowledge of the workings of the university at the commencement of my PhD course was minimal. Given the size of the university, its organisational structure, lack of readily available staff organograms or information about job progression routes, and lack of knowledge about historical developments, politics and relationships, I could be described more accurately as an outsider than an insider.

3.4.3 Selection of and access to interviewees

A note on terminology: for clarity, I adopt the term used in SSK and refer to my interviewees as scientists. By this I mean research active employees of an HE institution.

Social science research calls for the application of a purposeful sampling that enables building a rich picture of the phenomena studied (Patton, 2002). The interviewees were identified by searching through staff profiles on Cranfield University's external website and selecting those scientists who a) listed

[3] Restructuring and renaming took place in January 2011.

government departments and their agencies as their clients and b) whose research topic fell within the environmental sector.

Altogether, an initial search of all university staff led to thr identification of 135 individuals across its four schools. These scientists fulfilled the criteria stated above. Following a consultation with my supervisor, it was then agreed to focus only on staff within the Department of Environmental Science and Technology in School of Applied Sciences (SAS). As a check i.e. to help ascertain the soundness of the findings, two interviewees were additionally recruited from the School of Health.

Further advice from my supervisor led to the list then being narrowed down to twenty-nine initially and then thirty-two potential interviewees by selecting primarily those: a) who were known to have reasonably regular contact with employees of government departments; b) have conducted research on topics within the environmental sector and c) who were considered would respond favourably to a request for an interview, based on the personal opinions and knowledge of my supervisor, who was their colleague within the department.

All thirty-two scientists whom I approached agreed to be interviewed; interviews with two of them from SAS did not take place subsequently: they quoted lack of time as a reason why they could not take part in the interviews.

The scientists were first approached via a short email (see Appendix B). A response to this email was received from ten scientists; all positive, i.e. they were all willing to be interviewed. I then applied various strategies to recruit the other interviewees on the list. In some instances, I visited those whom I had already met before and became familiar with. After speaking to these scientists, they also agreed to be interviewed. On other occasions when visiting an interviewee, I asked them to introduce me to their colleagues who were on my interviewees' list. Thus, I used a form of snowballing technique, by employing existing interviewees to recruit further interviewees for my study. I also called a number

of scientists by telephone and spoke to them before meeting them in person or sending them further emails detailing my study and inviting them to participate.

A structure – an organogram – of the Department of Environmental Science and Technology became available during this time on the university's intranet as an internal document.[4] Research active staff who were of interest to this study were listed in the organogram within two main categories: as Research Staff and Academic Staff. The difference between these two categories did not lie in separation of the teaching and research functions, the only difference being, at the time this study was conducted, that staff in the Academic category were supposed to have completed a Postgraduate Certificate in Teaching; this information was based on personal communication with two members of staff within the department). My list of scientists targeted for an interview included both Research Staff and Academic Staff, as categorised in the department's organogram.

It is worth noting that the only member of staff with the job title of Knowledge Exchange Manager was included in the organogram under the category of Research Staff. Overall, such roles – i.e. dedicated research administrators and special research managers recognised in HE research, and studied, for example, by Allen-Collinson (2009) and Shelley (2010) – were uncommon at Cranfield University. Most administrator types of roles within this university were dedicated to supporting teaching as opposed to research activities. I excluded this sole Knowledge Exchange Manager from my sample and instead focused on other academic staff in the department. This was because, in light of the calls for the introduction of designated knowledge brokers in the reviewed literature from the environmental sector (see Chapter 2), I was interested in what happened in the

4 A copy of the organogram is not included in the thesis to avoid compromising the anonymity of the interviewees.

absence of such dedicated roles: who actually engaged in science—policy interactions.

The Heads of institutes, centres and other groupings within the targeted department (and also in the School of Health) were research active: they performed their management roles alongside their academic roles. In the HE sector it has been a common practice for senior academics to act in rotation as heads of department and in other management roles (e.g. Whitchurch, 2008). Out of all of my interviewees four were such research active scientists cum managers. Further relevant contextual information is provided in Chapter 4.

3.5 Fieldwork

In this section, I outline how the fieldwork proceeded. I start with the decisions taken with regard to my stance as a researcher, before reflecting on the process of conducting interviews.

3.5.1 The researcher as interviewer

In this section I show how I considered the issue of power dynamics in interview encounters. I asked myself: how can I avoid an interview becoming, in the words of Garfinkel (1956), a degradation ceremony? And how, in the words of Mishler (1995), can interviewees be empowered through telling their stories? Kvale and Brinkmann (2009) remind us that it is difficult to eradicate inequality in interviews completely due to the fact that it is a contrived encounter, in which the interviewer has questions to ask and thus is in charge. What role then, should the interviewer adopt that would positively influence the dynamics of an interview encounter so it is mutually beneficial, leading to co-construction of knowledge? Such considerations call for application of strategies that go beyond the issues of rapport: defined as a "***stance vis-à-vis the person being interviewed"*** (Patton, 2002, p. 355, bold original).

Bogner and Menz (2009 – Table 3.2) propose strategies in relation to expert interviews which are relevant for the purpose of this research, as my interviewees are scientists who are traditionally perceived as experts in their scientific field.

Table 3.2 Options for an interviewer's positioning

Dimensions	***Expert from a different knowledge culture***	***Interviewer as lay-person***	***Interviewer as accomplice***
Dimension typification	Specialist competence of equal value	Specialist competence (low level)	Normative background (shared)
Indication of the communication situation	Symmetrical interaction situation: numerous counter questions asked by the interviewee	Asymmetrical interaction Situation in favour of interviewee: monologues delivered by interviewee, demonstratively good-natured manner; paternalism	Secret knowledge is revealed, Interviewee speaks in a "personal" way (for example by addressing the interviewer informally)
Interview and question style	Oriented towards dialogue, repeated supplementary questions, rapid exchange of questions and answers, "trading information"	Interviewer is primarily a receiver of knowledge, questions generate narrative, committed but naive Supplementary questions	Interview is conducted in a "personal " style and everyday language is used; repeated confirmation of common ground; Range of different kind of question possible
Possible advantages	High level of specialist knowledge, high density of facts More explicit setting out of grounds and orientations	High level of trust on the part of the interviewee, pressure is taken off interviewer	High level of trust on the part of the interviewee; Access to confidential information
Possible disadvantages	Interview remains within interviewee's professional frame of reference; "technicist element"	Difficult to guide interview in desired direction	Normative premises are not revealed

Source: Bogner and Menz (2009, pp. 68-69, Table 2.1 *Typology of interaction situations and interview strategies)*
Rows and columns reversed from the original source.

From the strategies suggested by Bogner and Menz (2009), I was keen to avoid being perceived by interviewees solely as a *lay-person*; in this case being reduced into the stereotype of an unacquainted student-learner. Alternative options that Bogner and Menz (2009) propose and that I tried to adopt were that of *expert from a different knowledge culture* and *interviewer as accomplice*, for

which I drew from my previous work experience in a policy implementation organisation that happened to be a key client organisation for the majority of the interviewees. Positioning myself as an expert from a different knowledge culture was exercised through the manner in which I presented myself to the interviewees: I would power dress as I used to do for high profile Head Office meetings in my previous job role. Many interviewees reacted positively albeit some looked visibly surprised when I arrived for an interview. In the positioning as an accomplice, "…the interviewer is seen as a comrade-in-arms in a field of action where power struggles are going on. This turns him/her into someone who is seen as particularly worthy of trust, so that concealed strategies will be explained and confidential information will be revealed" (Bogner and Menz, 2009, p. 67).

My work of positioning myself as an interviewer-accomplice focused on carefully disclosing the information to my interviewees that I was an ex-Environment Agency (EA) employee. The disclosure was made, whether prompted by interviewees who enquired about my background at the start of the interview (interviews 6, 7, 12, 13, 32), as it by chance became a topic of discussion during the interviews (interviews 10, 14, 20, 22); or where I volunteered the information at the end of the interview (interviews 4, 17, 19, 26). Whilst not wanting to claim that this positioning as an interviewer-*accomplice* alone led to some very candid revelations by the interviewees, on reflection those interviews where I disclosed that I was an ex-EA employee during the initial small talk with the interviewees at the start of the interview encounters were all evidently very successful interviews: they yielded rich data and were enjoyed by both parties (based on verbal and/or written feedback from the interviewees).

3.5.2 How did the interviews go?

The interviews took place between January and March 2011.

First, I conducted 3 test interviews with members of staff within SAS. This led to amendment of the wording of some of the interview questions. For example, the

question about perceived value of face-to-face interactions was changed to asking about the value of networking, as it yielded much richer relevant responses.

I scheduled a maximum of two interviews per day, except on one occasion where I had to undertake three. Overall, I did find the interviews enjoyable, but exhausting. The interviews took place in the offices of interviewees or in a meeting room in Building 52A. Their duration varied between 35 minutes and 2 hours and 18 minutes (see Appendix F). The interviews were recorded using a Dictaphone.

Prior to each interview, I researched the interviewee's background, i.e. read their university staff web profile, to familiarise myself with the type of research they were undertaking; I made notes where questions arose from reading this information that I wanted to ask during the interview.

The way the interviews were conducted was based on some of the suggestions by Kvale and Brinkmann (2009), and also Rubin and Rubin (2004). During the interviews, the interview questions were not asked in a fixed order and the verbatim wording I memorised was modified as deemed necessary during each interview, aiming for the interviews to flow as conversations rather than being performed as living questionnaires.

During the interviews, the interviewees were asked questions about issues with which they were familiar, but about which they do not usually have the opportunity to talk about or reflect on. In that sense, they were both interpreting my questions and constructing their accounts during the interviews. This was demonstrated by their silences during the interviews as they were thinking about their responses, and occasional remarks such as "I have not thought about this before" or "That is a good question". Overall, the interviews were an opportunity for the scientists to take a break from their busy schedule in the office and to reflect on their work and have a conversation with someone who was genuinely interested in what they do

and how they do it. In this respect, I considered research ethics for the actual research encounter and my positioning as the interviewer. Indeed, during some of the interviews (in particular, interviews 11, 14, 19, 22 and 28), I felt like a counsellor; as in a stereotypical perception of a therapy session, I was not trying to lead the interviewees in any way, but simply allowed them the space and time so they could express freely what was on their mind.

3.5.3 Additional data

Further data utilised for the purpose of this research included:

1. Written notes from further meetings with two of the interviewees and another two members of staff (Head of Department; and Head of Learning & Development – L&D).

2. Contextual information stemming from informal interaction with other members of staff at the university. For example, I had numerous informal conversations with the Student Services Manager who had over fifteen years of service with the university. As an active member of the university's student societies I experienced the institution's culture first-hand. For example, the Internal Communications Executive informed me that I was not allowed to post information for students and staff on the university's internal website because, upon review, my announcement did not represent "key University business and activities". This incident reaffirmed my classification of Cranfield University as a hard entrepreneurial university (see Chapter 4).

3. Approximately two A4 pages of field notes were produced after each interview in order to capture further details from the interview encounters. These also served as a form of reflection. The field notes were structured using questions suggested by Patton (2002) and by Glesne (2010). For example, some of the questions suggested in Patton (2002) on p. 384 include:
    - Where did the interview occur?
    - Under what conditions?

- How did the interviewee react to questions?

Each field note that I wrote did not necessarily contain answers to all the questions. An example of a field note is included in Appendix D.

4. The university's internal documents, such as its corporate brochure. Also information from the university's external and internal web pages.

5. My field notes from *Cranfield University in Context*, an induction day for new staff organised, by the university's L&D, that took on place 12th September 2012 and that I attended as an observer.

3.6 Data analysis and interpretation

Data analysis allows transforming data (e.g. interview transcripts) into research findings, primarily by using systematic, standardised approaches (Patton, 2002; Wolcott, 2009). The constructionist type of research that I am pursuing requires a much more flexible approach to data analysis that places emphasis on researcher's interpretation rather than on rigid methods of data analysis (King, 1998). Interpretation, in contrast to data analysis, then arises "from our efforts at sense-making; a human activity that includes intuition, past experience, emotion – personal attributes of human researchers that can be argued endlessly but neither proved nor disproved to the satisfaction of all" (Wolcott, 2009, p. 30). It requires a certain level of reflection on the data (Welsh, 2002).

Data analysis is described in this section. I carried out a form of a discourse analysis and a form of a thematic analysis. I also performed a content analysis (e.g. examining what words appear in the text and with what frequency) that was to aid the other types of analysis. An example of content analysis I carried out can be found in a table presented in Appendix E. My interpretation of the findings is interwoven into the results presented in Chapters 4 and 5. Overall, I relied on two types of software to aid me with data analysis and interpretation:

- **NVivo** (versions 9 and 10) is qualitative research software developed by QSR International that I used as a data organiser and interrogation tool. This particular software was chosen after a careful review of three main products on the market – NVivo, Atlas.ti and Walrus. NVivo software was found to be most user-friendly: its front window resembles Microsoft Word which I use on daily basis; it allowed storing demographic data about interviewees; it provides storage and analysis of PDF files.

- **Mindjet MindManager** (version 8) is graphical visualisation software which I used extensively for brainstorming, and arranging and organising concepts, mainly because of my own preferred learning style that relies heavily on visualisation.

Before proceeding with descriptions of data analysis, I outline below how interviews were transcribed.

3.6.1 Interview transcripts

The interview recordings were transcribed verbatim, which took almost three months to complete. All thirty interviews – equalling to 34 hours, 27 minutes and 29 seconds of audio tape – produced 842 A4 pages of transcripts (see table in Appendix F). Due to the fact that my analysis was not linguistic per se I did not follow a strict transcription style, as pursued, for example, by conversation analysts. Nevertheless, I tried to capture other non-verbal communication that took place in each interview e.g. smiles, laughs, exhalations, pauses, blowing of air through the mouth or blowing of a nose, birds singing in the background, door noise, phone ringing.

I used Dragon Naturally Speaking voice recognition software to help me transcribe the interviews, as suggested by Glesne (2011). It usually works as follows: as the software can only to be attuned to one voice, the researcher listens to the audio recording, then repeats aloud what she or he hears, and the voice recognition software then types it out in a Microsoft Word document. The software

was, however, not attuned automatically to my East European accent. For example, when reading aloud a piece of transcript about “a meeting in Brussels”, the software typed instead “meeting in a brothel.” Therefore I had to train the software and carry out quality checks whilst using it for transcription. Nevertheless, I found the software immensely helpful with the painstakingly long process of transcribing the interviews. Additionally, by listening to the audios, saying the words aloud and re-reading the text helped me to immerse myself in the data. Thus the transcription was not reduced to a solely mechanistic chore, but became an “interpretative process” (Kvale and Brinkmann, 2009, p. 177), “a translation from one narrative mode – oral discourse – into another narrative mode – written discourse” (Kvale and Brinkmann, 2009, p. 178).

3.6.2 Discourse analysis

Parker (1992, pp. 3-4) suggests critical re-reading of text and continuously posing questions such as: “Why was this said, and not that? Why these words, and where do the connotations of the words fit with different ways of talking about the world?”, bearing in mind that discourse analysis must not be treated as a strictly prescribed method, but an approach that relies on the interpretation and intuition of a researcher.

Willig (2007) outlines seven steps for the identification of traces of discourses: 1) identifying both implicit and explicit instances of references to the discursive object; 2) examining the differences between constructions and placing the discursive constructions of the objects within broader discourses; 3) examination of the action orientation of talk and text, i.e. what can the various discursive constructions achieve; 4) the position of the subject in relation to the object and how they are taken up; 5) the relationship between discourse and practice, i.e. how discourses are demonstrated in practice through what can be said and done and what cannot and by whom; 6) exploration of the relationship between subjectivity and discourse: how participants experience and feel from various subject positions within discourse.

I applied discourse analysis only to a small sample of my interview data. For this purpose I selected 10 pieces of interview transcripts, in order to explore how scientists constructed the practice of boundary spanning. These excerpts represented complete pieces of coherent text/speech that, when extracted from the interview transcripts, could be presented and understood in isolation. The excerpts came from eight different interviews and included seven stories and three personal accounts and/or advice giving that was based on the interviewees' extensive experience of working with clients. The stories, as told, were annotated by commentaries and explanations that the interviewees used to illustrate or justify a particular point that they were making in the conversation. Such rich data was suitable for an examination of discursive constructions.

Furthermore, the data analysis I performed through re-reading the text of the interview excerpts was based on the first two stages of Willig (2007): 1) identifying both implicit and explicit instances of references to the discursive object and 2) examining the differences between constructions. Such scrutiny of contradictions aligned with the validity criteria adopted i.e. *transgressive* validity as advocated by Sandberg, 2005 and discussed in the Section 3.6.4 Research Validity.

3.6.3 Template analysis

The principles of template analysis were described in Section 3.2.3. This section shows how I applied them. Firstly, I decided on an initial template formed of four key categories, which then served as a structure for developing the interview template. Four broad themes were used to craft the interview template and thus drive data collection, analysis and interpretation: 1) properties of intermediaries/ boundary spanners, 2) boundary spanner role, 3) context and 4) practice (Table 3.3). These four broad themes originate from the research literature cited in this thesis. For example, the idea of the importance of context stems from my reading of Higher Education and SSK research whilst context is, to a smaller degree, mentioned also in the literature from the environmental sector that I reviewed in Chapter 2.

Table 3.3. Themes for data collection and interpretation

N	Themes	Origin (Thesis chapter where the literature is reviewed)
1	Properties of intermediaries/boundary spanners: Networking, Weak tie, Matchmaking	Boundary spanning (Chapter 2) Environmental sector literature (Chapter 2)
2	Boundary spanner role	Boundary spanning (Chapter 2) Environmental sector literature (Chapter 2) HE research (Chapter 4)
3	Context	Environmental sector literature (Chapter 2) SSK (Chapter 3) HE research (Chapter 4)
4	Practice	SSK (Chapter 3)

I then analysed the full interview transcripts by applying the four themes outlined in Table 3.3. Appendix E shows the 1st and 2nd order coding applied in NVivo software. Here is an example of how I carried out analysis, looking specifically at *Networking* - a subnode under the theme *Properties of boundary spanners*:

- After the initial template was recreated in the NVivo software program, I read through interview transcripts that were uploaded into the programme as Word documents, and assigned chunks of text under the *Networking* subnode by using the manual coding function in NVivo.
- Once this was done, I then re-read the selected text and coded it inductively, producing a further level of 68 subnodes under *Networking*.

- Next, with help from the visualisation software MindJet MindManager I organised, aggregated and reduced the number of codes. This was done by first inserting the 68 sub nodes into Mindjet MindManager and then observing them, looking out for categories that could make a relevant aggregation. I also marked some very dominant relationships between various subnodes/categories. Thus the 68 subnodes were clustered into themes in MindJet MindManager.

  At this stage I went back to the NVivo software and, based on the newly aggregated categories produced through MindJet MindManager, I moved the

data originally coded in NVivo software around to fit into these new subnodes, effectively replacing the original 68 subnodes, and saved it as a new project version in NVivo.

- Next, I created a Word document into which I copied the text from NVivo that was coded exactly using the new structure, based on the aggregations done in Mindjet MindManager. The text alone in such a raw format equalled to 119 A4 pages in the newly created Microsoft Word document.

  I then went on reading through the Microsoft Word document (a copy of the document was subsequently saved as a different version every time I worked on the document), reading through the interview excerpt, inserting short commentaries and notes beneath them, and referring back to NVivo as necessary and making changes there as well e.g. if I concluded that an interview excerpt might fit better into another node than the one that I originally coded, it or if I suddenly recalled a particular interviewee saying something, which was not under a particular node, I went back into the interview transcript, searched for that particular section, read it again, and, if necessary, added it under that particular node, in a copy of the NVivo project. Throughout, version control was strict and provides an audit trail.

3.6.4 Research validity

A positivist type of research has strictly prescribed validity criteria against which it is judged. These include: 1) measuring a phenomenon under study as accurately as possible; 2) avoiding personal bias; 3) aiming at prediction and control, due to a belief in the unchangeable nature of a phenomena over time; 4) converting observations into numbers, due to the belief in their superiority in terms of precision; 5) searching for the answer that reveals one universal truth (Gergen, 2009, pp.58-61).

These criteria are not compatible with a constructionist approach that posits that “all knowledge is provisional and contestable, and accounts are local and

historically/ culturally specific" (Burr, 2003, p. 158). In constructionism, collection of uncontaminated data and their mechanical analysis in order to achieve valid/true results is a foreign concept; instead focus is on data interpretation that arises "from our efforts at sense-making; a human activity that includes intuition, past experience, emotion – personal attributes of human researchers that can be argued endlessly but neither proved nor disproved to the satisfaction of all" (Wolcott, 2009, p. 30). Thus, as Gergen (2009) explains, it is not about preoccupation with research validity that is unattainable but about opening new ways of understanding.

There are non-positivist means of assessment against which studies and their knowledge claims can be evaluated. One set of alternative validity criteria proposed is based on phenomenological philosophy as espoused by Sandberg (2005). The proposed criteria are: 1) *Communicative*, 2) *Pragmatic,* 3) *Transgressive,* and 4) *Reliability as interpretative awareness* (Sandberg, 2005, pp. 54-59, Table 3.4.).

Table 4.4. Validity criteria for social sciences research

Type of validity	**Achieved via:**
Communicative	▪ Mutual understanding between the researcher and research participants about the research purpose ▪ Discussing research findings within a research community that researches the topics under investigation or with a community of practice (bearing in mind that sometimes these might not want to confirm a finding not because it is not valid but for other reasons
Pragmatic	During interviews: ▪ Asking further questions ▪ Checking researcher's interpretation by presenting it to interviewees and observing their reaction ▪ During participant observation when researcher can compare their interpretations with what they are observing
Transgressive	▪ Searching for differences and contradictions rather than coherence in the lived experience ▪ Assessing particular interpretations against alternatives ▪ What is the female imagery/experience as opposed to male way of seeing things
Reliability as interpretative awareness	▪ Acknowledging and explicitly deal with subjectivity throughout research process

Source: Sandberg (2005, p. 54- 59).

I strived to achieve communicative validity in my study by firstly ensuring that interviewees had a good idea what my research was about ,and by outlining key topics that I was interested in prior to the interviews taking place. During the interviews, an emphasis was on developing a quality conversation with interviewees, which sometimes required me to re-word my interview questions in the terms they themselves used during the encounter. An example of how I tried to achieve communicative validity can be found in interview 13; the interviewee was describing a particular practice and I wanted to double check my understanding of it. The interviewee first denied that my interpretation was valid, but during further discussion, they came to a realisation that my interpretation was indeed coinciding with what they were describing:

Interviewer: […] so when you are writing a proposal for a government, how do you do it? Do you double the time? That you expect....

Interviewee 13: What? To take into account ... These greater interactions

Interviewer: Yes, […] the change of goalposts, the fact that they want something extra...

Interviewee 13: [interrupts KS] no, no you can't do that, you can't double the time

Interviewer: So how do you? ... [Smile, amazement]

Interviewee 13: You have to you... you... Well, I think you ... […] what you have to try to do is ehm ... [pause] ah, OK, I suppose... […] You do take into account when you are looking at your day requirement the ... So you know if you're managing the task rather than just delivering the work package, if you are the project manager yeah, you do have to be very aware of the fact that... ehm, as a project manager you gonna have a lot of interaction so yeah, ... yeah, you, yeah, you probably... You're right, yes. So I think... I think for project management time you probably do eh, make sure there is plenty in there to cover that kind of thing yeah...

I discussed my research findings with professionals in practice (i.e. practising scientists), which is a means of achieving communicative validity according to Sandberg (2005). The above excerpt from interview 13 is also an example of attempting to achieve a pragmatic validity, of accepting that interviewees might wish to construct their accounts in a certain way. In this case, my interpretation of their practice of calculating time for project proposals as "*doubling time*" was aimed to provoke a reaction from the interviewee that would either dispute or confirm my interpretation. *Transgressive* validity can then be achieved during the data analysis and interpretation phase, for example, by searching for contradictions and differences in data, according to Sandberg (2005). Such steps were undertaken in particular when examining the discursive constructions of boundary spanning.

3.7 Chapter summary

I positioned my research philosophy and methodology within SSK studies; therefore, this chapter started with an overview of SSK scholarship. I then introduced one of its key philosophical approaches – constructionism, its main ideas and critique. Next, I considered various methods applied by SSK studies. I opted for a combination of a form of quantitative content analysis, elements of discourse analysis as outlined by Willig (2007), and a form of thematic analysis labelled by King (1998) as *template analysis*. Semi-structured interviews were selected as a mode of enquiry. I outlined the steps I undertook in crafting the interview template, the types of questions and wording that I considered, drawing mainly from Patton (2002). Subsequently, I described how I considered research ethics, selection of a case study and of the interviewees, as well as my stance as a researcher. Next I depicted how I conducted thirty interviews with scientists within one university department, and how I carried out transcription of the interviews. I described what interview analysis was undertaken and what specialised software I used. Finally, I discussed the concepts of research validity that was applicable to the type of research that I adopted, and what steps I took to achieve such validity. My findings are presented in Chapters 4 and 5.

CHAPTER 4: INTRODUCTION TO A CASE STUDY

4.1 Introduction

> "… There's a nice description of university research that it should be like watching fish swimming in a goldfish bowl in the sense that it should be possible for anybody to come here and peer in and see what's going on." (Interviewee in a study by Oh, 2000, p. 104)

This chapter contains contextual information from a variety of sources. It starts with introducing some of the recent developments in the UK HE sector as depicted in HE research. It is followed by a brief overview of the university where the interviews took place and that was classified according to the typology put forward by Barnett (2011). Information from the university's internal and external documents was added. The last section of the chapter was constructed from the interview excerpts.

4.2 From an ivory tower to a knowledge-intensive workplace

HE research paints the following picture: UK universities no longer resemble ivory towers – elite, isolated places where science is a curiosity-driven quest for one universal truth, unscathed by and protected from societal and political changes. On the contrary, UK universities had been transformed into knowledge-intensive workplaces; the disinterested pursuit of truth had been replaced by the pursuit of economic gain. What is more, the current state of the UK's HE sector is a direct result of governmental policies.

4.2.1 HE sector reforms

The Conservative government, led by Margaret Thatcher between the years 1979-1990, subjected UK[5] universities to policies that made them business-like, transforming them into enterprising organisations, highly conscious of their own efficiency and accountability, with overt interest in maximizing economic gain (Deem *et al*., 2007; Shore, 2008, Diefenbach, 2009; Furedi, 2011). This was preceded by transforming the elite system of universities into a mass system, as recommendations of the Robbins Committee to expand HE sector were implemented (Committee on Higher Education, 1963; Deem, 2004; Deem *et al.* 2007). Overall, HE reforms have been largely imposed from the outside, as opposed to emanating from within, and were not confined to HE, but to the public sector at large (Chandler *et al*.; 2002; Shore, 2008).

The justification for the public sector reforms was the need to curb public spending (Deem, 2004; Deem *et al.*, 2007; Shore, 2008; Henkel, 2000). There was an entrenched belief that the public sector as a whole operated as a cumbersome and resources-wasting bureaucratic apparatus that could only be revitalised and made more efficient by exposing it to market forces, and by introducing a set of measures such as outsourcing delivery of its services (Lock and Lorenz, 2007; Furedi, 2011). However, due to the sustained involvement of the UK government in the HE sector, it is more accurate to speak of quasi-market forces rather than market forces (Barnett, 2011; also Henkel, 2000). Although advertised as economically driven incentives, they had an ideological and political agenda (Shore, 2008; Furedi, 2011).

[5] There are some differences between the changes that universities have undergone in different parts of the UK, such as Scotland (e.g. see Deem *et al.*, 2007; Shattock, 2012).

4.2.2 Neo-liberalism, knowledge economy and NPM

The reforms, introduced initially by the Conservative government, are associated with neo-liberalism, knowledge economy, and New Public Management (NPM). These concepts are closely interlinked. Neo-liberalism can be defined as "a modified form of liberalism tending to favour free-market capitalism" (Oxford Dictionary, undated). Knowledge economy is an ambiguous and contested concept: it is an ideology with normative assumptions that emerged from a number of fields, ranging from economics and politics, to education and philosophy (Hancock, 2012). In contrast to what the term implies, i.e. an economy shaped by scientific knowledge, this ideology is about (scientific) knowledge turned into economic goods, where "homo academicus is now to be modelled after homo economicus" (Lock and Lorenz, 2007, p. 412; citing Lorenz 2000, 2006a, 2006b). NPM can be defined as "a set of assumptions and value statements about how public sector organizations should be designed, organized, managed and how, in a quasi-business manner, they should function" (Diefenbach, 2009, p. 893).

The rise of neo-liberalism and the concepts of knowledge economy and NPM are not confined to the UK, but have been gaining prominence worldwide and in many instances across the political spectrum (Diefenbach, 2009). Therefore, these ideas have been embraced in the UK by the Labour government that succeeded the Conservative government in the years 1997-2010, as well as the current Conservative-Liberal Democrat coalition government (2010-present):

- "To build a dynamic, knowledge-based economy, the new Department will draw together the nation's strengths in colleges, research, science and universities" (The National Archives, 2012). This was stated for the Department for Innovation, Universities and Skills that was created by the Labour government.
- The Wilson Review - *A Review of Business-University Collaboration* - published in February 2012 under the coalition government states:

> "The economic and social prosperity of the UK depends upon a healthy knowledge-based economy. In our globally competitive economic environment, never before has there been a greater need for a talented, enterprising workforce, for constant innovation in product and service development, for a thriving culture of entrepreneurship, for dynamic leading edge scientific and technological development and for world-class research that attracts investment. In collaboration with business, and with the support of government, the UK university sector has the capability to fulfil Lord Dearing's vision: to be the source of strength in the UK's knowledge based economy of the twenty first century. (Preface, Wilson, 2012)

The incessant reduction in funding directed to the HE sector as part of these reforms was accompanied with calls for accountability and efficiency that were to be answered through new monitoring and measurement mechanisms (e.g. the first *Research Selectivity Exercise* held in 1986) (Deem *et al*., 2007; Diensbach, 2009). These new forms of accountability, although promoted as a means of restoring trust, were in fact about ensuring government's control (O'Neill, 2002). Thus HE reforms earmarked the end of government's limited intervention in universities' affairs (Deem 2004, Deem *et al.*, 2007). A new era of the government's increased and ceaseless effort to interfere and "micro-manage" HE institutions began (Deem *et al.*, 2007, p. 49; Deem 2004).

4.2.3 The outcomes of HE reforms

Under NPM, academic labour was highly intensified (Chandler *et al.*, 2002). NPM, as imposed on universities, introduced performance management systems and setting of precise targets, which led to an explicit adoption of customer-orientation, and gave rise to a new breed of academic managers, whilst demands were made on all staff to behave in a business-like manner and conform to the new corporate culture (Diensbach, 2008). The crowding of HE space, due to an increase in the number of universities versus reduced public funding, resulted in

competition for resources amongst universities (Chandler *et al.* 2002). The HE reforms led to a profound culture change, according to Deem (2004). They have not yet resulted in a UK university going bankrupt, which some now consider a genuine possibility, especially given that student numbers for academic year 2012-2013 dropped by 43% at one such institution (Fazackerley, 2012).

The reforms of the HE sector have been widely criticised within the academic community worldwide. Although promoted as ‘‘bureaucracy-busting’’, they have been blamed for leading to even more bureaucratisation, being “hugely prodigal” of public money (Lock and Lorenz, 2007, p. 409). Equally, they have been accused of causing “a drastic” loss of academic identity among those labelled suddenly as “‘non-research active’” (Henkel, 2000, p. 260); this gave rise to a form of an “academic identity schism” (Winter, 2009), resulting in a loss of collegiality and academic freedom (Saunders, 2006); as well as in “linguistic impoverishment, vanishing of imagination and mystery”, reducing universities into “matter-of-fact places” (Barnett, 2011, p.15); leading to comparisons of academic staff with the status of peasants in a feudal order (Holligan, 2011); creating a new academic “lumpen proletariat” of lowly paid contract researchers (Reay, 2004); and introduced new rigidly defined job roles (Whitchurch, 2008, 2009, 2013). All this occurred whilst the new cadre of research managers and administrators reported experiences of distrust by academics who viewed them as “’minions of management’” (Allen-Collinson, 2009, p. 950, quotation marks original). Overall, the reforms signalled what Henkel (2010, p. 4 and p. 7) described as an end of “optimal conditions for the formation and maintenance of distinct, stable and legitimizing identities” within the HE sector; instead they led to a diversification of the workforce and, with it, to disintegration of longstanding identities.

The HE sector reforms accelerated a process of fundamental change under which “all kinds of scientific activities and their results are predominantly interpreted and assessed on the basis of economic criteria” (Radder, 2010, p. 4). Such developments were prophesised by Lyotard (1984):

> "The relationship of the suppliers and users of knowledge to the knowledge they supply and use is now tending, and will increasingly tend, to assume the form already taken the relationship of commodity producers and consumers to the commodities they produce and consume - that is, the form of value. Knowledge is and will be produced in order to be sold, it is and will be consumed in order to be valorized in a new production" (Lyotard, 1984, pp. 4-5).

It means that processes and entities that were previously not deemed to have an economic value are now being turned into tradable commodities. This phenomenon is recognised as commodification, a theoretical concept that stems from critical Marxist theory, according to Shumar (1997). Fuller (2010) sees commodification as "evil" and a "dangerous process", not because of commodification per se, but because the process does not recognise its own limits; it inflicts harm on scientists as producers of scientific knowledge and consumers of that knowledge, where "the increasing disposability of the former is matched by the increasing dependency of the latter, which together undermine autonomy and create addiction" (Fuller, 2010, p .293). Commodification encroaches upon all types of scientific activity and scientific disciplines, including social sciences, and it may impact on science in a number of ways, for example, by science losing the trust of the public as its image of impartiality is replaced with one of subservience to commercial interests (Radder, 2010). The negative outcomes of commodification:

> "… especially challenge the institutional integrity of the university, which is supposed to be in the business of manufacturing knowledge as a public good. But the university is fast becoming a factory for intellectual property rights and job credentials as the products of research and teaching as functionally differentiated processes, both designed for obsolescence in tow to the endless circulation of capital" (Fuller, 2010, p. 294).

Commodification has been viewed as detrimental to the quality of research and teaching (e.g. Furedi, 2011), leading to education for the market as opposed to education for citizenship (Kleinman, 2010, p. 40), thus reducing a politically aware and morally conscious citizen to the notion of a customer, an individual with narrowly defined economic interests (Diensbach, 2009). It also gives preference in research to "the quick and dirty result" as opposed to quality in research which becomes an "epistemic luxury" (Carrier, 2010, p. 161 and o. 167); it turns universities into corporate research parks and shopping centres set within commodified and sanitised communities (Shumar, 2008); and causes universities to be treated, as Holligan (2011, p. 60) put it, as "government's supermarkets". These are signs of an advanced stage of capitalism; as Fuller (2010, p. 290) puts it, "an epistemic" one where knowledge "does not merely accelerate commodification but is itself subject to commodification".

Yet the ideologies of neo-liberalism, knowledge economy, and NPM, after three decades of HE reforms, have been internalised within UK universities (Chandler *et al.*, 2002; Deem *et al.*, 2007). Sautson and Morrish (2011) found in their study of mission statements at UK universities that the wording was overwhelmingly in line with the dominant neo-liberal discourse, with knowledge marketed as a commodity.

4.2.4 From the entrepreneurial to a corporate university

The adoption of neo-liberal policies and the implementation of NPM gave rise to a particular type of university. Professor Ronald Barnett, a prominent HE research scholar, conceptualises the idea of an *entrepreneurial* university that evolves into a *bureaucratic* and *surveillance* institution: moreover, he posits such changes are prerequisites for the emergence of a *corporate* university. This section outlines Barnett's ideas as presented in his 2011 publication *Being a university*.

According to Barnett, the meaning of an entrepreneurial university is actually ambiguous and has multiple origins. Nevertheless, it may seem inevitable that all

universities are destined to become entrepreneurial in the wake of the current political and economic developments – a notion with which the author disagrees: “There is legitimate academic life still to be had outside entrepreneurialism and even possibly inside”, argues Barnett (2011, p. 41).

In an entrepreneurial university, knowledge production takes place in isolation from the world yet “its knowledge products are applied to - or sold to - the world so as to yield, characteristically the highest economic return” (Barnett, 2011, pp. 31-32). An entrepreneurial university is in a ceaseless state of flux, always adapting and evolving. An entrepreneurial university engages in risk taking. An entrepreneurial university, through its enterprises that involve risk taking, “may be risking itself”, transforming itself in the process, its values and its being (Barnett, 2011, p. 36). Different forms of entrepreneurialism can then be distinguished, such as hard versus soft:

- *Hard*: a strong focus on economic gain that can override other objectives
- *Soft*: economic objectives are less visible, implicit or missing completely

These two types can then be, for example, influenced by the market i.e. depending on the extent to which markets are regulated by the state or not. If these two sets *hard/soft* and *open/regulated markets* are then plotted as two axes, four distinct types of entrepreneurialism can be distinguished (Figure 4.1).

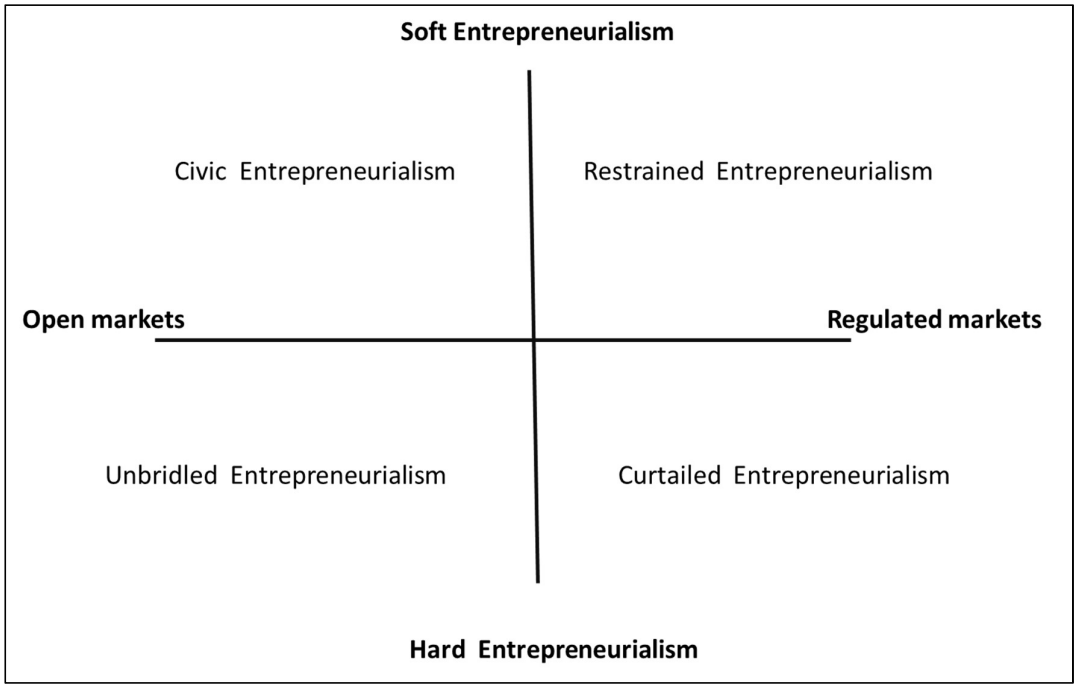


Figure 4.1 Forms of entrepreneurialism in Higher Education
Source: Barnett (2011, p.38, Figure 3.1).

These four distinct types of university entrepreneurialism, as depicted in Figure 4.1, are:

- *Civic:* A soft form of entrepreneurialism. This type of university is characterised by enterprising done in a close connection with the public and for the benefit of its communities; the social element is key. Enterprising is done laterally, creatively expanding in multiple directions, which may run counter to what is deemed to be important by funding bodies and may pose a risk of the university being assessed as not performing well in valuations such as the Research Assessment Exercise (RAE).
- *Restrained*: A soft form of entrepreneurialism, similar to the *Civic* type, but the amount of creative enterprising is limited, e.g. this type of university has to offset its social engagement against the application of selectivity criteria that maximise the efficient use of public funding it receives.
- *Unbridled*: A hard form of entrepreneurialism. Scientific knowledge is a commodity to be exploited for economic gain. The main focus is on

generating and maximising profits. This type of university is ultimately considered and run as a business.

- *Curtailed*: A hard form of entrepreneurialism, similar to the *Unbridled* type but here the free market is strongly regulated by the state and this limits the amount of enterprising that can be done.

Any university – even one department or a centre within it may then be engaging in more than one type of entrepreneurialism. However, it may still be possible to determine the prevailing mode of enterprising. Moreover, an entrepreneurial university is also a bureaucratic and a surveillance university:

A bureaucratic university serves as "a supremely rational device with which to cope with the extraordinary complexity that is the contemporary university", explains Barnett (2011, p. 48). A bureaucratic university strives towards accountability, efficiency and transparency through the increased regulation of academic work. However, as Barnett (2011) points out, it would be impossible to match every bureaucratic procedure to these concepts, yet bureaucratic procedures are still being put in place, e.g. for the purpose of averting the risk of litigation, although they are often "disproportionate to the alleged risks" (Barnett, 2011, p. 47).

Barnett (2011) points out that bureaucratic procedures and regulations put in place by a university are often not created and carried out by academics themselves, but by supporting staff and academic managers. Thus, in a bureaucratic university, the number of non-academic staff tends to be higher than the number of academic staff. According to the information of the Higher Education Statistics Agency (HESA), in the academic year 2011-2012 English universities employed 152,630 academic staff; this figure is less than the 159,980 non-academic staff employed during that year.

The logic behind bureaucratic procedures is not about "getting things done but by exercising control and surveillance (albeit for other ends of greater institutional

efficiency and effectiveness", suggests Barnet (2011, p. 49). A bureaucratic university is therefore a surveillance university, through bureaucratic procedures that allow "'intelligence' to be gathered about certain kinds of activities" (Barnett, 2011, p. 48), and through which its staff are subjected to what Barnett (2011, p. 46) calls "increasing watchfulness". Surveillance can be detected at various levels; bureaucratic procedures impose control and limit options, and remind staff that they are subject to the university's power and control. Then there is a personal form of surveillance – "'Surveillance' with a capital S" – that occurs when "individuals are required to undergo procedures that are designed to reveal themselves." (Barnett 2011, p. 49)

A bureaucratic university is a prerequisite for the emergence of a corporate university, under which the university, as one united entity, is "severed from culture" (Barnett, 2011, p. 7). A corporate university is presented as a brand that stands on its own, has its own identity. A corporate university, Barnett (2011) continues to postulate, strives for commonality and transparency, through corporate strategy, mission statement, corporate communication, corporate template, etc. produced by new marketing departments and corporate communication teams. Thus a corporate university is an outcome of the forces of globalisation, knowledge economy and neo-liberalism: in this type of environment universities are primarily compelled to primarily compete against each other.

4.3 Cranfield University

Cranfield University is one of 115 universities in the UK and it does not belong to any of the major groups of universities, such as the Russell Group or the 1994 Group (Universities UK, undated). It is a distinct academic institution for postgraduate students (i.e. no undergraduates study at this university). Cranfield University is a strongly STEM (Science, Technology, Engineering, and Mathematics) oriented university. It is regulated by the Higher Education Funding Council for England (HEFCE) and on the HEFCE's website it is listed as a registered charity (HEFCE, undated). Cranfield University was described as

"world-leading in its contribution to global innovation", and as "one of the UK's top five research-intensive universities" (Cranfield University, 2010, p.5 and p. 29).

4.3.1 Place, history and current structure

Cranfield University is situated about eighty kilometres northwest of London near the village of Cranfield, Bedfordshire, on the site of a formal Royal Air Force base. The publication by Revel Barker (1996), entitled *Field of vision,* charts the first fifty years of the university's history:

The UK's first College of Aeronautics (CA) was founded at Cranfield in 1946, as a pet project of the Minister of Aircraft Production, Sir Stafford Cripps, and his then Technical Advisor, Sir Roy Fedden. The college initially trained fifty students a year, with the aim to train a new generation of industry experts. Originally and unusually at the time, it did not receive funding through the University Grants Committee, but through a grant directly from the Ministry of Education. Further developments were halted by the government's *White Paper on Defence Policy (1957)*, which outlined no future need for aeronautics; this document marked the start of diversification of the CA (i.e. opening new areas of research and teaching in other subjects than aeronautics) - a strategy that has continued over the years. Following the publication of *The Robbins Report* (Committee on Higher Education,1963), the comparatively small size of the CA was identified as an issue and it was suggested to the CA that it was to be affiliated with other universities; a proposition that the CA resisted. Instead, the CA presented a Petition for the Grant of a Royal Charter, which was granted in 1969 and the CA changed its name to Cranfield Institute of Technology. Subsequently, it was renamed to Cranfield University in 1993. In its current format and at the time this study was conducted, the university was divided into five schools that represented a wide range of research carried out on its premises:

- Cranfield Defence and Security (based away from the Cranfield site, at Shrivenham campus near Swindon);
- Cranfield Health;
- School of Applied Sciences (SAS);

- School of Engineering; and
- School of Management.

4.3.2 Cranfield University: an entrepreneurial university

Using the classification by Barnett (2012) to describe a university as *hard entrepreneurial* means that the academic institution in question lives and breathes the values of neoliberalism and knowledge economy, and this is reflected in its culture and its corporate language.

Under this typology, Cranfield University could be classified as a *hard entrepreneurial* type of university (Figure 4.2).

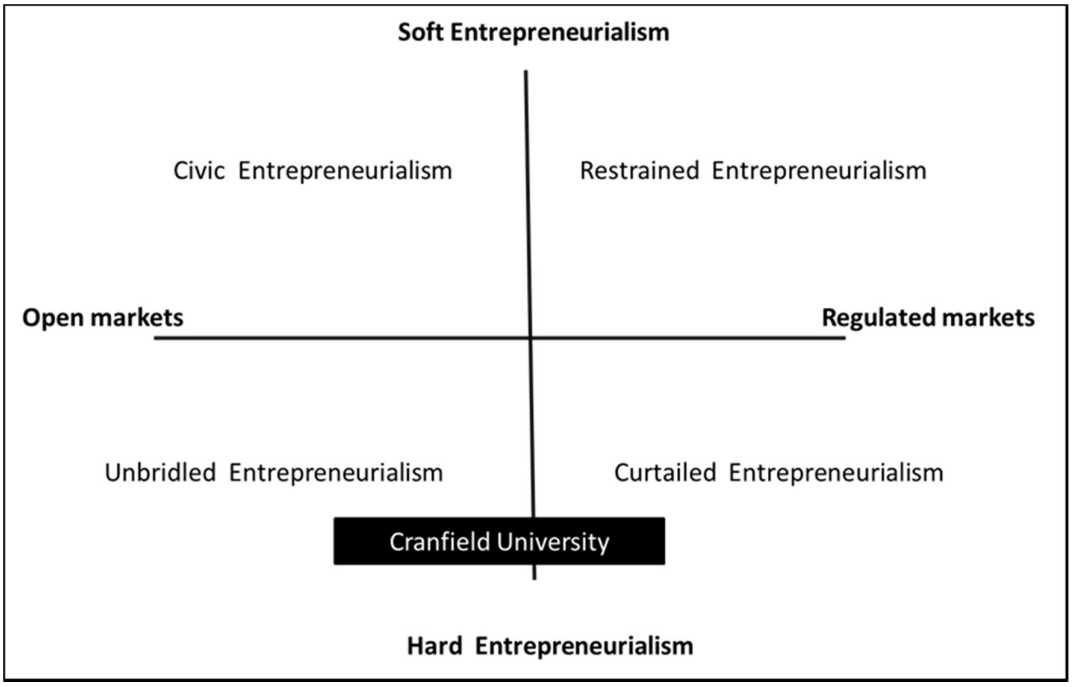


Figure 4.2 Cranfield University as a type of entrepreneurial university.
Source: Barnett (2011, p.38, Figure 3.1, Forms of entrepreneurialism in higher education).

The spirit of hard entrepreneurialism at Cranfield University is historical; it goes back to the appointment of Lord Henry Chilver as its Vice-Chancellor, a role he held for nineteen years (1970 – 1989). During his time Cranfield University

became "a model Thatcherite University" (Barker 1996, p. 89). Some of the measures Lord Chilver introduced were at the time considered novel and progressive. Barker (1996) gives this list:

- Devolution of budgets: each department became self-financing, with the surplus kept within the department;
- Introducing a tax system where each department paid an amount dependent on its usage of office space, lecture rooms and other central facilities;
- Setting explicit targets;
- Taking up bank loans for the building of student residences;
- Merger with the National College of Agricultural Engineering at Silsoe in 1974;
- Acquisition of Shuttleworth College at Old Warden, Bedfordshire in 1988;
- Winning a large scale, long-term contract with the Ministry of Defence for running the Royal Military College of Science at Shrivenham.

Lord Chilver is quoted in Barker (1996, p. 79) as saying: "People underestimate the commercial prowess of the academic." Given the changes he introduced, Lord Chilver had been described as "uniquely successful in marrying academic advances with business opportunities" (The Telegraph, 2012). During his reign as its Vice-Chancellor, Cranfield University acted as a business.

After the departure of Lord Chilver, Cranfield University has continued in the direction he set. The latest university corporate brochure, available at the time of this research, described Cranfield University as "the UK's most business-engaged university" that plays "a major role in building the global knowledge economy" (Cranfield University, 2010, p.29 and p.7). During the induction day for new staff that I attended, a senior manager introduced the university as "close to business, close to practice"; and by saying "we value only something that works"; adding that "you may be startled, if you come from a traditional background" and "we are no ivory tower." Key corporate responsibility messages directed to new

staff during this event included “treat each other as a customer” and “providing excellence in customer service” – an ethos that applied to internal staff, students and clients, and which “might give [Cranfield] an edge”.

The university’s mission statement stated[6]:

> *“Cranfield’s mission to transform knowledge into ingenious solutions in science, technology and management places us at the forefront of some of the world’s most practical, cutting-edge projects.*
>
> *From unique cabin evacuation research to finding life on Mars, from a frost blanket for racecourses to zero-emission cars, and from the next generation of anti-landmine devices to a new blood glucose monitor, Cranfield’s focus is squarely on the application of its research.*
>
> *Cranfield has a global reputation for **inspirational** teaching and research, **industrial-scale** facilities and **superior** links with industry and commerce.*
>
> *And as a wholly postgraduate institution, Cranfield is the first choice for ambitious and skilled individuals wishing to enrol on Masters’, Doctorate and professional development programmes.*
>
> *Our passion for the areas of expertise we operate in – aerospace, automotive, defence, energy, environment, healthcare, management, manufacturing and security – makes us uniquely placed for both students and corporate partners alike“* (Cranfield University, undated a.; bold font as in original text, grey highlights to the font added;).

[6] This text could be found on the university’s external webpage: http://www.cranfield.ac.uk/about/page1357.html. Note that the text differs from the text of the mission statement that was presented during the induction day for new starters I attended on 12th September 2012. Here, I refer to the version of the mission statement available on university’s external web page at the time this research was conducted.

The text of the mission statement above corresponds to the findings by Sautson and Morrish (2011) who observed a trend towards a standardisation of the wording of mission statements of UK universities in line with the neo-liberal discourse. In the example above, the word 'knowledge' was present in the text, but was not associated with students and student learning. Instead, knowledge was treated as an object that can be transformed, exploited and marketed in order to position Cranfield University, as stated in its mission statement, "at the forefront of some of the world's most practical, cutting-edge projects".

The hard entrepreneurialism tone was evident in SAS strategy for the years 2011-2015. According to this document, SAS valued "agility, boldness and pace; teamwork and integrity; passion for success…and excellence in everything we do." Its senior staff were expected to "take the lead in winning large-scale funding", "demonstrate a capability and hunger for winning exciting and commercially viable work" (Cranfield University Intranet, undated, c). Furthermore, the strategy document stated that in the academic year 2011-2012, SAS had 319 staff and a turnover of £35.6 million (Cranfield University, undated, a), out of the university's annual turnover of £150 million (Cranfield University, 2010). An explicit target was set of "2% surplus to maintain financial stability and provide investment" (Cranfield University Intranet, undated, d). The strategy document pledged to "selling our taught Masters and research programmes" (Cranfield University Intranet, undated, c). Two key areas of "core business" were outlined in the strategy document as:

1. Winning and delivering research and consultancy, with a focus to maximise the number of high quality bids;
2. Recruiting and educating people, which includes a measure to increase short course income to £1.5M/year (Cranfield University Intranet, undated, c)

According to the SAS strategy document, the interaction with the wider public was to be limited to interaction with research sponsors and through publishing in

scientific journals (Cranfield University Intranet, undated, c). This stance on the level of public engagement was reflected in the vocabulary of the senior management at the induction day for new staff that I attended: the word 'community' did not feature in their talk. In relation to communities within a close proximity of the university, new staff were asked to guess how many businesses were based at Cranfield University Technology Park.

4.3.3 Cranfield University as a bureaucratic, surveillance, and corporate university

At the core of a bureaucratic university lies, through increased regulation and information gathering exercises, an attempt for control and surveillance, "when individuals are required to undergo procedures that are designed to reveal themselves" and where individuals are "reminded of the presence of the institution as such" (both Barnett, 2011, p.49). Thus there were progress meetings and a *Performance Development Review Scheme* in place, administered through line managers, as well as *the loading form* (precisely entitled *Individual Staff Loading for year*) – a management tool designed by a group of SAS senior managers and generated by the SAS finance office every year as an A4 form: it collected information about each member of staff's activities, including teaching, publications, and research and consultancy income. Reportedly, based on personal communication with some staff, the *loading form* was compulsory to complete for all staff except Professors and senior managers.

Other areas not considered income generating were neglected. For three years the university had no L&D lead and once a new one was appointed (in 2008), the new head found the service disjointed and with no sense of direction, and an individually focused business culture fixed on solely generating money, that was geared negatively towards staff learning and development (Bryant, 2011). The university's attitude of "we cannot afford that" was countered through offering learning and development opportunities to all staff free of charge, the cost being covered within the L&D budget (Bryant, 2011). Whilst L&D encouraged individuals to book a place for themselves, some managers resisted relinquishing

control and so a change from the historically top down approach was slow, this then impacted the speed of change of attitudes towards learning and development activities by individual members (Bryant, 2011).

In the academic year 2011-2012, Cranfield University employed 650 scientists and 1,040 support staff (HESA, undated). This outnumbering of academic staff by support employees is a feature of a bureaucratic university, according to Barnett (2011).

Equally, Cranfield University was an example of a corporate university, as espoused by Barnett (2011). It was marketed as a brand; it had a mission statement and a corporate strategy, a corporate brochure, a Corporate Relations Team; a prescribed template for PowerPoint presentations and business cards with a specific logo and font, and some schools had a dedicated marketing team. These more recent efforts for consistency and unity across the university were signs of moving away from the devolution of departments and their budgets as exercised during the Chilver years.

4.4 Cranfield University revisited

A senior member of the university's management, at an induction day for new staff that I attended, described Cranfield University as a place "full of energy", where "people hurry to meetings" and "work late at night". But how do the scientists themselves talk about Cranfield University?

This section was pieced together from retrospective accounts of the interviewees. First, to follow from the previous section, I show how the interviewees themselves talked about their university i.e. whether they viewed it as a business or as a traditional academic bastion. I then introduce the scientists interviewed and their clients and outline for what purposes these clients used the scientists' research. Lastly, I present the reasons why the interviewees did not consider the idea of an appointment of a designated knowledge broker viable.

4.4.1 Cranfield University: an educational institution or a business?

Cranfield University was shown to have a long history as a hard entrepreneurial university, being a prime example of "a model Thatcherite University" (Barker, 1996, p. 89). The view of the university as a business resonated in the talk of many of the interviewees. I asked them about interaction and relationship building with clients; instead of communication and dissemination tasks that feature highly in the reviewed literature from the environmental sector that promotes knowledge brokering the interviewees' accounts were full of economic terms. Twenty-six interviewees out of thirty used the word 'money' at least once in their interviews. Half of the interviewees used the metaphor of winning: *winning business, winning a grant, winning a next project, winning the mon*ey, etc. During one of the interviews, the interviewee remarked how they found my PhD research fascinating:

"It's the ecology of academia, what you are studying... It could be like the plaines of the Serengeti ... with wildebeest and antelope and lions, you know, it's exactly the same thing". (Interviewee 13)

So this interviewee described the "ecology of academia" in terms of a competition, the survival of the fittest. Elsewhere in the interview they compared the university with a shop:

"…academia is a business, research is a business... It is no different to selling an aeroplane or selling double glazing or selling aromatherapy, you know ...There's someone who wants a service or a product, you are offering a service or product and that transaction requires, you know, you to say what is the service or product, when I am going to get it, how much is it going to cost... It's the basics of a shop". (Interviewee 13)

Another interviewee explained that the university was not a shop per se, rather a form of franchise:

"Cranfield says it runs as a business but it is not operating as a true business enterprise model. It operates as a cash-accounted shop, as a federation of small corner shops. You do not get any money from the corporate tin, you are asked to go and get the money yourself and bring some surplus in. It is not an enterprise; it is more a franchise where academics get the brand and the legal entity to use. Plus all the various small corner shops at Cranfield campus tend to be competing against each other." (Interviewee 10)

However, some scientists I interviewed saw the idea of the university as a business problematic, especially as they viewed traditional academic values as not primarily driven by a desire to maximise economic gain. Subsequently, financial pressures were seen as diminishing the authentic purpose of the university as a learning institution:

"I primarily see myself as an academic and a scientist and not a consultant so I am concerned that Cranfield is turning itself into a consultancy [smiles] which [...] ... and if I wanted to be a consultant I would go and work for a ... professional consultancy company [smiles]. I don't want to be a consultant so I am at university. And Cranfield is kind of a half-way house between those two [smiles], but it is moving nearer, I think, to consultancy because of the financial pressures it is under ..." (Interviewee 6)

Cranfield University was described as a "collection of cottage industries" (Interviewee 7); and as an institution "with a lack of social fabric" (Interviewee 11). The present-day culture of Cranfield University was contrasted to the interviewees' experiences of being previously based at Silsoe College[7], which

7 Silsoe was formerly the National College of Agricultural Engineering that opened its doors in 1962; was acquired by Cranfield University (then called Cranfield Institute of Technology) in 1975 as a result of pressure by the Department of Education and Science; renamed to Silsoe College in 1983 and then became part of the Cranfield Rural Institute in November 1987 (Burt, 1989). In 2005 a decision was made for the campus to close down, with a move to Cranfield University completed by 2009, and the land sold to developers (e.g. see Bedford Today, 2013 http://www.bedfordtoday.co.uk/news/education/silsoe-college-remembered-on-new-homes-estate-1-5748954).

was described by them as a small but a friendly institution in which social networking and informal communication was facilitated and thrived.

“I used to be on Silsoe campus and I moved over here. And the main thing that struck me when I moved over here, how isolated all the different centres were on Cranfield campus…It’s not a single entity and people felt they belong to the centre, rather than they belonged to the university.” (Interviewee 7);

“… there are hundreds of sort of little kettles and coffee areas, you can’t sit down and relax around them, you just get a coffee and then go back to your office on your own … and as a university as a whole, with lots of little buildings, with very thick walls. (Interviewee 11);

“I don't just wander around the buildings going “hi”, it doesn't happen... at Silsoe it was a smaller campus and so we could meet for a coffee in the morning in one big coffee room and so it was easier to build relationships with people outside of your immediate working area” (Interviewee 18);

“We are driven to sit at our desk, working 9 till 6, little bit of talking but then you go home and we need... there is no building where you can go and have a coffee and eat your sandwiches and just relax you know and I think that is poor.” (Interviewee 28)

Some acknowledged that Silsoe “had to be closed down because it wasn't delivering any goods” (Interviewee 15); because of Silsoe’s perceived reputation as “a poor performer” within Cranfield University” (Interviewee 10) and that “the simple argument would be that you spent too much time talking and not enough time winning business” (Interviewee 13).

4.4.2 Scientists and their clients

I interviewed two scientists from the School of Health and twenty-eight scientists from SAS who came from these centres within the Department of Environmental Science and Technology: Cranfield Water Science Institute; Centre for Energy and Resource Technology; Centre for Environmental Risks and Futures; and National Soil Resources Institute. Demographic information is provided in

Appendix F. The interviewees were seven females and twenty-three males. In terms of their job titles there were: twelve Research Fellows (including Senior Research Fellows and Principal Research Fellows), ten Lecturers or Senior Lecturers, and eight Professors or Readers. A majority were white British, which was representative of academics at UK universities. Four of the thirty interviewees had been employed in academia less than ten years. Half of the interviewees had only worked in academia; the other fifteen had previous experience of working in industry and/or in public sector organisations.

Two of the interviewees reported having formal science communication training and/or client management training, whilst four attended, at the time the interviews took place, the *University Business Skills Development Programme.* Half of my interviewees appeared to be unaware of the existence of the L&D unit within their university. Their responses included:

"[Pause] if they exist, I am not aware of them, [laughs] so there is very little in terms of staff development in the area. (Interviewee 7)
"There is quite a degree of disconnection between what … what did you call them? Learning whatever…" (Interviewee 11)
"I am not aware of any [training opportunities]." (Interviewee 15)
"I don't know who they are, where they live, what they do." (Interviewee 28)

None of the interviewees spoke of the general public as their client; five described interaction with farmers (Interviewees 12, 14, 28, 30 and 35) and three individuals (Interviewees 25, 27 and 35) listed students as amongst their customers. The key clients, according to the interviewees, were policy making and policy implementation organisations: government departments (e.g. Defra) and their agencies (e.g. EA). Some of these key policy clients of the interviewees are listed in Table 4.1. Clients included Research Councils, European Commission (EC), MoD and other government bodies, and industry (e.g. chemical, waste, and water companies). Therefore, the scientists interviewed were both involved in consultancy types of activity and in publicly funded research.

Table 4.1 Interviewees' policy clients

Policy making organisations	Policy implementation organisations
▪ The Department for Environment, Food and Rural Affairs (Defra) ▪ Department for International Development (DFID) ▪ Ministry of Defence (MoD) ▪ Foreign and Commonwealth Office (FCO) ▪ Department for Transport (DfT) ▪ The Department for Business, Innovation and Skills (BIS) ▪ The Department of Energy and Climate Change (DECC)	▪ The Environment Agency (EA) ▪ Scottish Environment Protection Agency (SEPA) ▪ Food Standards Agency ▪ Natural England ▪ Highways Agency ▪ Forestry Commission ▪ Waste and Resources Action Programme (WRAP)

The clients of the interviewees were not exclusively policy clients. Whilst I explicitly stated in my research intent, presented to the interviewees, that I was primarily interested in their interaction with policy clients, the interview accounts tended to contain examples of both policy and non-policy clients. I thus deliberately asked the interviewees this question during the interviews: "*How does it compare, working for a government and a private sector client, such as from industry*?" Overall, the responses indicated that the interviewees did not perceive very much difference between the two types of clients, except for two common grievances they had: one about the practice of changing goalposts that was reportedly exercised more frequently by policy clients and the issue of government departments frequently moving their staff around internally to different posts after a certain period of time. Therefore I now use the word client in this thesis without distinguishing further whether it was a policy client or not.

4.4.3 What scientists do

When I asked for what purposes their clients used their research, the most common response was to inform policy:

“Mainly to inform regulation and policy” (Interviewee 10); “Basically, to inform environmental decision-making” (Interviewee 18); “Eh... I suppose, most of the work I do is kind of about [topic] which are kind of [...] and the EA is... regulates the ... [type of] facilities. So the work I have done for them is being used primarily to kind of inform their policy on regulation.” (Interviewee 23)

The provision of information by the scientists was to satisfy the need of their clients to develop their understanding:

“… it's to gain understanding perhaps of the [topic], how it might affect them, what you think, what is it first, describe it” (Interviewee 17);” they want to manage their [type of] assets and understand them so we provide them with the information” (Interviewee 18); “[...] their need is actually understanding for ...” (Interviewee 32)

The scientists also supplied tools to their clients: prediction tools, benchmarking tools, decision support tools and measurement tools:

“It's a prediction tool which allows them to plan what they may need to do in terms of treatment of [pollutant], removal of [pollutant], so it gives them worst case scenario” (Interviewee 6);”… some tools to carry out assessment of effectiveness of policies or marking interventions.” (Interviewee 9)

Furthermore, scientists provided a solution to their clients. As Interviewee 32 put it, “they [clients] have problems and we have solutions.” Interviewee 5 spoke of how they enjoyed providing solutions for their clients: “My research is there to deliver solutions to their problems”, they said. This satisfaction in providing solutions also resonated in another interview account:

“I am interested in the topic [name], interested in solving problems. Basically, I am rather a problem solver, I think, rather than a scientist.... Interacting with the client if I know what the problems are, defining them and then producing a solution, I suppose is my interest in it” (Interviewee 12)

Provision of a solution was associated with working not only with policy clients, but with industry clients too:

"Eh... at the other extreme you got [industry] companies who have very specific problems. They are not necessarily... ehm, they are not necessarily thinking about tomorrow's problems, they are thinking about today's problem and how to solve them." (Interviewee 13)

"… but industrial clients, as I say, they often just want a solution to a problem, they don't care how that solutions works necessarily or the physics, you know, or the fundamental science behind how that process or product works – they just want to know that that product works." (Interviewee 27)

"So they come to us if they have technical problems, they want some ideas or solutions developed." (Interviewee 28)

Thus scientists spoke of their work as providing information, tools, and solutions. New knowledge was discussed in relation to pure research, funding by Research Councils and PhD studentships. None of the interviewees used the term knowledge brokering when discussing what they did. Appendix E lists the related terms and how many interviewees used them in their talk. It shows that the terms knowledge transfer and knowledge exchange appeared in nine interviews altogether; three of these discussions linked them directly to research funded by Research Councils and EC-funded projects. Two interviewees spoke of the terms in relation to the need for research impact. Interviewee 23 described an intermediary role between science and policy as knowledge exchange:

"…something about keeping them informed as to what is happening, you know, feeding them information about the science that is happening, keeping them in touch with what is going on." (Interviewee 23)

Only Interviewee 28 described their work as explicitly involving "knowledge exchange, knowledge transfer, outreach and communication".

4.5 Why not appoint a knowledge broker?

During the interviews, I asked the scientists two hypothetical questions: 1) Whether they would welcome the option to solely concentrate on research and leave interaction with clients to somebody else (in other words, would they welcome the introduction of a knowledge broker?); and 2) What would they do if they were approached to change the focus of their role from research to client relationship building and communication? (i.e. becoming a knowledge broker). The scientists answered the questions from their point of view; i.e. what would they do personally in such situations; additionally, many discussed hypothetical scenarios on the feasibility and practicality of such proposed arrangements and thus acted as expert informants.

There was a general disagreement amongst the interviewees about the designated intermediary role, viewed as an arrangement that would ignore nuances and complexities of academic practice. Some scientists considered the suggestion about the introduction of knowledge brokering as distorting the situation and the image of academic practice, making it and its proposed solution of a designated knowledge broker too simplistic:

“It doesn't have to be black-and-white. There doesn't have to be a situation where you say a researcher sits in the room and does the research and never talks to the client. Or a situation where a researcher sits in a room and is the only person who talks to the client... There are... models in between.” (Interviewee 7)

“The research is not clear-cut enough you could just ignore the user. In fact, the stakeholders are really important in research; you have to have the interaction.” (Interviewee 12)

It is notable that all of the scientists except one dismissed this idea of leaving their interaction and communication with clients to somebody else: they did not consider Cranfield University as a suitable environment for an introduction of such designated roles. Among the scientists who dismissed the idea were those who had a direct experience of engagement with dedicated business development

and client account manager type of roles, either in their previous employment in the commercial sector or from Silsoe College where such dedicated roles were in existence up to the academic year 2005-2006.

The only scientist who would openly welcome the idea was experiencing a high level of stress with their main client – described as “very demanding” and “dictatorial” – and would have preferred not having to deal with them directly:

“Because I’ve got so much, so many demands on my time, I can't be... You might... I might get an e-mail saying why we have not received an invoice for the project or what is this, why is this late... And sometimes I prefer someone, the project manager, to be dealing with that rather than me.” (Interviewee 19)

Heavy workloads and stress featured in other interview accounts:

“Well, it has been incredibly stressful. ... [...]Headless chicken stuff... yes. It is, you know, when you are running round like aaah, you don’t know what you are doing anymore because you are so busy and you are here, there, everywhere and you... cannot really focus properly... headless chicken.” (Interviewee 14)

“...work becomes part of life, you know, and you live for work rather than work to live so you can go home and spend time with the family and then, in your mind, you are thinking; I need to send this email, I need to do this, I need to do this and you are back into work mind set so you can’t leave.” (Interviewee 28)

“… but ... whilst it’s great, but I haven't really followed this up very closely, it is just... I've got [number of] Ph.D. students, two have just submitted, five are ongoing, I have got post docs, and a technician I'm dealing with, so I am full on really.” (Interviewee 30)

“Because I got about 100 emails a day – I just get swamped, I could spend 10 hours a day, battling emails away and dealing with just responding, reacting to an email and then you’ve got no agenda there, you are not actually doing any real work, you are not making progress in your work, you are just battling emails away and there has to be more to life than that [laughs].” (Interviewee 32)

Given the heavy workloads of the interviewees, why would they not welcome an introduction of a designated knowledge broker into their work? Amongst the reasons why this dedicated role was not deemed suitable for Cranfield University, the interviewees cited: resistance from professors, threat to academic freedom, and a lack of corporate commercial discipline aimed at organisational outcomes as opposed to individual ones (Interviewees 8, 10 and 26). Three other key factors emerged from the data, which I expand on below:

4.5.1 The need for business administrative support

According to the literature relating to the environmental sector which I reviewed, the knowledge broker is described as a type of communication role that involves interpretation, translation and dissemination of scientific findings. According to the interviewees, they did not need help with communicating scientific results nor building relationships with their clients; what they needed instead was business administration support:

"No, what we need help on is the other end of the process; it is not communicating the results to the client, it is getting the proposals together [...] It is more admin support", argued Interviewee 24.

Interviewee 12 said that they would "happily hand over all the administration to someone else, all the writing of contracts and collecting money and invoicing, I'd get rid of that." Interviewee 14 described the current situation as unsustainable and not productive, leading to academics spending a considerable amount of time on business administrative tasks as opposed to o conducting research:

"…there is less and less administrative support and more and more of the administration is falling onto ... academic and research staff, so that increases the workload. And … actually stops you from doing the science communication and publishing papers and getting projects out…, putting in a new proposal. I think it is a problem anyway, I mean they may save money but… is the saving of money worth the opportunity cost which is

what you lose from not being able to spend that time ... on sort of more science related stuff." (Interviewee 14)

4.5.2 The need to be a business winner

The other issue highlighted was the feasibility of the intermediary a designated knowledge broker at a university that demands that its staff (as individuals) be business winners. As Interviewee 10 explained, firstly, the performance measurement system assesses academics as individuals and this can lead to a competition:

"…the main problem is that the Cranfield model … is that individuals support themselves. Really [emphasis], the model is that individuals should go out and get research and get funds and stand on their own two feet. and ... so ... Inevitably, there is some competition between the academics and the researchers to secure the funds that are out there, right?... so the Cranfield model is that every individual has pressure put on them and must respond positively to that pressure as an individual and generally they will be measured as an individual [emphasis, bangs hand on table] in terms of what they have produced..". (Interviewee 10)

Thus the academic environment in which the interviewees were based did not operate on the model of tightly-knit research groups and teams - the ethos of academic collegiality was not strongly present and, instead, it was "more individuals looking after themselves" (Interviewee 10). A multiplicity of roles taken on by one individual, including performing some form of the knowledge broker role, could also be as a result of purposively top-down driven loss of "critical mass" in some research areas at the university:

"Cranfield has a challenge in that... the size of it tends towards having individual experts…Many other areas that I see are being squeezed down to individuals, having that core competence, who then have to fulfil all the roles that we have been talking about in themselves. In their relationship to clients." (Interviewee 15)

An introduction of a designated knowledge broker within such an environment would not be viable, unless the role also engaged in business winning. This view

was evident from the majority of responses the scientists gave me, when I asked them further questions on how they perceived the designated intermediary role:

"I think I see it as a sort of a business management role in that ... well, you are managing the relationship between Cranfield and the client. And hopefully... getting new projects in or winning new money but also in terms of a [pause] maybe managing the client's expectations and transferring those expectations to the researchers within Cranfield. So … sort of business communication, business management kind of role…. [Pause] cannot think of how else to describe it...." (Interviewee 14)

Interviewee 7 agreed:
"It would be a client management role.... a business management role and some people are good at that and some people are not good at that and there is no automatic reason why somebody who is a good researcher should be a good client manager."

The role may be also described as a business administration role carried out by a "business person who controls and sort of looks after contracts, the sort of nitty gritty of line managing" (Interviewee 8). Another scientist offered a markedly different view on such a role of an intermediary, one that they would themselves be interested in: not as an "administrative, a sale support role" that involves "keeping spreadsheets", but one that is "looking for the big shifts in policy and how the organisation needs to position itself in relation to big new agendas" (Interviewee 10). This would be a type of a strategic business development role, one "with a very big travelling expenses budget" and "not one Cranfield could afford" (Interviewee 10).

One of the interviewees, listing reasons why they would not wish to change the focus of their role from research to a strongly client facing role, explained that it would lack the attraction and value that an academic role has for them:

"Partly, that I work for a university because I want to do research. I don't want to do business management. If I wanted to do business management, I could join a consultancy....ehm, and partly that that sort of... If one was thinking about being a

business manager for a larger organisation, where you have to knock on doors that are potentially shut to you that is not something I would enjoy doing." (Interviewee 5)

When I asked one of the senior academics whether they would be interested in a client relationships development role, they replied:

"That would not be enough though to justify my existence here at the university. Now maintaining good relationships with clients does not necessarily generate income. It generates good will, it generates a nice relationship and it generates an atmosphere and environment in which income can be generated. Much more than if you really... pissed your client off, then that is not going to lead to an atmosphere that is going to generate income. But a professor is expected to do more than just good will and good relationships with clients; a professor is expected to deliver income." (Interviewee 27)

Business winning was a central activity expected to be undertaken by staff across ranks at the university where the interviews took place. Therefore, it would be required of a designated knowledge broker, if they were to be appointed to this particular HE setting.

4.5.3 Knowledge broker as threat

The question of general acceptability of a designated broker role by academics was raised in the interviews, suggesting that it could potentially be perceived as a threat.

When I asked Interviewee 18 what they would do if they were offered a change of focus of their academic role, and instead of carrying out research, concentrate on client relationship building and communication, they rejected the idea as not feasible, indicating that client relationships had some innate value that was dependent on the two people involved in the relationship. This value was not easily transferrable and replicable:

"I would probably get them to get their head changed because [laughs] that would never happen.... how the university works is that everyone has their own contacts within Natural England, the Environment Agency, and academics tend to be quite protective of their

contacts.... They are very protective, this is my client, my area of the Environment Agency, I've built up a ... relationship with this person and I want to maintain that and rightly so ... it's very difficult thing to get to work well, not quite like, you know, supplying a printer or printer supplies... In that kind of company we have a client manager... I think this kind of engagement with academia and policy is much more personal than it first appears... Is the use of that relationship building what you are talking about?" (Interviewee 18)

Elsewhere, interviewees spoke of: "people protecting their turf" (Interviewee 5); describing some colleagues as being "very protective about budgets" (Interviewee 7); some pockets of staff within their school as being "quite territorial and "they feel rather threatened by newcomers so they just want to hold their fort, they don't want newcomers to come in and penetrate into their barrier" (Interviewee 30).

Having a designated client manager in a form of a knowledge broker was not feasible in a type of a university environment such as Cranfield University, according to another interviewee, as it was "not the nature of the game at university", given that "academics do not like to be fettered by that sort of thing, even if it would be a sensible approach" (Interviewee 26). According to Interviewee 26, personal relationships with a client hold some special value that was worth protecting:

"…as one becomes more academic, and less from the consultancy background, it is more of a free for all [smiles] to the detriment actually in some cases I guess of the university. Those people jealously guard their personal contacts and silos build up with poor communication between them." (Interviewee 26)

Some interviewees expressed concern that a designated knowledge broker would not work to their own benefit.

"Ehm.... [pause] I would be a little cautious that this might jeopardise my relationships with other clients...[...] for example if somebody said okay, I want you to be the main Cranfield contact for Defra and then somebody else is the main Cranfield contact for the

Environment Agency.... I would play fair [smiles] and I would be looking for business opportunities for all of my colleagues, but I wouldn't be 100% confident that my counterparts would be doing the same, … that they were finding things and keeping it for themselves and not involving me when I might be the best person to be in involved in that. So I would be cautious [smiles].” (Interviewee 7)

Another interviewee also reflected on this topic:

Interviewee 34: “It is a strange beast I think, universities per se not Cranfield but the university system... in that it almost insists that you do the interaction and a lot of that is down ... partly I think to people feeling insecure. Some of my higher colleagues I think would feel insecure if there was somebody like me doing the client meeting, generating projects, and taking that... that is from my perspective, eh... [pause]

Interviewer: “Why would they feel insecure?”

Interviewee 34: “Because they would wonder if I am giving them all the opportunities or have ... secretly given them to other colleagues [low voice, actor voice]. There is a lot of.... I feel a lot of insecurity within the hierarchy itself ... a lot of pressure, partly due to the pressure for income.”

The interview accounts indicated that an introduction of a designated knowledge broker with the aim to improve science—policy interactions would not effortlessly fit within this specific university setting, whilst such a move could be met with resistance by the academics themselves.

4.5.4 Pure research, Research Councils, and ivory tower

The interviewees referred to Research Councils and pure research, and used the metaphor of ivory tower when discussing the designated knowledge broker role:

“No, no and certainly the Research Councils have taken this on board and they have a lot of training people, and when you write a proposal it is now a requirement that you say how you are going to disseminate, how you are going to manage your data into the future, or you are going to make sure that people get a message, and you have to write

things in plain speak and I think people are getting the message that we need to do a better job as scientists... ehm, yes." (Interviewee 6)

Explaining why they would not welcome an appointment of a designated intermediary, another interviewee said:

"Because I fall more into the applied area... I think if I was looking at pure research, then I might want to hide or shut myself into a room and think about something theoretically … My position is, you know, moving to the edge of the interface, actually; it is very much looking at solutions to problems which we can actually apply, so yeah, it wouldn't really work if I didn't talk to the clients because I need to know what they want..." (Interviewee 8)

A designated role for communicating research findings might be feasible in a pure type of research, such as a project funded by a Research Council that would specify requirements for public engagement:

"I think that would not work actually.... you would not be able to get that understanding of what they want. Either you do pure research and... you've written a Research Council bid where you are the client, the science is the client, the side of community is a client therefore you are just putting out your ideas, but if you are working with a client, you've got to have face to face contact with them ..." (Interviewee 32)

> "...I suspect that might be as you move towards the centre of that taller and taller ivory tower as you moved out and across into the applied research and you have an activity which is immediately obvious what the benefit is to a group of stakeholders." (Interviewee 26)

Equally, Interviewee 9 associated the designated broker role as suitable for a specific type of research:

"I can't see me retreating to an ivory tower. I just cannot see it, I am just not like that and it would just be too frustrating. Because I like to hear what their [clients] challenges are,

what they are getting out of what we are doing, how that feeds back in... I could not see me operating in that mode, I just couldn't." (Interviewee 9)

Finally, an illustration of research funders' influence on the terminology used in research was given in one interview account:

"…most recent experience of EU has been through the Life Environment programme, and interestingly in the application [...] in the proposal, we were not allowed to use the word 'research' and somebody jokingly said to me that through your proposal, just go through the word 'research' and cut it out because we need to be applied,... we can't use the word research because that sounds too. .. academic, too scientific; we needed to be ... stakeholder involvement and you know, what this means to the farmer in the field... very, very applied; they did not want it to be seen as a research project, they wanted it to be seen as a knowledge transfer that did not have that research element" (Interviewee 27)

Overall, the interviewees associated the designated knowledge broker role with pure research and its caricature image of an ivory tower – a distant, isolated place where disinterested researchers pursued truth. Such a knowledge broker role would primarily be about unproblematic one-directional dissemination of research findings and communication, as depicted in the literature reviewed in Chapter 2.

4.6 Summary

Chapter 4 started with an introduction of a broader context of the HE sector in the UK, as depicted in HE research publications. It has shown that the UK HE sector has been undergoing significant changes, as directed by successive governments in the name of neoliberalism, knowledge economy and NPM, and that led to outcomes that are portrayed mostly negatively in the reviewed literature, such as resulting in commodification of scientific knowledge. Afterwards, I introduced the university at which the interviews took place, classifying it with the help of the typology of entrepreneurial universities by Barnett (2011). I then showed how the typology was reflected in the university's documents and in the interviewees' accounts. I introduced the interviewees and

their clients. I examined what language the interviewees used when describing the work they do for their clients. Drawing from responses to two hypothetical questions about the introduction of designated knowledge brokers, such an idea was overwhelmingly rejected by the interviewees. They stated that they did not need help with communicating scientific findings to policy makers but with business administration. Equally, they saw the designated role of knowledge broker as not viable within their university's environment, unless such a role engaged in business winning. Additionally, the practice of valuing individuals as opposed to research teams within academia was identified by the interviewees as a barrier to the introduction of designated brokers within this context. Furthermore, the interviewees implied that relationships with their clients had a special value to them that would lead them to perceive designated knowledge brokers as a threat. They suggested that such a designated role would fit better within a scientific environment where pure research was conducted; e.g. the type of research projects funded by Research Councils. Within such an environment, the designated knowledge broker could focus on performing the tasks of one-directional science communication and research findings dissemination, which are outlined as key functions of the knowledge brokering approach in some of the studies from the environmental sector that were introduced in Chapter 2.

CHAPTER 5: BOUNDARY SPANNING IN PRACTICE

5.1 Introduction

In Chapter 5 I outline results of the research relevant to the practice of spanning boundaries between science and policy. The chapter is divided into three main sections. In the first part, the discursive constructions of boundary spanning, identified from the analysis and interpretation of interview transcripts, are presented. The second part of the chapter looks at networking with policy clients as an important aspect of the practice of building relationships and includes examples from the published literature and other documents reviewed. The third part shows the practice of networking that the scientists engaged in as constructed from the interview accounts.

5.2 Constructions of boundary spanning

For the purpose of this research, scientists were conceptualised as boundary spanners in practice: “agents who with, or without nomination, engage in spanning (navigating and negotiating) boundaries of diverse fields” (Levina and Vaast, 2005, p. 342).

My interviewees spanned the boundary between science and policy through their engagement with their clients. Furthermore, they had the potential to act as boundary spanners in other circumstances: whether due to their previous work experience in industry (Interviewees 8 and 32); due to the straddling of scientific disciplines across research areas of other scientists (Interviewee 24); through acting as scientists-cum-consultants (Interviewees 15 and 24); by being physically present at Cranfield University only a certain amount of time (Interviewees 15 and 34); or due to being scientists-cum-managers (Interviewees 16, 18, 32, and 35).

The interview excerpts subjected to discourse analysis, as described in Chapter 3, Section 3.6.2, included seven stories and three personal accounts and/or advice giving (Table 5.1).

Table 5.1 Interview excerpts selected for discourse analysis

Interview excerpt	Interviewee n.	Summary	Examples of interviewees' talk
A	8	A story how the interviewee took a government organisation's employees on a field visit	...they just see a figure at the end but they don't really understand what goes behind that figure They can actually see for real what it looks like and then we explained to them
B	8	Interviewee describes their experience of working with a government department	...we've built a relationship ...even sometimes help them to identify what their issues are
C	13	A story how interviewee writes a proposal for a research call	...sending an e-mail to various people saying there is an opportunity here, anyone interested? ...they've put in the money, we won the job.
D	13	Personal reflection and advice on how to respond to client interaction	You have to have a relationship... It is all about who you know...
E	18	Reflection on the option of employing someone solely to interact with clients	An educated service... you know, we are a university It's actually helping people on this journey
F	19	Interviewee describes their experience of working with a government department	You have to kind of pander to their needs They treat you rather like a normal contractor rather than an academic
G	20	A story on how the interviewee went with a government organisation's employee to examine a particular problem in the field	And they rang me and said, what you think it is? And I said well, I don't know [laughs], we have to go and have a look …if you can get them to sort of actually look at it bit more closely
H	22	A story how interviewee writes a proposal for a research call	... not what you call a formal aspect of client management I know him and he is a friend of mine
I	24	Interviewee describes working with a government department after a winning contract they did not want in the first place	...just driving me crazy at the moment Well, it is just too many people trying to talk and nobody gets...really gets a chance to say their bit Well, it didn't give a very good impression, did it?
J	28	Interviewee explains why they were at a sport event with their child one Saturday morning whilst on the phone to a client	I know that person, you know, is going to be a long term client They want is a pair of hands they can trust ...they will deliver, they are a safe pair of hands, and you can contact them at any time.

5.2.1 Discursive constructions

The first phase of discourse analysis, according to Willig (2007), is to identify how the discursive object is constructed in the selected text. This involved re-reading the selected text and asking myself the question: how do interviewees talk of boundary spanning in the text? In this case, all references made to boundary spanning in the selected text were implicit; none of the interviewees used the term explicitly in the interviews. Three discursive constructions emerged through re-reading the text and comparing and contrasting the excerpts: depicting a scientist-cum-boundary spanner as: 1) *Contractor;* 2) *Confidant* and 3) *Educator* (Table 5.2).

Boundary spanning as a *Contractor* comprises the possibility of acting as a form of broker within an interpersonal network and thus performing the social role of an intermediary. In contrast, boundary spanning as an *Educator* and *Confidant* involves a dyadic type of relationship. In the case of the *Educator* construction, it involves translation and interpretation from scientific language to a language understood by a client.

The function of the discursive construction of *Confidant* is, then, a type of framing as an activity, similar to that described by the reviewed studies presented in Chapter 2 that adopted a co-construction view on science—policy interactions (e.g. Litfin, 1994; Lövbrand, 2007).

Table 5.2 Discursive constructions of boundary spanning

Scientist as a boundary spanner	Contractor	Confidant	Educator
Key activity:	Mobilization of and brokering for interpersonal contacts	Framing	Translation, interpretation of complex scientific knowledge/ information into a language understood by the client (boundary work)
Interview excerpts	C, F, H, I	B, D, J	A, E, G

Contractor - Interview Excerpts F and I both depicted situations where the interviewee worked as a contractor for a client from a government organisation. In the case of Excerpt I, the contract won was unwanted:

"It was one of those we put in thinking, we don't really want this job, it is really... they are wanting us to do an awful lot in a very short timescale so we put in a very big bid and we won it [laughs] and now we are having to deliver it on a very short timescale." (Interviewee 24)

The situation in Excerpt F was slightly different because the contract was long term, with a "very important client to Cranfield" (Interviewee 19):

"They are quite difficult to deal with at times... They are very demanding... They don't treat you with the respect at times …, they are always wanting wanting wanting and it can get quite stressful and at Cranfield it's seen that... They are the clients so... You have to kind of pander to their needs so it's quite awkward at times so it may add a lot of stress to your day, to your work and they don't appreciate how academics work so they treat you... I've had cases where t... They kind of ... Get quite stroppy and they treat you rather like a normal contractor rather than an academic so for that I wouldn't want to manage their relationships..." (Interviewee 19, Excerpt F)

In Excerpts C and H, the interviewees told a story of applying for a contract with a government organisation, which was done through mobilizing their interpersonal contacts for the purpose of collaboration. In Excerpt C, the story started with:

"I've just won a [contract], and that was... eh, purely by me sending an e-mail to various people saying there is an opportunity here, anyone interested?" (Excerpt C, Interviewee 13)

The story in Excerpt H went as follows:

"Yeah, I mean for example I had an email this morning from a guy I used to work with ... well, in a parallel organisation years ago, who just said to me by the way, have you seen the latest call from Defra? So in three emails the answer is we keep quite a close contact

with the client, I know my other colleagues who are dealing with a lot of these do the same and some of them are almost personal friends and so, yeah, you would ring up; and I ask him where he's been ...recently because maybe we went out years ago for a day so I am a great believer that it is a really good ... it is not what you call a formal aspect of client management, but I would have thought at Cranfield pretty crucial actually that ... there is an awful lot of work done on the basis of you know, I know him and he is a friend of mine ..." (Excerpt H, Interviewee 22)

Confidant – In stories in Excerpts B and J, the importance of developing a close relationship with clients dominated:

"I don't usually use the word 'client' very much. Usually think of them more as.... Kind of.... I suppose weirdly more like colleagues reallyWhen you're working closely with somebody, it is more of a partnership We are not doing it because you said you want to do it, it is not like that at all. The way we work. Certainly in terms of repeat business, it has always been.... we've built a relationship with that [government organisation] or [government organisation] you get to know the people, we get to find out what their problems are ..." (Excerpt B, Interviewee 8)

"I know that that person, you know, is going to be a long term client so I don't mind that, and I think a lot of clients, they like that – they like the idea that the network is there and what they want is a pair of hands they can trust, you know, that if they have a problem they can just say, ok, these people – just go to them, they will deliver, they are a safe pair of hands, and you can contact them at any time." (Excerpt J, Interviewee 28)

Excerpt D was a personal account. It contained advice on client interaction, based on their extensive experience; close relationships with clients were seen as paramount to gain competitive advantage but that required special "client skills" that not everyone could exhibit. The complete excerpt was two A4 pages long. Below are a number of shorter segments from the complete text:

"… You have to have a relationship… Sufficient of a relationship that they would tell you what they want and ideally they would tell you more than they might tell another… someone you are competing with.

“I think it takes quite a long time to get into a position where you have sufficiently good relationship with somebody that they would tell you stuff that is privileged information … But that is the key, it is all about … who you know.

“…if you are not in touch with clients and what they want and where the money is going and who is it going to, your chances of success are hugely reduced...

“To be honest, not everyone can have that, it is impossible, you know, the idea that everyone in a university department can … have a very high level of client knowledge is wrong, I just don’t believe that.

“People without these kinds of client skills we have been talking about will not succeed.... I'm sure of that... You have to have them, you have to be competitive.” (Excerpt D, Interviewee 13)

Educator – The stories in Excerpts A and G were about interviewees helping clients to develop their understanding by taking them out, literally, and demonstrating to them some specific scientific issue in the outdoors:

“One of the things that we did do a few times, was to actually try and get people [out] who are working there, who are just stuck in their offices ...” (Excerpt A, Interviewee 8)

“And they rang me and said, what do you think it is? And I said well, I don't know [laughs], we have to go and have a look, so... Then they came out with me and we were digging around and stuff.” (Excerpt G, Interviewee 20)

The purpose, as portrayed in these stories, was not just simply to get their clients out of their office into the fresh air; the clients learned something new or deepened their existing understanding:

“And you know, these people are working on [crop], talking about figures, talking about policy and they have actually never seen a [crop] field before.... And I think they got a lot

out of it because...., they can actually see for real what it looks like." (Excerpt A, Interviewee 8)

"...if you can get them to sort of actually look at it a bit more closely, in a field as well and touching it Start to understand that there are some differences; it is the same though I guess with teaching as well so there is only so much you can do in the classroom, particularly with the sort of things that we teach.... Okay, there is quite a lot of theory as well, but a lot of the applied stuff you need to be there practically... out in the field... And explaining ... And usually, that's one… particularly with the students I find that they start to understand and put it together... I kind of tried to take some of those lessons from teaching to the clients as well to sort of... Clarify some things ..." (Excerpt G, Interviewee 20)

The short reflection by Interviewee 18 in Excerpt E on the client interaction role was a response to my interview question: "So if you would have the option to change the focus of your role and leave communication and interaction with clients to someone else and solely concentrate on research, what would you do?" According to Interviewee 18, it was not possible to reduce academic work to selling because academic work was an educated service that was about "helping people on this journey." This is what distinguished a university from a consultancy:

"… it's strongly client focused but you also have to have a very good understanding of the science behind it, otherwise you make stupid decisions and you advise people to do stupid things... because I have thought about this, how can we ... employ a sales person just go and sell this stuff, and that doesn't sit at all well because it is not what we want to offer in terms of an educated service... we are a university … and just hiring people who are gifted to sell things is not the same as... it's actually helping people on this journey of... Towards making a better use of [type of asset] or taking a better care of it..."

It was possible to find more than one discursive construction in a single interview. Thus Interviewee 8 constructed the practice of boundary spanning as an educational endeavour (Excerpt A), whilst elsewhere in the interview, they gave an example of a close business relationship with a government client (Excerpt B).

Equally, Interviewee 13 talked of acting as a contractor who brokered for their interpersonal contacts (Excerpts C), but elsewhere described client interaction as client care and business winning (Excerpt D). This was representative of the variety of client arrangements one interviewee might have had with different clients.

5.2.2 Differences between constructions

The next stage of discourse analysis involved "focusing on the differences between constructions" (Willig, 2007, p. 109). Table 5.2 was extended into Table 5.3 to demonstrate the various differences and similarities that were explored in this stage of the analysis.

Table 5.3 Differences between discursive constructions of boundary spanning

Scientist as a boundary spanner	**Contractor**	**Confidant**	**Educator**
Key activity:	Mobilization of and brokering for interpersonal contacts	Framing	Translation, interpretation
Theoretical concepts/ disciplines	Commodification/ HE, philosophy of science	Discourse, rhetoric and fact construction/ Discursive psychology	Boundary work/ SSK
Interview excerpts:	C, F, H, I	B, D, J	A, E, G
Who is in charge?	Client	Client and scientist – a dialogue	Scientist
What is the main aim?	Business winning and delivery	Client care Competitive advantage Helping, providing solutions	Developing client's knowledge and understanding
Stage of project/idea:	Announcement of a research competition /Delivery stage	Inception stage of a research project	
Relationships	Interpersonal network of collaborators/ colleagues/ friends	Close relationship with a client	
Strength of a tie:	Weak - strong	Strong with a client	
Academia as a:	Business		Educational institution
Mode of working with a client:	Collaboratively	Individually	
Is knowledge transferred?	Information/ explicit knowledge as product/output	Information, tacit and practical knowledge	
Is intermediary function enacted?	Yes	No	

Contractor: A project was at a stage when a research competition was announced and the scientist had no input at the inception stage. Thus, it was the client who had the upper hand and the role of the scientist was to deliver to the brief. In Excerpts F and I, presented in the previous section 5.2.1, the scientists had no close relationship with the client prior to embarking on a piece of research for them. The scientists did not perceive the interaction with such a client during the delivery of a research project as satisfying; but as frustrating to say at least.

In Excerpt C, the Interviewee 22 talked about how they mobilised their interpersonal contacts in order to win a contract for a research call put forward by a government organisation. In Excerpt 22, an example was given of how their interpersonal contact alerted them to a research call by a government organisation.

The main goal in all these examples was that of business winning and then business delivering of a tangible product or an output, according to client's specifications.

Confidant: The excerpts under this discursive construction also talked of business winning and the university as a business and the need to generate income. Yet equally, the excerpts were about the importance of developing very close relationships with clients. This was about trust: "being safe pair of hands" (Interviewee 28); and about "client care" (a term used by Interviewee 13 elsewhere in the interview transcript) It was about a dialogue between the interviewee and the client, a partnership really" (Interviewee 8). In these examples, it was about: "helping clients", "showing them the path" and "solving their problems".

Such a close relationship meant that the scientist was present and could shape a project from its inception stage. This could have disadvantages, such as the need to be available for a client at any time, which can lead to loss of life-work balance. As Interviewee 28 reflected: "You live for work rather than work to live."

Yet the advantage of such a close relationship was that it could be enduring and thus, ultimately, also beneficial financially, as a source of regular income. These close relationships could lead to a competitive advantage that could bypass standard tendering procedures: for example, by allowing one to have significant input into writing a proposal/ bid and subsequently being awarded this bid based on a successful application that arose from having an intimate understanding of the bid as its author or co-author in first place.

***Educator**:* In the stories in Excerpts A and G, the interviewees were concerned with developing their clients' understanding and knowledge. The words used to describe this in the excerpts include: start to understand, explaining, clarify some things (Excerpt G, Interviewee 20), understand what goes behind, see for real what it looks like, explained (Excerpt A, Interviewee 8). The interviewees recognised the value of learning for their clients. The interaction with clients in these particular examples was not about winning business. In both cases, the clients were from government organisations and the interviewees developed a close relationship with them. The interviewees were focused on client care and on making the effort of educating their clients; revealing to them what was behind the figures they provided to them or the methodology they have used. They acted as interpreters and translators of science to non-scientists. The fact that the university was about an "educated service" was then stressed in the personal account in Excerpt A (Interviewee 18) quoted earlier.

Theoretical concepts, research disciplines: The discursive construction of *Educator* could be seen as an example of boundary work between science and non-science: boundary work is a theoretical concept from SSK studies introduced in Chapter 2. Equally, the discursive construction of *Confidant* could be taken as an example of discourse, rhetoric and fact construction that all fall within the discipline of discursive psychology. In contrast, the unequal relationship between a scientist as a producer of knowledge and a client as a consumer of that knowledge could be further explored using the theoretical concept of commodification that falls within HE research and philosophy of science.

Alternatively, it could be studied by adopting of the lens of science as competition which was one of the options in Callon's (1995) classifications presented in Table 2.2.

Strength of ties: With regard to the strength of the ties in these interactions, the strength of the tie was strong, due to the close relationship between the interviewee and the client; it was strong in the case of the constructions of client care (where the interviewee acted as a *Confidant)* and educated service (where the interviewee was construed as an *Educator*). The discursive construction of the *Contractor* was not based on a close relationship with a client in the interview excerpts examined. Yet in submitting a research proposal to a research competition, the interviewees in Excerpts C and H deployed their interpersonal network of colleagues, collaborators and personal friends to increase their chances of winning business; in this case, the interpersonal ties could be both weak and strong.

Intermediary (a broker) function: The discursive constructions of *Educator* and *Confidant* involved a dyadic type of relationship between a scientist and a client. In contrast, the discursive construction of a scientist as a *Contractor* could fulfil structural sociology's criteria of boundary spanners as those individuals who: 1) had a strategic position within a particular interpersonal network that allowed them to perform specific types of social roles, such as of intermediaries who acted as weak ties or spanned "structural holes" within a network (Burt, 2004) and 2); were proactively engaged in the process of spanning the boundary, as stressed by e.g. Gould and Fernandez (1989).

5.3 Networking: a review

In this study networking is considered an important aspect of relationship building. In this section I present examples of publishing studies on networking and the latest trends in the HE sector.

5.3.1 Networking versus academic collaboration

Firstly, it must be noted that networking may appear to be a foreign term in traditional academic environment where one is likely to speak of academic collaboration between peers as opposed to networking for business with clients. Yet literature on academic collaboration suggests that there may be an overlap between these two concepts, especially given that Katz and Martin (1997, p. 6) in their review concluded that academic collaboration is a contested and unclear term: "little attempt has been made to distinguish and categorise different levels of collaboration (ranging from inter-individual through inter-departmental and inter-institutional to international collaboration)." Furthermore, some published studies into academic collaboration draw from boundary spanning (e.g. Melkers and Kiopa, 2010), as well as SSK research (e.g. van Rijnsoever *at al*., 2008).

Statistical analyses of large sets of data that study authors' citation patterns and co-authorship appear to be the preferred choice of method for studies into academic collaboration (e.g. studies by Liu *et al.* 2011; Melkers and Kiopa, 2010). This is despite the fact that reliability of such data has been questioned, for example, due to the fact that not all collaborators appear as named co-authors of a published paper (Katz and Martin, 1997). Other studies into academic collaboration focus on the micro level, as perceived from the point of view of those engaged in the practice of academic collaboration. Melin (2000), using data from a co-authorship questionnaire and nine qualitative interviews, examined motives for collaboration (e.g. trust, personal chemistry). Academic collaboration was found to be a highly self-organizing endeavour and an essential resource-amassing activity:

> "Mostly, there is a feeling that there is something to gain, whether material, intellectual or social gains – equipment which will make new articles possible or knowledge that will increase the quality of a present study, or a contact that may prove to be valuable in the future" (Melin, 2000, p. 38).

This observation is shared by van Rijnsoever *at al*. (2008) who carried out a survey of scientists at Utrecht University; 304 completed questionnaires were used for the analysis. The authors examined scientists' collaboration with other scientists and with private companies. The first type of collaboration was found to lead to competitive advantage in terms of career development. A different trajectory was also identified in terms of a rise of networking activity within the different groups (i.e. increasing with industry over time). The scientists surveyed considered active networking to be important in their work. Moreover, it was found to be a resource-oriented activity that is bidirectional and involves reciprocity (van Rijnsoever *at al*., 2008).

5.3.2 Increased interest in networking in the HE sector

According to the Royal Society (2011), academic collaboration is globally on the rise and the main drivers behind this trend are scientists themselves. The international networks they form and are members of are increasing in prominence. "Yet little is understood about the dynamics of networking and the mobility of scientists, how these affect global science and how best to harness these networks to catalyse international collaboration" (Royal Society, 2011, p. 6).

A recently conducted online survey and interviews examined networking patterns of scientists from eight UK universities (Vitae, 2012), with a focus on networking in relation mainly to career development. It examined "the specific networking skills researchers believe they do and do not have" as well as their "networking behaviours" and "reservations" (Vitae, 2012, p. 3 and 7). Overall, the level of networking amongst the scientists surveyed was found to be lower than expected. This was due to lack of confidence and skills they possessed – "a high degree of comfort with networking seemed to be the exception" (Vitae, 2012, p. 13). Other factors reported by participants were lack of time and the perception that networking was an artificial, and thus unethical, activity that involved "simulated rather than real relationships with others" (Vitae, 2012, p. 14).

The Economic and Social Research Council (ESRC) conceptualises networking as one of the tools of its impact toolkit. The importance of networking is described as:

> "Networking can help you connect with the people who have an interest in your research, and build on the relationships you establish with them.
>
> Your impact plan will bring you into contact with a range of important stakeholder groups, such as policy makers, business CEOs, the media and participants in your research programme. Effective networking can ensure that the opportunities you have to connect with these people are not wasted.
>
> The relationships you build as a result can be mutually beneficial – for example, your media contacts can help you get your press release into the news; they can also come to you if they need an expert opinion on your research area." (ESRC website, undated)

The ESRC *Guide to effective networking* then contains the following steps: "Starting out; creating a good first impression; creating rapport; requesting and giving favours; networking at events; networking online; joining professional groups and networks and maintaining contacts" (ESRC website, undated) .

5.4 Scientist's guide to networking

I wished to explore how scientists formed and nurtured relationships with their clients. The findings, presented in this section, are primarily based on these questions I posed during the interviews: "*Now turning to networking: what networking, if any, do you do?*" And: *"What value do you see in networking?"* The findings presented here are based on the template analysis I carried out and described in Chapter 3.

How did the interviewees network? Firstly, the language the interviewees adopted when discussing the practice of networking was rich in metaphors. Considering how the interviewees talked about the topic as one social group, networking with clients was about: bumping into people, bouncing ideas off them,

and courting clients; it was about meeting them cold; getting a foot in the door; banging heads against the wall, dealing with clients' burning fires; things coming up in the air; getting wrists slapped, getting on a map, and hoping that something will drop out. It was about dodging things, as well as having an opportunity to milk something; where particular environments were networking goldmines and a dating agency for business; where networking equal to touching the flesh; jumping through hoops and jumping higher; fishing for funding and feeding a client information.

It must be noted that the networking model presented in this section was constructed from the interview accounts collectively and thus was a construction of the practice of networking as per one social group at a given time (i.e. in this case, scientists working within one university). Not every interviewee talked about every component, as shown in Figure 5.2.

The advantages of such presentation was related to research design issues. Notably, my data are a combination of retrospective accounts and snapshots. An interviewee might explicitly refer to an important element of their practice in a first interview but not in a second one and vice versa. Overall I interviewed my interviewees only once. It is acknowledged that my data are local constructions produced at a given time and so is the networking model.

Nevertheless, for illustration I include examples of further content analysis before describing the whole networking model in detail.

Table 5.4 shows the key components of the model of networking per job title. According to this table, trust and luck/chance occurred evenly in interviews with Professors/Readers and Research Fellows but were not much mentioned by Lecturers. Lecturers also did not speak of the importance of being proactive; something that Professors/Readers and Research Fellows brought up in the interviews.

Table 5.4 Key networking components in interview accounts per job title

Job title	Total Number	Access	Luck/chance	Being proactive	Physical contact	Experiential knowledge	Reciprocity	Trust
Research Fellow	**12**	2	5	1	2	1	2	5
Professor/ Reader	**8**	3	4	2	2	2	1	5
Lecturer	**10**	2	**1**	**0**	3	1	1	**1**

Source: Appendix F.

Table 5.5 highlights the three most frequently occurring elements per gender and job title. Across the categories, the most frequently occurring components were : repeat work (5 x times; 4 x featuring as the most frequently occurring per category); followed by trust (4 x, once featuring as the most frequently occurring per category); and luck/chance (4x, twice being as the second most frequent and the third most frequent component)

Table 5.5 Key networking components in interview accounts by frequency

Component: **Category**	**Component 1st = most frequent**	**Component 2nd**	**Component 3rd**
Female	Repeat work	Luck/Chance	Trust
Male	Repeat work	Trust	Luck/Chance
Professor/ Reader	Trust	Luck/Chance	Repeat work
Lecturer	Repeat work	Physical contact	Access/foot in the door
Research Fellow	Repeat work	Luck/Chance Trust	

As shown in Table 5.2, in terms of frequency of occurrence, these were the most frequently occurring components by gender: out of the 7 female interviewees 4 spoke of repeat work; 3 of luck/chance; and 2 of trust. Only 1 female referred to

business winning. Out of 23 male interviewees, 10 spoke of repeat work, 8 of trust; 7 of luck/chance. Business winning was identified in 6 interviews with male interviewees.

In terms of frequency of occurrence, these were the most frequently occurring components by job tile: out of the 8 Professors/Readers 5 spoke of trust; 4 of luck/chance; and 3 of repeat work. 3 Professors referred to business winning. Out of 10 Lecturers; 5 spoke of repeat work; 3 of physical contact; and 2 of access/foot in the door. None utilised the business winning metaphor. Out of 12 Research Fellows, 6 spoke of repeat work, 5 of luck/chance, 5 of trust; 4 referred to business winning.

Appendix F contains a list of the interviewees and their demographic data, and again the individual components of networking as they appeared (or not) in their interview accounts.

5.4.1 Trust building strategy

Key components of networking and the relationships between the components were discerned in the interview accounts, as shown in Figure 5.2. Being a construct, the model of networking practice depicted in Figure 5.2 served as a helpful visual demonstration of particular linkages between the various components that emerged from the interview accounts, subsequently interpreted by me as the researcher. In Figure 5.2, the components that an individual could actively shape are shown in white-coloured boxes; their possible outcomes in green-coloured boxes and the factors that could influence them are in blue-coloured boxes.

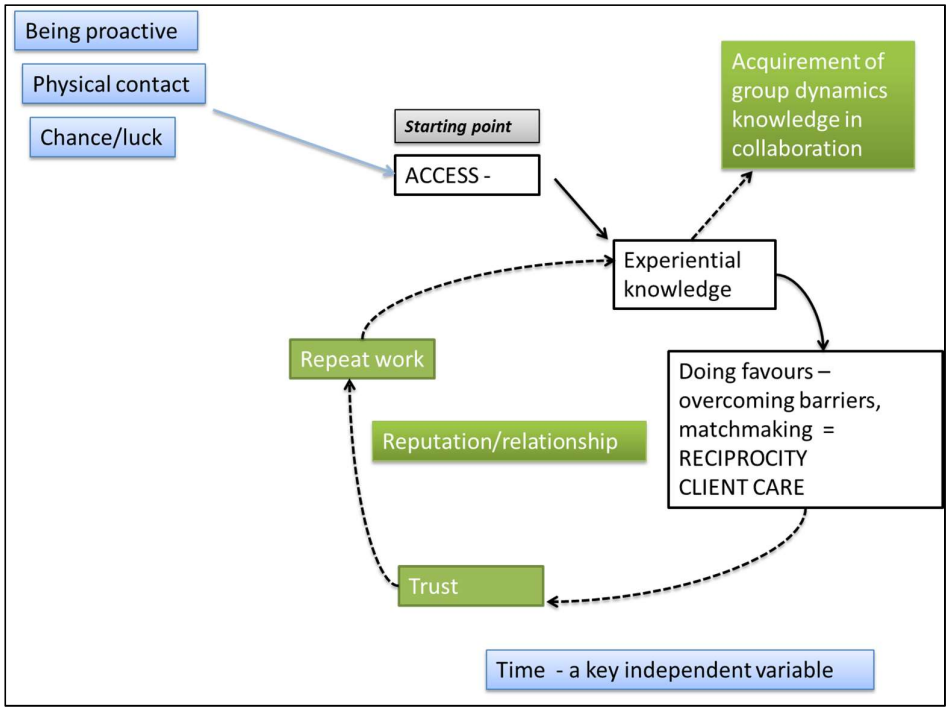


Figure 5.1 *The trust-building strategy* and its key components

The model of networking practice constructed out of these accounts was not linear, but showed the practice of networking potentially as a cyclical process. In particular, if one managed, after gaining access, to iterate the process as depicted in Figure 5.2, experiential knowledge could be gained, and relationship and trust may be formed that can lead to repeat work.

Thus the cyclical process in Figure 5.2 depicts a valuable shortcut that could save resources, time and money that otherwise would be necessary to spend on getting a new contact and getting access to new clients. In addition, it portrays an area where the interaction between a client and the scientist had very different dynamics. It is transformed into a relationship, a mutually beneficial and rewarding social contract where it is not the client who has the upper hand or the scientist who is in charge, but where there is a dialogue:

"And you know, we've had the dialogue, we had the conversation and that project emerged out of the conversation and it wasn't really them saying, Cranfield we've got

this, we need to do this... You know we would like you to do it or would like you to tender for it ... It is more subtle than that; it is a two-way thing." (Interviewee 32)

In summary, the practice of networking, as shown in Figure 5.2, could be described as: first, gaining access (influenced by being proactive and/or having luck). That would hopefully lead to valuable experiential knowledge that would foster trust by engaging in reciprocity rituals (e.g. by doing favours, matchmaking, being flexible, and overcoming barriers). This would lead to relationship forming, enhanced reputation and, hopefully, repeat work.

Figure 5.2, of course, does not illustrate all the possible combinations between the components. For example, time is an independent variable that influences the development of experiential knowledge and trust, as well as the size of a network and the number of networks one is a member of (not shown in Figure 5.2), but none of these components can influence time in return. Similarly, chance/luck can not only lead to access and new opportunities, but it can influence all the other components; equally chance/luck can be helped by one being proactive, according to the interviewees. So the full interplay between the various individual components is more complex than depicted in Figure 5.2. The linkages between the components were discussed in some complexity in the interview accounts and occasionally it was a challenge to untangle them. Any interview excerpt could be used simultaneously as an example of an interviewee talking about trust and luck. Furthermore, many of the components, such as trust and reputation, are subtle and tacit; they take time to reveal themselves and thus their value might not be immediately obvious and they pose a challenge for capturing their multifaceted qualities.

In the following sections, I introduce three of the components depicted in the white boxes in Figure 5.2 in more detail. All relate to the practice of networking in which the interviewees engaged. The way they were practiced by the interviewees could have an influence on their outcome. Therefore, being proactive and having a physical contact could positively impact gaining access; for example, doing favours and overcoming barriers could be seen to be a part of the practice of

acquiring experiential knowledge, unless one refused to engage in these practices.

Next, I explore how interviewees talked about trust. This component is depicted in Figure 5.2 as a possible outcome of gaining experiential knowledge and engaging in reciprocity rituals, but yet again, the concept of trust appeared to be much more complex. However, based on the interview accounts, trust was shown to be a key ingredient that gave rise to relationships, reputation, and repeat work.

One note on reputation: I am not referring to the academic type of reputation that results from a publishing record in scientific journals, but a reputation that emerged from repeated social situations where a client placed trust beforehand in whoever was appointed to deliver a piece of work for them, where a client believed that whoever would carry out work for them, would do so satisfactorily, and the person carrying out the work would act positively and not disappoint the client. So this form of a reputation could be seen as a form of an investment that a client placed into whoever was to carry out a piece of work for them; this investment may be repaid and the reputation of whoever carried out the work (e.g. an individual scientist) improved; or the investment could lead to a loss (e.g. loss of client's investment and trust, loss of scientist's reputation). This explanation of reputation is similar to Latour and Woolgar's (1986) discussion of the investment on the credibility market.

Lastly, I look at the practice of repeat work with clients and the barriers the interviewees perceived to be preventing them from engaging in this practice.

5.4.2 Access

Paramount to client interaction and "winning business" was access or foot in the door. Getting access to a client was unlikely to succeed if done "cold", as suggested by Interviewee 13, but it could be done fruitfully via an introduction through a mutual contact:

“But how do you tell a young person how to do it? [...]... Ideally, they need to get an introduction to clients you know. Cold calling is very, very difficult and very difficult to get anything out of; if you just go up to someone cold, you cannot do it. So you need some way in […] Getting the foot in the door, in terms of conversation with a client, going for visits so you got senior colleague who is going to [water company name] and then they take you along and then... You may be talk to them about what you are doing …” (Interviewee 32)

The situation was exacerbated by rigid hierarchies in place in the world of science. As Interviewee 13 put it:

“The truth is that we have a pyramidal structure by which a very small number of people can be very highly successful in the academic environment... so someone like [Head of Department] .... Not everyone can be like him, it's not possible, there is not that much work there.”

Being a member of a particular professional association or a network could also lead to access, as Interviewee 6 explicated: “… it gives me a door into Brussels“. Acting as a member of an important committee, according to Interviewee 17, gave them access to one water company: “…because they knew about it. They’ve heard about it. Suddenly, my credibility goes up and it opens doors.”

Access equalled competitive advantage:
“Although we already had a foot in the door because of previous work that we have done. So we had an advantage over other bidders in that respect.” (Interviewee 4)

Getting access was valuable as it could lead to a long term working relationship due to clients’ preferences – especially those in the government – for working with those people whom they knew through past work experience:

“…clients become comfortable with people they know, especially if you do good work for them so they tend to go back to the same people time after time, but once you can get a foot in, like with the EA, and they realise that you can also offer that ...” (Interviewee 34)

However, getting access to these types of clients was often a matter of **chance** or **luck**:

"I believe that many of the clients we work with.... particularly in government, they only want to work with a sort of small trusted band of people and so how do you get to be one of those trusted people? It is incredibly difficult, you know, a lot of it is to do with luck, you know, you have to have the luck to get a sort of foot in the door in the first place." (Interviewee 13)

According to Interviewee 8, when seeking networking opportunities with clients, luck played a key role but "you have to throw yourself in the way of fate*":*

"There is luck, the whole thing is around luck, but you've got to be proactive to make the luck come to you and so it is about putting yourself in the right place at the right time and ... that is the key to it ... it's not easy ..." (Interviewee 8)

Thus, according to Interviewee 8, access to clients could be helped by chance, but also by **being proactive**. This suggestion resonated in two examples given by Interviewees 6 and 9:

"… so, for example, there is [a type of event] being launched which is about [topic] written by a guy who I first worked with [a number of] years ago and we stayed in touch all this time, [nationality] guy, it's being launched in [city], he is going to be there and I know everybody to deal with [topic] will be at that meeting [...].... You know, in fact I'm going and I e-mailed the organiser to say, this is great, I'd love to come to this event, you know, I have not seen [name of contact] for a while, the guy who wrote it, and as a result of that I am invited into a small working party after the meeting to discuss what we are going to do next so.... yeah, those sorts of things just... Taking the initiative really and... E-mailing people ..." (Interviewee 6)

"[Sights] I'm starting to build a relationship with a [type of] association at the moment and I just happened to see one of their chief executives on a programme on telly, so the following morning I track down his details and phone him up, say: saw you on television last night, it's really interesting, I have got some ideas I would like to take forward with you. He was delighted, I followed up with some e-mails and we started to build up a

series of potential collaborations with them and their industry members who I tend to phone up, e-mail, get them to come here or I go there and get the ball rolling that way ..." (Interviewee 9)

Access could be influenced by having a **physical contact**, which could be through a chance meeting, and then it depended on how the two parties were proactive in continuing to keep their contact alive:

"I suppose... ehm, the [name of] Inspectorate guy is quite interesting,... I met him in a queue at the [government organisation building] [laugh] to go through security, I did not know him, I just happened to be standing next to him and …We just hit it off and so, he calls me sometimes to ask me what do I think about this and I call him sometimes to say have you heard about this, we are doing this …" (Interviewee 6)

For Interviewee 12, it was important to "be seen so that other people know I'm around" and therefore they tried to be out of the office one day a week, visiting their contacts. Interviewee 15 appeared to spend a significant amount of time travelling, visiting clients in person, attending meetings and workshops. Being seen and out and about was perceived as being important for doing business with a client: "You do need to be out and about; you need to be in touch with people, you need to go to the key conferences, and that is where you do the business (Interviewee 32).

As Interviewee 30 put it: "Well, for me personally, if I just sit in the office, I can produce wonderful papers, but I still feel that face-to-face is important.... For people to know, oh, this is what this person is known for or good for..."

Access could lead to work with or for a client, and an opportunity to gain experiential knowledge. This component is discussed in the following section.

5.4.3 Experiential knowledge

The term was coined by Interviewee 10 who described it as developing a shared understanding in the process of working together; developing "a shared construct:

"…language is important, you know, kannt sie Deutch sprechen, [laughs].... this is why I think doing work together is very valuable, powerful; people do work together and they do what they do, and they tell each other stories and out of those stories they develop a shared construct, yeah? And language which is a manifestation of a set of constructs so the effective person who works at the boundary of policy and research.... would need to be able to ... understand the language developed which is based on a set of stories, yeah? And **experiential knowledge** of what happens around these parts, yeah? [Pause]... [...] that experiential development which would give them access to the language and the story lines that allow them to communicate effectively and getting inside the skin and the understanding of the two communities." (Interviewee 10)

The reason why developing experiential knowledge could be so important was because having worked together previously with someone meant that you got to know each other's modes of working, and strengths and weaknesses. This ***group dynamics knowledge*** could be a very useful by-product of gaining experiential knowledge through working in a research team. Such group dynamics knowledge could serve as a valuable asset and shortcut every time there was another research project or there was a need to form a research team. Having to form new research groups every time from scratch could be time- and resource-consuming; initial effort was needed to get to know individuals and their ways of working before actually being able to productively concentrate on executing the research project itself. So having a group dynamics knowledge based on past project experience enabled individuals to mobilise and quickly and effectively re-assemble a new project team:

"… we have networks of contacts so the group I was on the phone to, was the [name] laboratory agency, [name of organisation], [name of organisation] – another consulting company, we know each other, work with each other for quite a long time, we are all

going to deliver a project... when the project tender was issued, we all thought of each other that we knew each between the four of us we could do the best job. And form the strongest team. And that is because we know each other's strengths, so that way going forward we knew that was a good way to do... to bid. So informal networks are very powerful as well." [Laughs] (Interviewee 21)

"I think my network is mostly created through tendering for projects actually [laughs].... because of the people I worked with on past projects you see a project tender or something and you think; oh, could try and do this with so and so over here, or so and so over there and, you know, put something together and see how it goes...." (Interviewee 14)

"So just this morning for example, I've worked with people at the [name of] trust for many years – in fact, they were involved in this project [pointing to something] and there was a call for some [type of] studentships, where they need to put in a bit of money and then it is much funded by the Research Council and immediately, I sent that off to them saying, hey guys, do you fancy doing this? So without that network, it would be quite scary to be actually able to generate the work and income that is expected of me [KS nodding], yeah." (Interviewee 27)

The process of gaining experiential knowledge often involved having to overcome unexpected barriers and these might have triggered the need to do favours and engage in reciprocity rituals.

5.4.4 Overcoming barriers and doing favours

Unexpected complications were bound to emerge during the duration of any project. Clients could be particularly demanding:

"They are likely to change their brief or to ask you for extra stuff" (Interviewee 13); "You don't clearly hear what they really want and they don't clearly see what you are really doing." (Interviewee 11); "They squeeze every last drop of blood out of you, in terms of delivering projects." (Interviewee 14); "They start off by saying they want this, this and this, and then you start working with them and you realise that they want this, this and this and this, this, this, this and this, for the same price." (Interviewee 28); "So they are

very political, they are very driven by, you know, what the government thinks today." (Interviewee 6); "… it could be very frustrating at times because it is almost like you hitting your head against the brick wall in trying to get them to understand what you are talking about. Trying to get them to see the bigger picture." (Interviewee 4); "… a lot of things come with very tight deadlines or impractical deadlines either in the bidding process, you know... You are asked to write a tender in a couple weeks or whatever and you think, oh, [pause] it is unnecessary because they will not do anything so quickly." (Interviewee 5); "The client group cannot remember or does not wish to remember the original question they asked you to answer and they are giving you new questions or different questions or slightly nuanced versions of the original question which means that you basically end up re-working your report and your work because they won't sign it off until they got an answer to the question that they now have, which was not the original one." (Interviewee 10)

However, as Interviewee 13 pointed out, "it's a buyer's market" so the client was in "a position of strength": "if you want to get repeat business... if they say jump this high or jump higher then you do..." Therefore, it was about not being "a bringer of bad news" (Interviewee 8) and about "giving the client a way out" and "turning something negative into something positive" (both quotes Interviewee 14). It was of utmost importance of providing good "client care" (Interviewee 13). This is where the ability to be flexible and having a willingness to accommodate a client came in.

"So there is a lot of trust and there is this thing where I was saying they might move the goalposts and expect you to be aiming for a new target or to deliver something extra,... If you do that, you deliver quality and they can rely on you then they will come back to you so that's why we do it. Because we know, well, if we say no we know that's it you won't work for them... Well, there is a danger that you wouldn't work for them again." [Pause] (Interviewee 13)

Additionally, **matchmaking** could be deployed as **a form of reciprocity** ritual and thus used to enhance one's trust and reputation in the eyes of a client:

"… even point them in the direction of … maybe [name of a client] are the best people to do this, they may be able to help you to do better than we can to do that, I don't mind that at all." (Interviewee 32)

Thus matchmaking could be a valuable strategy deployed for effective networking. Interviewee 35 described how their team was trying to position itself in the eyes of clients as a matchmaker by telling them, “We can answer your question or if we can’t, we know someone who can”. Putting clients’ needs first was a matter of survival; part of this practice was providing some form of a free service to strengthen one’s trust and reputation in the eyes of clients. As Interviewee 28 explained:

“… you can’t be a researcher and be stuck in your office or a laboratory and just get Research Council money and not be connected to the end users, to stakeholders, to funders. You have to make a connection and so I am quite happy just networking, communicating and I think that is becoming more and more important, the good communicators, the good networkers... you can see it happening around you. They are the people who get the work and who get repeat business and if you are not a communicator and telling people what you are doing, asking people what you can do for them and offering advice sometimes free, then... you are marginalised, which is the way it is.”(Interviewee 28)

However, other interviewees were acutely aware that ‘just networking’ was not enough; such time consuming activity would ultimately lead to pressures:

“...one cannot afford too much time meeting clients that then nothing happens. So I think that is pretty clear in terms of the university approach ... that you can’t spend all the time courting your clients, you’ve got to deliver as well.” (Interviewee 27)

Client care and reciprocity rituals might be detrimental, even initially, in a sense of a financial loss. However, putting the client’s interests first could increase their trust; the scientist’s reputation would thus increase and this would, hopefully, lead to repeat work. Therefore, the initial financial loss might be compensated. Relationships could be strengthened, trust built and one’s reputation improved, if one engaged in some act of **reciprocity**. However, these practices could run against the university’s policies. Scientists, when trying to accommodate client’s changing demands, could encounter obstacles in the form of the university’s

procedures and objectives:

"And that, of course, for any organisation research organisation like ours... it **hits our margin** because the more, work you do ... for a given.... Amount of money...eh, that's hitting your margin, as if I was to do an extra... week's work on a contract that is not costed in that hits the university because I should... I could have written a paper in that time or written another proposal so there is this constant battle to try to … to match the resource... to the task…" (Interviewee 13)

".. well, clients want always more ...well, no, they don't always actually, some are reasonable and appreciate what you do and sometimes they want more than they have a right to expect from the size of the ... the grant they've given you. So that makes things really difficult … [pause] while we have to book time on**,** Aggress[8] to all these different projects and things and then if you spend too much time on something, then you get sort of asked why you are spending so much time on this and bladidadidah so that makes... sort of management a bit difficult." (Interviewee 14)

The attempt to put clients first and accommodate their needs could be perceived as a deviant, illegitimate practice. I now return to the excerpt from interview n. 32 above, where the interviewee described how they would match-make a client and an alternative contact, if they were of the opinion that they wouldn't be in the best position to help the client themselves. The interview excerpt continued by the interviewee describing how they believed that what they do was an effective way of nurturing lasting client relationships in a way that was also rewarding and fulfilling for them, but how this practice could clash with university's expectations of its staff to proceed in a way that would firmly put its economic interests first:

"... I think **it is about trust building** isn't it? That's how I and maybe... if this tape gets... you sort of share this with the kind of hierarchy. I may well get my wrist slapped because

[8] Interviewee 14 is referring to Agresso, an online finance system used by Cranfield University to process payments.

I should be going out and grabbing things for Cranfield at all costs, but I think the trust building, in a long term, is better as a strategy, one is you feel as a deliverer of solutions – you feel better about that because you feel like you are actually helping people if you... try to find a solution for clients.. Genuinely try and help them, not just get the money and run, then they will come back to you. And you get repeat business." (Interviewee 32)

How building client trust and one's own reputation required engaging in practices that the university's management might deem inappropriate resonated in another interview, at the end of which the interviewee told me, jokingly, to "ring their lawyer":

"To get the trust to build up and sometimes that means you are doing people favours,....this is not what you would say in front of your Head of Department but, , you might go a little bit further than you have to just to win people's trust and their loyalty".... (Interviewee 13)

The dilemma between stringently following university procedures, driven by economic interests, and following one' own intuition with the prospect of increasing one's own (and the university's) reputation, was illustrated in the story told by Interviewee 22. It could be summed up in one sentence by the aphorism the interviewee used: "You need a sprat to catch a mackerel", meaning that occasionally a situation might occur where one may do a job at an initial financial loss. However, long-term, this could lead to further work that was not only financially viable, but had tangible benefits in terms of cementing trust, reputation and relationship building that could outweigh prior possible economic losses. It depended on the individual's judgement of the situation on how they proceeded, taking a risk and relying on luck to see how the situation might pan out:

Interviewee 22: "I had a case of that last year where I did a job for the [client] and the [client] have very strict rules,... on this particular issue they pay like, , [amount] a day; does not know who you are, what your qualifications are, and if you got the finance people here, they say; oh, gosh, you need to charge at least twice as much but they won't pay it so .. so you don't do that job. Well, in this particular case we did the job and my colleague and I we got to, you know, one 6,000 and one 7,000 pound contracts from

the [client] in London on the back of this I mean I needed four days work on it so ... absolutely paid off because we got some proper paid work out of it afterwards."

Interviewer: "Did you know when you were going into this, were you quite confident [about the outcome]?"

Interviewee 22: "Eh... well, if you put me up against a wall, I would have said maybe 50:50. But I also said to myself we should do it because if somebody else did it, then we would not be visible in the frame. So even if we haven't got the contract, we would have kept the ... what is the word I am looking for? ... we would have contributed to the centre of excellence because it would have been seen that we did that job for the [client] and everybody in [geographical area] would see that.... actually ... this is interesting because it ... [going through papers] ..... a paper comes out of it... So it goes into REF you see[...] ... anyway, we got it done but that is an example, to me, of sometimes you have to do a job but slightly lower ... recompense then the financial people, but if you get something like that out of it, then you compensate in another way so it can go into the reference system and you keep a centre of excellence ... up to scratch. And that is quite difficult to do if you turn these things down really."

5.4.5 Trust

Overall, in the interview excerpts presented in this chapter, trust featured as a key ingredient for fostering and maintaining relationships with clients, closely linked to the other components of the networking practice. Yet, explicitly, the word trust appeared in only eleven out of thirty interviews (see Appendix F). As shown in Table 5.4, more individual Research Fellows, Professors, and Readers than those with a job title of Lecturer spoke explicitly of trust. Furthermore, the frequency of use of the word trust varied significantly within the individual interviews: it was used 14x and 6x times in interview n. 17 and interview n. 13 respectively, whilst in five other interviews it appeared only once. It was also notable that the word trust did not feature in any of the university's documents I reviewed. However a noteworthy difference was per interviewees' job title; it showed that only one Lecturer out of 10 spoke of luck/chance and of trust; and none of the Lecturers spoke of being proactive as an important component of interaction with clients (Table 5.4.).

Gaining access and experiential knowledge, engaging in reciprocity rituals, overcoming barriers and being flexible were all part of the practice of networking with clients for business. All these components appeared to somehow influence or be influenced by trust. It is what Interviewee 28, in interview excerpt J presented earlier in this chapter, described as being seen by a client as "a safe pair of hands". Trust could lead to access and was thus a prerequisite for work with a client:

"People don't just contact you out of the blue to do something. They need to know. They need to know what you do, they need to know they can trust you ...That they can work with you I think..." (Interviewee 6)

"To actually get the exactly right person and it is probably via… They ask somebody who asks somebody else who says oh, yeah, I know somebody at Cranfield who does that [smiles] and I think most of the real business comes out of that route, I don't think someone in the [name of government department] says oh, we've got a problem with [topic] and types it into Google… They don't do that [laughs], not in a million years" (Interviewee 8)

Trust could help overcoming the issue of the daily rate charged by a university that was considered to be too expensive by a client:

"...there have been jobs where people have said you know, it is a bit expensive, but I said, well that is all we can do, I am sorry, and they've trusted us and we've done it, we've got the work. Others they can't afford [laughs], they might want us to do it..... not on my own project but other people's projects where I had a part and you get a very strong reading between the lines [laughs], they really, really want you do it, but we haven't got that budget; is there any way you can come below £50,000... They can't say that of course, because it has to be done all open and whatever, but strongest hints that you know that ... or in so many respects they trust you and want you to do it, but there is one thing that cost, that they can't ...or vice versa I guess." (Interviewee 17)

5.4.6 Repeat work

All of the interviewees claimed to have repeat work with their clients. Gaining access and experiential knowledge, engaging in reciprocity rituals, overcoming barriers and being flexible could lead to repeat work with clients. When I asked Interviewee 28 whether they got repeat work, they replied:

"Yes, that is how I survive... the success rate here is very low [pointing at 'research councils' written on a piece of paper in front of them], but track record, networking, relationship building, doing a good job previously, you get repeat business. So it is these people here [outside of science] that once they know you and they like you, they like what you do, and then they come back to you ...[...] I mean, to me networking is what is all about work and repeat business and getting reputation ... is all about networking." (Interviewee 28)

Repeat work was a good arrangement for scientists who could rely on existing relationships as opposed to exerting efforts to make new connections:

"Yeah, we've had repeat work... Obviously, we've had a number of repeat work with the [government department]... We haven't got currently a repeat work, we started in [year] and we've got repeat work right through until [year] so that's [laughs] quite a lot of repeat work and I obviously totally agree with the idea that it's much easier to get a repeat work than it is to get a new client…" (Interviewee 8)

An established relationship with one individual within an organisation could lead to a number of repeat contracts with their colleagues too:

"I have quite an informal relationship with the person... I've had some rolling contracts with them so I have kind of been contractually involved but quite often,.., I am waiting for some results to come in which might take a few months so I might just send a quick email to her, more of a friendly ... how are you doing, how was your holidays sort of ... I've kind of a point of contact for them now for sort of [types of] issues... So that is why I get the repeat business because my name then gets passed on and people who'll.... Want some [type of] information for something else quite often... We can't do it or can't

measure it ... And that's just over time then I've Built up the relationship." (Interviewee 20)

Repeat could be seen equally as a mutually beneficial arrangement that may enhance quality of scientific work, as Interviewee 34 highlighted:

"…it benefits not just through income but you know... it is the trust and the quality of the science because there is a continuation so you are using the same techniques as well, carried through to different projects, which means there are overall knowledge benefits by doing that as well." (Interviewee 34)

Repeat work could be viewed as an outcome, an extension of a particular relationship between a scientist and a client. It was also a sign of trust a client had in handing a piece of work to the scientist they have already got to know through previous engagement. Ultimately, having a repeat work with a small circle of regular clients was "an efficient way of going on," as Interviewees 10 and 23 pointed out. As another interviewee explained, repeat work served as a valuable shortcut for clients wishing to reduce their time spent on choosing to whom to award a research contract:

"Clients cannot afford to deal with that many people.... I believe that many of the clients we work with.... particularly in government… What's happening with research providers is They are concentrating their funding ... With smaller, ever smaller band of universities or clients.... So that's a very efficient way for research providers to work because they don't have to deal with too many people and they know they are working with people that they can trust ..." (Interviewee 13)

However, such approach, of relying on a close circle of trusted scientists, can have a downside, as Interviewee 13 continued to point out: namely, homogeneity and a lack of inflow of innovative ideas resulting from research opportunities not being opened to new entrants.

At the time when this research was conducted, many public sector organisations implemented policies and procedures for allocation of research projects based

on competitive tendering – e.g. see Defra's web page *Research funding* about its procedures on this matter (Defra, 2013). These policies in effect were to eradicate the practice of exclusively allocating a piece of work based on past interpersonal relationships:

"We used to have a system with Defra were you had something called ... [Pause – interviewee thinking]... Yes, rolling contract where you could... When they had something they wanted to do, then they would call you up, but that doesn't happen these days. Every contract is competitive. So the proposal they put out is competitive." (Interviewee 24)

Having a rolling contract with a public sector client was thus considered to be rare; it might had been possible for contractors who were highly specialised and thus suffered from a lack of competition. When I asked Interviewee 16, who was describing that sort of arrangement, how common was it, they replied:

"Not particularly. [Laughs] Especially at the moment because people can't commit to that sort of money but it is quite a traditional type of contract for [name of a research team] to have... Yes, I would say it's quite special, there aren't many... places doing the types of work that we do." (Interviewee 16)

Interviewees 4, 8, 25 and 26 also spoke of such historical arrangements of rolling contracts with government clients. Others disclosed the possibility that despite competitive tendering procedures in place in clients' organisations, some research projects might be allocated based on a preferred list of suppliers:

Interviewee 14: " a lot tend to put work out competitively through tenders, I mean you may have a relationship with them, a good relationship with them, but they are still under their own rules, they are obliged to put things out ..., put new research projects out to tender so, for example, Defra might do that… you might get on to a sort of preferred client list or if it is a very small project and they know your capability, they might just come and say look, can you do this? But if it is a big project, then what they usually do, they have to write up a tender document, and then you have to bid for it competitively…"

Interviewer: “So are you on a preferred client list?”

Interviewee 14: “I don’t think …not myself, I can think of some people who might informally be on a preferred client list, if they are not formally on a preferred client list. some people are just so well known in their area of work like in [topic] ... Defra will know there is no point necessarily going to someone else and if it is a small job they would just say; can you look at this for us, but if it is a big job,... I don’t think whether you are allowed to do that. I mean I might have the wrong end of the stick there, that is the impression I get sometimes, there is certainly a repeat business, we do get in this sort of [subject side] side of things, just because we have a good reputation, ... some of ... our team have really good reputations and so … people like it when [laughs shortly] ... you bid for their work or they may just ask you.”

This discussion with Interviewee 14 had a resemblance to a story told in Excerpt B from interview number 8 that was presented in Section 5.2.2. The story suggested that a close personal relationship with a client from a government department could be advantageous to the point of bypassing standard tendering procedures in place. Elsewhere, it was suggested that new online systems in place in clients’ organisations, that would be used to advertise research competitions, might paradoxically lead to individuals clinging even more to their interpersonal relationships. In the next example, firstly the interviewee’s interpersonal network served as a valuable shortcut: having the network in place hopefully meant that if a suitable research call came along, one of their contacts would learn about it and, subsequently, alert them to the opportunity. Secondly, the tendering systems and processes in place in public sector organisations were described as complex, often changing and perhaps difficult to operate and understand. Here, having the interpersonal network in place was again advantageous because a contact could guide the interviewee through the system and point them in the right direction, thus giving them competitive advantage:

“… these days it’s quite difficult to identify new projects, tends to have to come through that route because even though they are on the web, because you are so busy, doing all other stuff, you don’t actually get a chance to sort of keep that close an eye on these

websites that are announcing them...and they are all changing at the moment as well only the last few months they now actually ... [name of government organisation] uses a new website so everything has to go through that rather than only 6 months ago, we had another project which came through a completely different route … [a government organisation] is the same, they've just changed their ways of working so that they have now much more formal online approach... so in a way, you have to have networks so that you can actually find out about these things happening. (Interviewee 24)

Compulsory competitive tendering procedures in clients' organisations were not the only obstacles to securing repeat work with clients from public sector organisations. The other, reported in 12 interviews (Interviewees 4, 8, 9, 10, 11, 12, 18, 19, 24, 29, 30, 35) was the practice in government ministries to move its civil servants staff from one post to another within an organisation after a certain period of time. This practice could not only severely damage the process of developing lasting relationships, but it could disrupt execution of a project, leading to delays and unexpected complications:

"One of the things about the [government department], you get a massive [emphasis] changeover of staff, they rotate staff so quickly, which is actually a bit of an issue for dealing with government organisations actually is the fact that you have such a churn... so that you have to rebuild your own relationships every year [laughs] otherwise... very frequently, you have to... Go in and present to them what you are doing to them again and convince the new lot of people that what you are doing is valuable ..." (Interviewee 8)

"For example, I was doing some work for [government department] for one person but I am the contractor inside that but the two people involved changed jobs, but we ended up doing the contract for someone else who wanted something quite different to what the first person wanted so what they actually wanted was what was actually written in the contract. That led to a few... Confusions [smile]..." (Interviewee 12)

"Eh... [pause]... going back to another project, you try to ring people but sometimes within the organisations because they change the real knot, they change jobs within the organisation, re-assigned to different sections, especially the [name of organisation] and

[government department], the people are forever changing and I think it is similarly with other government departments, they move around a hell of a lot, it is surprising... you ring somebody: no, I am not doing that anymore, I am doing this and then you try and find somebody who is doing that and it is just... very difficult at times." (Interviewee 29)

5.4.7 Networking as a competency

Networking was an inherent part of the scientists' roles. It featured in the university's competency framework document where it appeared under the core competencies of: *verbal communication*, *working with others; valuing people*; and *business development* (Cranfield University Intranet, undated, a; Table 5.4). An explicit reference to relationship building externally was made for the business development type of competency (Cranfield University Intranet, undated, a).

Table 5.4 Networking in university's competency framework.

Competency	Detail:
Verbal communication	▪ Uses clear language, which also builds relationships (Step 3)
Working with others	▪ Develops internal contacts (Step 1) ▪ Maintains a network of internal contacts (Step 2) ▪ Builds a network of useful internal contacts (Step 3) ▪ Actively promotes teamwork and collaboration in others; Builds strong internal relationships (Step 4)
Valuing people	▪ Builds positive relationships with others (Step 2)
Business development	▪ Collaborates with others to generate new business; maintains awareness of markets (Step 2) ▪ Networks internally and externally to create business opportunities; consistently generates new business; monitors and exploits emerging markets (Step 3) ▪ Maintains strong external network; promotes collaboration between units; considers long-term versus short-term business growth (Step 4)

A new course, the *University Business Skills Development Programme,* was developed where staff could learn about "networking, developing contacts and building business relationships" as well as to acquire skills such as "selling, client relationship management, and making business pitches in person" (Cranfield University Intranet, undated, e). This unique programme was created by L&D with the help of the university's School of Management and supported by SAS

management “interested to increase the income of some academics to sell their expertise” (Bryant, 2011). Since its inception in academic year 2009-2010 it was attended by eighty-eight staff, including fifty-three participants from SAS – thus SAS was perceived to be one of the most engaged schools with regard to this programme (Bryant, 2013). The outcomes of attending this programme for the participants included successes in business winning and thus generating income although other results were reported such as: “developing/improving a client relationship with Defra, beginning to complete own strategic network, and learning how to treat the client” (Bryant, 2013).

Additionally, a new course was run by L&D in January 2013, entitled *Improve your business networking - achieve results*. Its aim was to “enable participants to understand and practice networking for business purposes” (Cranfield University Intranet, undated, b). According to the information used to advertise this course: “In order to get anything from your network you need to be prepared to give of yourself and your time and focus on how you can be helpful or of use to others, in effect, to be the person that they are most likely to turn to for help in a given field” (Cranfield University Intranet, undated, b). The course was attended by participants from SAS (and the School of Engineering) and was considered to be run again in the future, if needed (Bryant, 2013).

5.5 Summary

Chapter 5 contains research findings on how scientists within one UK university operated as boundary spanners in practice. In part one, based on a discourse analysis, I found three discursive constructions of scientists-cum-boundary spanners: 1) as a C*ontractor*; 2) as a *Confidant;* and 3) as an *Educator*. These constructions differed in: the type of relationship they required between a scientist and a client; the stage of a project in which a scientist got involved; and the type of boundary spanning a scientist engaged in. Next, I introduced literature on networking and explicated its link to studies on academic collaboration, before presenting my interpretation, based on a thematic analysis, on how the scientists constructed the practice of networking with clients (conceptualised as a type of

boundary spanning). I identified individual components of the practice of networking that consisted in: access, experiential knowledge, reciprocity, trust and repeat work. Overall, the practice of networking was depicted as a complex cyclical process that the interviewees described in rich metaphors, as a “trust building strategy”. The practice of networking was depicted as a social endeavour in which interpersonal relationships played a key role. There were examples in the interview accounts that some of these components of *the trust-building strategy* ran counter to university policies that prioritised economic gain. Other practices (especially of gaining repeated work) were being squeezed out by competitive tendering policies within clients’ organisations whilst the practice of moving civil servants within government departments hindered relationship building. This is in spite of a number of benefits, stemming from a continuous engagement with a client, being identified by the interviewees.

CHAPTER 6: DISCUSSION

Chapter 6 brings together Chapters 1, 2, 3, 4, and 5.

6.1 Research overview

In Chapters 1 and 2, I critically reviewed environmental studies promoting knowledge brokering. My understanding was influenced by reading SSK research including Callon (1995), Tuunainen (2005), Albert and Kleinman (2011) and the critical article by Greenhalgh and Wieringa (2011).

Overall, I found that knowledge brokering was not a clearly defined concept and its benefits were not well understood within the environmental sector literature. Apart from the dominant philosophical standpoint that perceived scientific knowledge as objective, superior and tangible there was another yet smaller group of studies that took the view of knowledge as constructed and subjective. Thus what knowledge brokering was depended on how one perceived scientific knowledge and science: In Litfin's (1994, p. 13) words, knowledge brokering thus represented "struggles among contested knowledge forms".

Presence of such opposing approaches to a topic is not uncommon in research. For example, in the LKM literature introduced in Chapter 2 the initial dominance of positivist studies associated with the view of knowledge as an object and application of quantitative research methods appeared to be increasingly equipoised by studies taking a knowledge co-construction view (Paulin and Suneson, 2012).

The adoption of boundary spanning, with its roots within the business and management sector and LKM literature, as an analogical concept to knowledge brokering propelled me to conceptualise scientists as boundary spanners in practice: defined as "agents, who with or without nomination, engage in spanning (navigating and negotiating) boundaries of diverse fields" (Levina and Vaast,

2005, p. 342). My research question was formulated as: How does the practice of building relationships aid effective science—policy interactions? The research question was set to challenge the concept of knowledge brokering, especially in those studies representing the positivist stance of rational knowledge.

In Chapter 3 the research design was presented as a single case study and the mode of enquiry as semi-structured interviews. The choice of a single case study was to counter a general neglect of context that I found in the literature from the environmental sector that advocated the concept of knowledge brokering. With regards to a philosophical and theoretical positioning, my research was vested within SSK and constructionism.

Chapter 4 contains contextual information. I introduced the UK HE sector, as depicted in the HE research studies. This introduction showed that UK universities had been, well over the past three decades, radically and irreversibly transformed by neoliberal policies that were instigated by consecutive national governments. HE reforms had been implemented under the ideologies of neoliberalism and knowledge economy, whilst justifying public spending with the need to make public sector organisations - including universities - more efficient, transparent, and business like. The reforms introduced the concept of NPM as a means for managing these organisations. Subsequently, universities evolved, according to Barnett (2011), into: entrepreneurial, bureaucratic, and corporate as well as surveillance organisations. Overall, these HE sector reforms were found to have had a profound, mostly negative, effect on every aspect of academic practice. Chapter 4 included an introduction to the university under study, the interviewees and their work, and the interviewees' responses to two hypothetical questions that aimed to ascertain the plausibility of the designated knowledge broker role within HE setting.

In Chapter 5 I presented the results of a discourse analysis I carried out by examining ten excerpts of text selected out of eight interviews. Three discursive constructions of scientists-cum-boundary spanners emerged through re-reading

the text as a: 1) *Contractor*; 2) *Confidant;* and 3) *Educator*. These local constructions of boundary spanning differed in the type of relationship they required between a scientist and a client, and in the stage at which a scientist got involved in a client's project. I then presented the results of content and thematic types of analysis that I undertook. The analyses revealed a number of key influences on this specific type of boundary spanning practice of relationship building: access; experiential knowledge, reciprocity, trust and repeat work. The practice of relationship building was constructed as a complex cyclical process, labelled as a *trust-building strategy*. Barriers hindering this boundary spanning practice discerned in the interview transcripts were shown, as well as the factors promoting the practice. Situations in which the scientists acted as intermediaries were identified within the data. Finally, information about the university's internal professional development courses with a networking component were introduced.

The rest of the chapter is organised as follows:

- Given that none of the reviewed studies from the environmental sector reviewed in Chapter 2 appeared to adopt the model of science as competition yet this is what has emerged from research as pertinent, I introduce further theoretical concepts associated with SSK to help me further interpret my findings: the cycle of credibility coined by Latour and Woolgar and what Grenfell (2014, p.47) labels as Bourdieu's "thinking tools".
- Next, I examine my findings in relation to the boundary spanning practices uncovered: *Trust-based*, *accountable/transparent* and *risk-taking*.
- The findings in relation to the range of boundary spanning roles and their feasibility within the HE sector are discussed.
- Drawing mainly from HE research and SSK I revisit the concept of boundaries; and the notion of science—policy boundary as a barrier to science—policy interaction.

6.2 The results and the need to revisit the model of science as competition

This research, drawing from typology of Callon (1995), initially adopted a model of science as sociocultural practice. My aim of focusing on local practices of what scientists actually do fitted with the model of science as sociocultural practice that considers scientific practice as any other practice.

This was in contrast to the environmental studies reviewed in Chapter 2 that mostly adopted the rational view of science—policy interactions. None of the reviewed studies appeared to explicitly embrace the model of science as competition and to adopt a Bourdieusian perspective.

As well as adopting a model of science as sociocultural practice and thus embedding my study within SS I took advice from Albert and Kleinman (2011); devising a multifaceted research design for this research (Figure 6.1).

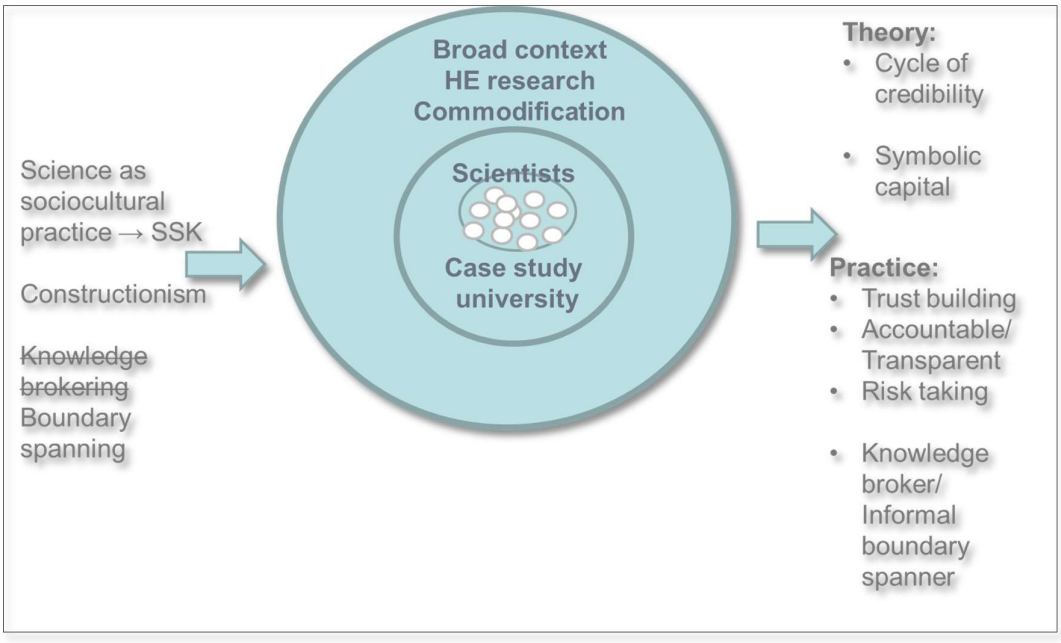


Figure 6.1. Multifaceted research design

My findings stipulate the relevance of the model of science as competition for the study of scientific practice. The need to revisit this perspective at this point of the thesis stems from multiple sources. Chapter 4, a part of a macro-focus of this research, was crafted by drawing from findings of HE research; serving as a broad canvass into which my case study was embedded. The ensuing portrayal of HE sector in Chapter 4 revealed it as under overbearing influence of government and its dominant ideologies promoting knowledge commodification. The university where the study took place was also found to be strongly wedded to a strict commercial orientation with one of its school's strategy document outlining as its "core business" winning research and increasing short course income. Equally, the business winning metaphor was identified in half of the interviews whilst constructions of the scientists' practices often could be compared to playing a game or engaging in a competition e.g. with colleagues.

6.2.1 The cycle of credibility

I was not alone in being perplexed by the high level of usage of quasi-economic terms amongst the interviewed scientists. Latour and Woolgar, SSK scholars whose study was originally published in 1979, were puzzled by the frequency of usage of words such as 'credit' and 'return' in their laboratory study.

What they found was that these terms were part of the scientists' credibility cycle that could be compared to "a cycle of capital investment", where credibility effectively represented "scientists' abilities actually to do science" (Latour and Woolgar, 1986, p. 198). A scientific career evolved around such credibility cycle: Scientific data enabled production of scientific arguments → these led to production of scientific papers → which brought recognition amongst scientific community → which in turn attracted funding through which equipment could be bought and new data produced → repeating the cycle over again (Latour and Woolgar, 1986; Figure 6.2).

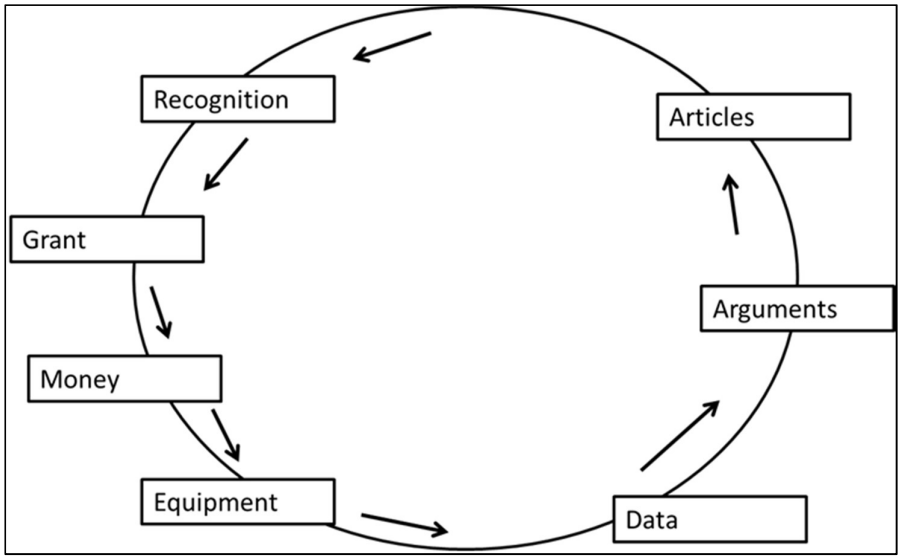


Figure 6.2 *The cycle of credibility* by Latour and Woolgar

Source: Latour and Woolgar (1986, p. 201, Figure 5.1. Cycles of Credit).

Thus academic collaboration took place amidst the market with credibility, where scientists as investors in capital perpetually redeployed their accumulated resources with the ultimate aim to "extend and *speed up the credibility cycle as a whole*" (Latour and Woolgar, 1986, p. 207, italics original). Scientific collaboration was about accumulation and expansion; furthermore, it could be compared to a relationship between corporations "that measure their success by looking at the growth of their operations and the intensity of the circulation of capital" (Latour and Woolgar, 1986, p. 207).

My interviewees constructed the practice of informal boundary spanning with their clients from policy making and policy implementation organisations as a cyclical process that one of them labelled as a *trust-building strategy* (Figure 5.2). This cyclical process shared similarities with the cycle of credibility by Latour and Woolgar (1986):

- *The cycle of credibility* of the scientists studied by Latour and Woolgar (1986) evolved around conducting laboratory experiments, producing scientific facts and writing academic publications. This was different to the scientists in my

research, who were very preoccupied by the need to win business and make money.

- The credibility cycle contained components, such as data, arguments and money, whilst *the trust-building strategy* mixed repeat work with trust and access. In both cases, the cycle represented a process in which all of its components were successively convertible, as put forward by Latour and Woolgar (1986).
- In both examples, credibility (which I described in Chapter 5 as a form of reputation) represented, using Latour and Woolgar's (1986, p.198) words, "scientists' abilities actually to do science".
- The cycle coined by Latour and Woolgar's (1986) took places amidst a market in credibility; scientists as investors in capital perpetually redeployed their accumulated resources with the ultimate aim to "extend and speed up the credibility cycle as a whole" (Latour and Woolgar, 1986, p. 207). Equally, in *the trust-building strategy* the focus was on speeding up the process – in order to generate income quicker.
- According to Latour and Woolgar (1986), the market of credibility was not about buying information due to information being firmly tied to its producer: "Rather, the object of "purchase" was the scientist's ability to produce some sort of information in the future" (Latour and Woolgar, 1986, p. 207). This notion also applied in the case of *the trust-building strategy*.
- The credibility cycle did not recognise access as an important component, because access needed to be gained once, through academic training – e.g. by gaining a PhD. In contrast, access in *the trust-building strategy* had to be gained every time one started to engage with a new client and thus set a new cycle of *trust building-strategy* in motion. In contrast, the credibility cycle was "activated" by the production of new credible scientific facts (Latour and Woolgar, 1986, p. 229).

According to the cycle of credibility, scientists acted as investors who wished to accumulate and maximise their symbolic capital (Latour and Woolgar, 1986).

Discussion of scientists as investors brings us to Pierre Bourdieu and his work that is also considered to represent the science as competition model.

6.2.2 Bourdieu's concepts

Pierre Bourdieu was a sociologist with philosophical training and anthropological experiences, born in 1930 in rural France. He is considered one of the most influential thinkers of the 20th century.

His work is not narrowly falling within SSK or STS; this explains at least partially why his concepts featured marginally in research from these fields, as noted by Albert and Kleinman (2011) and Camic (2011). Yet his writings (e.g. Bourdieu, 1975) contained work on knowledge production and a critique of the traditional sociology of science in line with SSK scholars. Bourdieu's approaches drew from economic theory and due to the relational and hierarchical considerations of his analyses it could be said to have parity with the structural sociology studies depicted in Chapter 2. For example, his publication *Homo Academicus* (Bourdieu, 1988) in which he scrutinised in detail the French academic field and its structures, included a statistical analysis that resembled a form of social network analysis.

Bourdieu's key theoretical concepts are envisaged to be considered not in isolation but in relation to each other to generate understanding of practice (Grenfell, 2014). Two of these indivisible concepts are *habitus*, perceived as a subjective aspect of practice that an individual amasses over lifetime and *field*, viewed as an objective element of practice defined as "the objective network or configuration of relations … to be found in any social space or particular" (Grenfell 2014, p. 47). "Habitus is both a system of schemes of production of practices and a system of perception and appreciation of practices", posits Bourdieu (1989, p. 19). The organic nature of the concepts of *field* and *habitus* means they are gradually evolving; but a rapid and often unexpected change can occur; leading to instability and the *habitus* becoming out of sync with the *field* – a phenomenon Bourdieu labels as *hysteresis* effect (Grenfell, 2014). Such radical field

restructuring is, for example, described in his *Homo Academicus* (Bourdieu, 1984) that follows far-reaching changes in the world of academia occurring at the time of 1968 student protests in France.

Bourdieu's concept of *field* is then often explained by comparing it to playing a game: as "a social space where everyone has an interest in winning – that is, securing the most advantageous positions within it." (Grenfell 2014, p. 154).

This brings us back to framework of Callon (1995) introduced in Table 2.2; in which Bourdieu's work was categorised as fitting the model of science as a competition (Bourdieu, 1989, Callon, 1995; Camic, 2011). Competition was what drove individual scientist's behaviour, in an environment where they were "caught up in a logic of success" (Callon, 1995, p. 38). In this model of science as competition, scientists were perceived as acting as businessmen, in a setting where they "have no choice; if they want to survive among their colleagues, they had to accumulate credit or credibility, which constituted their capital" (Callon, 1995, p. 38).

Through a Bourdieusian lens, to play a game in a given *field* leads one to acquire a range of resources, or capital. Bourdieu distinguishes not one but multiple types of capital that are exchangeable and convertible from one type to another: symbolic capital enveloping economic, social and cultural type of capital (Table 6.1).

Table 6.1 Bourdieu's types of symbolic capital.

Type of capital	**Symbolic capital**		
	Social	**Cultural**	**Economic**
Resource:	**Interpersonal network**	**Educational qualification, academic status**	**Grant, travel money**
Value:	**Privileged access to information, people and events. Reciprocity rituals**	**Degrees from prestigious institutions Academic publications**	**Enhancement of academic prestige Ability to hire more staff, open a new lab, travel abroad etc.**

Source: Bourdieu (1998), Nahapiet and Ghoshal (1998) and Albert and Kleinman (2011).

Capital, accordingly Bourdieu, was thus not necessarily material. Instead, it represented symbolic capital, which was:

> "… any property (any form of capital whether physical, economic, cultural or social) when it is perceived by social agents endowed with categories of perception which cause them to know it and to recognize it, to give it value. […] More precisely, symbolic capital is the form taken by any species of capital whenever it is perceived through categories of perception that are the product of the embodiment of divisions or of oppositions inscribed in the structure of the distribution of this species of capital (strong/weak, large/small, rich/poor, cultured/ uncultured)" (Bourdieu, 1998, p. 47).

Whilst SSK studies were mainly focused on micro processes of fact construction within defined spaces, such as research laboratories, Bourdieu considered it important to examine wider discourses (e.g. those that may cause inequality of power within a specific setting, i.e. a *field)* This understanding stems precisely from his notion of symbolic capital as a dominant force in society. Bourdieu (1989, p.23) went on to explain that symbolic capital was effectively: "credit: it is the power granted to those who have obtained sufficient recognition to be in a position to impose recognition. In this way, the power of constitution, a power to make a new group, through mobilization, or to make it exist by proxy, by speaking on its behalf as an authorized spokesperson, can be obtained only as the outcome of a long process of institutionalization, at the end of which a representative is instituted, who receives from the group the power to make the group." Whilst symbolic capital is omnipresent, Bourdieu stressed the importance of recognising authorities that may monopolise symbolic capital for the purpose of legitimising and imposing norms; such as in the case of government as "a kind of super-agent that combines the struggles over legitimate power taking place in different fields" (Siisiäinen, 2000).

Given that symbolic power is defined as “the power to make different entities exist by symbolic categorizing” it explains why knowledge is such a contested concept (Siisiäinen, 2000).

Through a Bourdieusian lens, acquiring capital through the process of playing a game in a given *field* then become source of power in that *field.* “Capital breeds capital,” writes Bourdieu (1990, p.91).

The world of science, viewed as a competition, was therefore a place of struggle, where power equalled domination of scientific authority – as “the capacity to define what legitimate science is” (Albert and Kleinman, 2011, p. 266). Such capacity was “defined inseparably as technical capacity and social power” (Bourdieu, 1975b, p. 19).

Bourdieu, in his detailed analysis of social backgrounds and career structures and trajectories of the academic field in France made the following observations in respect to academic power, considered to be exercised through control of others and their positions within a *field*:

- “Academic power thus consists in the capacity to influence on the one hand expectations – themselves based partly on a disposition to play the game and on investment in the game, and partly on the objective indeterminacy of the game – and o the other hand objective probabilities – notably by limiting the world of possible competitors. “ (Bourdieu, 1990, p. 89)

- “Like the accumulation of symbolic capital in a pre-capitalist society, where the objectification of economic and cultural mechanisms is not very advanced, the accumulation of a specific capital of academic authority demands payment in kind, that is, with one’s own time, in order to control the network of institutions where academic power is accumulated and exercised and also to enter into the exchanges of which these gatherings

are the occasion and where a capital of services rendered is gradually constituted, which is indispensable to the establishment of complicities, alliances and clienteles." Bourdieu (1990, p. 96).

- According to Bourdieu (1990, p. 95) time of was essence in the world of academia: "strictly academic power can only be accumulated and maintained at the cost of constant and heavy expenditure of time."

- He concludes: "It is doubtless because of this the logic of the accumulation of power takes the form of a viciously circular mechanism of obligations which breed obligations, of a progressive accumulation of powers which attract solicitations that generate more power" (Bourdieu, 1990, 97).

Bourdieu's teaching is not constrained to one discipline or research area but has a universal appeal. His concepts were adopted in HE research: for example, by Lucas (2006) and Reay (2004); and Allen-Collinson (2009). Reay (2004) used another Bourdieusian concept - of *symbolic violence*, described as "subtle, euphemized, invisible mode of domination that prevents domination from being recognised as such and, therefore, as misrecognised domination, is socially recognised" (p. 37) to highlight the plight of contract researchers exploited within the world academia. Shelley (2010) observed, in a study examining the evolution of new research support roles in English universities using data collected between years 2005 and 2007, that the accumulation of cultural capital was intrinsically linked to the notion of credibility within the sector. Hockey and Allen-Collinson (2009) also used the Bourdieusian concepts of *field*, *capital*, *habitus,* and practice to explore informal practices of UK research administrators: one of their findings was the value of interpersonal social networks.

There are examples from the informational boundary spanning research that adopted Bourdieu's ideas. In the highly cited theoretical article by Nahapiet and Ghoshal (1998) focused on the concept of social capital, the authors acknowledges the wide ranging value of interpersonal networks in terms of

gaining access, social status, and reputation. Levina and Vaast (2005) specifically applied Bourdieu's concept of *fields* due to its potential to grasp issues of power: their ethnographic studies focused on how organisational competence in boundary spanning emerged in practice. Bourdieu's understanding of power distribution as influenced by practices and boundaries of *fields* aided Zietsma and Lawrence (2010) in their longitudinal analysis of forestry logging practices in British Columbia of how dominant and legitimate practices were dismantled and boundaries penetrated.

6.2.3 Boundary spanning not a disinterested activity

In this section I utilise ideas by Latour and Woolgar and by Bourdieu introduced earlier as well as findings from informational boundary spanning research, to bring attention to two intertwined aspects that appeared neglected in the positivist environmental studies promoting knowledge brokering: interest and power.

Some of the non-positivist studies reviewed in Chapter 2 did make an observation that science—policy interaction was inherently an activity driven by individual interests: for example (Litfiin, 1994) who drew from Foucault and his understanding of power. Rydin *et al*. (2007), in their study of how knowledge of environmental sustainable construction was translated into practice, remarked on p. 376: "The danger of relying on knowledge brokers is that it can limit learning for others."

My results suggested that an appointment of a designated knowledge broker could be problematic. In Section 4.5.3 I included quotes form six interviewees who spoke of colleagues as "protecting their turf" and "quite territorial"; describing some as "very protective about budgets"; as "they feel rather threatened by newcomers so they just want to hold their fort, they don't want to penetrate into their barrier"; and as staff who "jealously guard their personal contacts." Hence the suggestion that a designated knowledge broker, or any other colleague entering the space occupied (by scientists), would be perceived as a threat, not as "honest broker of policy alternatives" (a term used by Pielke Jnr., 2007).

One may seek to explain these findings as stemming from contextual factors and by turning to the university under study and the HE sector at large, as presented in Chapter 4. The interviews took place at a university that was categorised as *hard-entrepreneurial*, a model Thatcherite institution that arduously pushed towards irreversibly transforming itself by adopting an enveloping business winning identity; projected both externally and internally. Introducing and integrating a newcomer into this highly competitive commercialised environment, whether a designated knowledge broker or another role, would be understandably difficult. It could certainly amplify any antagonism amongst existing staff. Especially given that at the university under study such a role would have to be reconciled with the business winning mentality imposed on HE staff at large. Meaning an appointed knowledge broker might come under pressure at such an institution unless they were engaging in business-winning activities as other scientist. This issue was raised by Knight and Lightowler (2010 in their experiences of holding knowledge exchange roles.

On an individual level, ideas by Latour and Woolgar and by Bourdieu and understanding of science as a competition can be helpful in elucidating why my interviewees considered the appointment of a knowledge broker as a threat. By drawing on the *cycle of credibility* by Latour and Woolgar (1986), scientists were conceptualised as investors focused on accumulating capital and speeding up their own *cycle of credibility*. Utilising a Bourdiesian lens, scientists were engaging in a game in a field or in multiple fields with the interest of maximising profit; accumulating and converting different types of capital in the process and acquiring prized symbolic capital - and with that power. Albert and Kleinman (2011), drawing from Bourdieu, observed how scientists pursuing their own self-interest concurrently contributed to advancement of knowledge. In other words, ‟scientists pursue their self-interest (the acquisition of power) but they do so according to the specific logic of practice of the field of science, which makes them engage in the struggle ‟armed″ with rational arguments (Albert and Kleinman, 2011, p. 271).

For Bourdieu, the issue of interest does not apply solely to the scientific practice but to the social life at large. For Bourdieu, a disinterested act simply does not exist because each human being is born with interest (Grenfell, 2014):

"The need for "recognition" is at the heart of this process" and "[t]to be human is to value: to value is to have preference; preference is determined in interest in possible outcome, "continues Grenfell (2012, p. 163 and p. 164 respectively).

Examples of effective transformation from a designated boundary spanning role to a boundary spanning in practice have been recognized in informational boundary spanning research (e.g. Levina and Vaast, 2005). However this body of research strongly suggests that effective boundary spanning may be best performed by individuals with extensive interpersonal ties internally as well as and externally and who were thus familiar with both environments across a boundary (e.g. Scanlan and Tushman, 1981). Therefore an individual with power due to its strategic position within a network and with significant acquired social capital (e.g. Gould and Fernandez, 1989; Burt, 2004). Identifying and nurturing non-designated boundary spanning (that is activities that emerged out of an individual building and sustain linkages between people from different structural units internally or externally) was considered to be more successful than simply creating a new designated role and placing in this post an individual with no established network of contacts on both sides of the boundary (Nochur and Allen, 1992; Levina and Vaast, 2005; Kim and Jarvenpaa, 2008). Similarly in the research on roles of scientists as PIs, Boehm and Hogan (2014) found that Technology Transfer Office managers, as designated boundary spanners, lacked trust of stakeholders and thus were considered ineffective boundary spanners in comparison to PIs who were senior and experienced scientists already in possession of significant amounts of amassed capital (i.e. social, cultural, and symbolic).

These findings supports the argument that as opposed to implanting new designated roles within the scientists' working environment, it would be more effective to acknowledge and formalise the informal boundary spanning activities of the scientists themselves.

If new designated knowledge broker roles were created, considerations of scientist's vested interests and positions within fields could be applied to the design of a new designated knowledge broker. To minimise resistance and suspicion of scientists and disturbance to their engagements in *cycles of credibility* and *trust building strategies*, the remit of the role of a designated knowledge broker could be reduced to a low type of capital amassing activities such as one-directional research dissemination and science communication. Utilising typology by Whitchurch (2008), this would be a highly prescribed role of a "bounded professional." As oppose to a powerful individual with a strategic position within an interpersonal network, a designated broker would be restricted to a supporting role where the opportunity to jeopardise other actors within a network and diminish their social power would be minimal.

However this many not prevent the designated knowledge broker, depending on an individuals' capability, still to amass over time considerable influence or indirectly power or possibly become a 'go to person' which could also be seen as benefit or threat to others within the network. Recent developments in the HE sector show that new roles of research administrators and other research support staff are no longer confined to low grade lowly paid administrative work: in contrary, the educational requirements for these roles was reported to now match those for academic posts (Shelley (2010). The activities of the Knowledge Exchange Coordinator's role described by Knight and Lighttowler (2011, p. 547) included "the building of relationships and engagement between academics and non-academics (primarily policy makers and practitioners)" In the USA a new cadre of research administrators was professionalised at institutional and government level as a key public sector roles (Whitchurch 2009, 2009). As Whitchurch (2008, p. 3) put it, "the concept of administrative service has become

re-oriented towards one of partnership with academic colleagues and the multiple constituencies with whom institutions interact."

In summary, the practice of science—policy interaction, as any social practice, is value laden. Knowledge brokering; knowledge exchange; knowledge sharing is not a disinterested act. The notion of mechanical transfer of knowledge is futile.

This brings us to further discussion about the range of boundary spanning / knowledge brokering roles within the HE sector.

6.3 The results and boundary spanning roles in the HE sector

The majority of the environmental studies reviewed in Chapter 2 called for the introduction of designated knowledge brokers to operate at the science—policy interface: a new cadre of individuals who would fill assumed void and whose role would encompass communication, dissemination of research findings, and synthesis of scientific knowledge (Table 2.1). These studies were considered to adopt a rational view of science and of viewing knowledge brokering as a solution to bridging the alleged gap between science and policy. These positivist studies, emanating from positivism and the belief of scientific knowledge as a special and objective entity that can be packaged and commodified, put forward that a designated knowledge broker would be involved in transfer and exchange of knowledge (e.g. Owens and Rayner; Konijnendijk 2004; 1999; Bielak *et al.*, 2008; Kiparsky, 2009). What was considered problematic, according to these studies, was lack of designated knowledge brokers currently in post (e.g. Surridge and Harris, 2007; Holmes and Harris, 2010; Holmes & Lock, 2010).

In this section I reflect on my findings in relation to a range of boundary spanning roles with HE sector, as shown summarised in Figure 6.3.

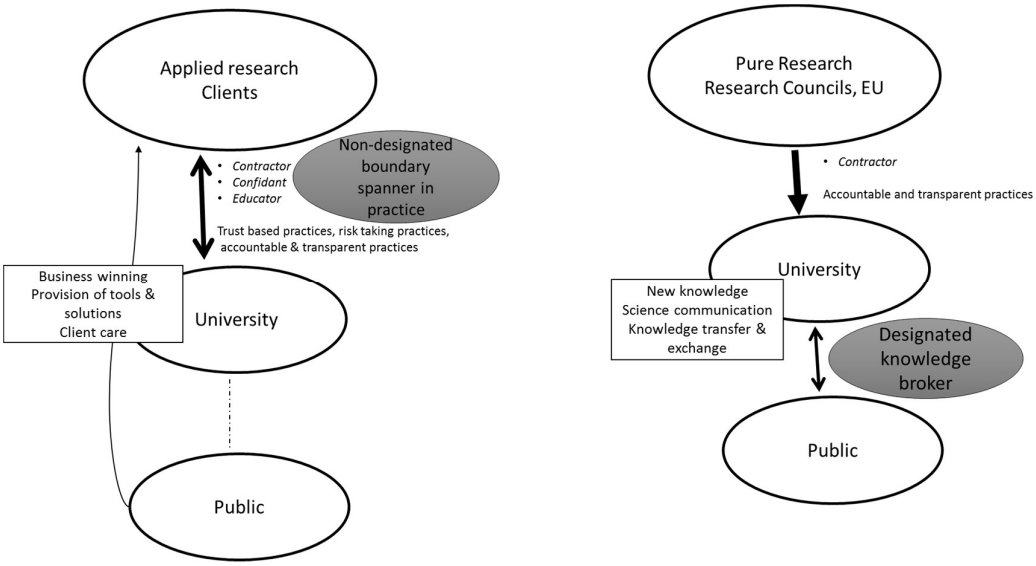


Figure 6.3 Boundary spanning roles per research type of HE environment

Overall, my findings suggest that the idea of a wide spread adoption of designated knowledge brokers was simplistic. The suggestion did not consider contextual factors and showed a lack of understanding of the importance of key concepts paramount to scientific practice that fit the model of science as competition: interest, trust, power, capital and its accumulation. Figure 6.3 outlines options for boundary spanning roles within HE sector as per either a type of research that is primarily applied versus pure research.

The University where my study was conducted focused on what was considered to be applied research; concerned with practical applications and solutions for the needs of specific clients including policy makers: in Chapter 4 my interviewees were introduced as primarily supplying information tools, and solutions to their clients from policy and industry and engage in client care e.g. through offering themselves as "a safe pair of hand" constantly on call if needed by their client. In such an environment that acted as scientists-cum-non-designated boundary spanners in practice. They engaged in performing informal boundary spanning roles, as shown in the discursive construction of *Contractor*, *Confidan*t and *Educator*. As part of their survival strategy and the need for business wining (a mantra of the university's senior management), they engaged in a range of

practices: trust-building, accountable-transparent, and risk-taking practices.

In contrast pure research is a fundamental type of research driven by curiosity of individual scientists. It is characterized by a quest for advancing one's knowledge as opposed to being primarily concerned with applicability to solving specific problems (Science Fuse, 2010). My interviewees indicated that a designated knowledge broker, as a type of supporting role, might only be suitable within this 'ivory tower' type of research environment.

Within the pure research context, the designated knowledge broker would work as part of a research team and their role would be primarily concerned with science communication and dissemination of scientific research – i.e. one-directional activity from science to the public. The appointment of such designated knowledge brokers would then be an outcome of the *accountable and transparent practi*ces imposed by government funders, e.g. Research Councils. This suggestion aligns with findings of Knight and Lightowler (2010) who showed how the increasing demand for research impact, driven by research funders, led to the emergence of designated knowledge brokering roles in the HE sector, created as a condition of funding provision by the research funders. Indeed, as mentioned in Chapter 3, one individual with a Knowledge Exchange Manager job title was employed at the university under study and this post was directly linked to a specific government funder's requirements.

6.4 The results and boundary spanning in practice

This research set to explore new avenues related to the concept of knowledge brokering by studying what scientists actually do in science—policy interaction and what language they use to describe their activities. In the words of Tuuinamen (2005), I thus set to identify "local practical action" that the participating scientists undertook as they engaged with their policy clients.

In sociology such approach is considered to be a study of practice. Pickering (1992) distinguishes two elements that encompass such approach: scientific

practice (as a temporal action of making science) and scientific culture (as a set of resources that scientists utilise as they go about doing science). These two concepts resemble those introduced earlier in this chapter; of Bourdieu's *field* as an objective aspect of practice and *habitus* as the subjective element acquired over time (Grenfell 2014). Zietsma and Lawrence (2010), who drew from SSK research and ideas of Bourdieu, point out that practices are not simply what individuals do. Instead, practices refer to shared activities of a social group that meet specific social norms: thus individuals engage in practice to "affect the recognition and acceptance of sets of routines (Zietsma and Lawrence, 2010, p.190).

The need for the study of the science—policy practices echoed in some of the studies in the environmental sector that advocated knowledge brokering (e.g. Bielak *et al*., 2008; Sheate and Partidário, 2009; Michaels, 2009; Petit *et al*., 2011).

Three distinct practices were identified in my data. These practices portrayed science—policy interaction as multidimensional; fundamentally a social enterprise with interpersonal relationships at their core.

6.4.1 *Trust-based* practices for science—policy interaction

One of the boundary spanning practices for science—policy interaction that emerged from my results evolved around a recurrent process that one of the practising scientists I interviewed labelled a *trust building strategy* (Figure 5.2). In this section I first review the concept of trust before returning to the *trust building strategy* itself.

Trust represents the core element of *trust building strategy*. Interestingly, trust as a topic was found to be neglected by sociologists in general (Luhmann, 2000). Even Bourdieu appeared less explicit in his writing on the concept of trust, as noted by Siisiäinen (2000). For example, *Indexes* in Bourdieu (1990) and in

Grenfell's (2014) publication about Bourdieu's theoretical concepts are missing the word "trust".

Trust as ingredient for effective science—policy interaction, was mentioned in some of the environmental studies reviewed in Chapter 2 (e.g. Cullen, 1990, Litfin (1994 Rydin *et al*., 2007; Bielak *et al*. 2008; Holmes and Lock, 2010). Elsewhere, scientists as PIs were reported to build trusted relationships (Kidwell, 2014); and form trusted research teams supporting them to effectively overcome managerial challenges (Cunnigham *et al.,* 2015).

Trust as a topic had attracted significant research interest in LKM literature (Wang and Noe, 2010). This stems from acknowledgment that interpersonal trust is a critical ingredient for successful knowledge sharing (Abrams *et al*., 2003; Easterby-Smith *et al*., 2008; Renzl, 2008). Trust is regarded as a facilitator of effective knowledge sharing", explicates Renz (2008, p.2009) who concluded that individuals' willingness to document knowledge were critical in the process of sharing knowledge. A prerequisite for formation of trust was the relationship building (Ipe 2003, Abrams *et al*., 2003).

Luhmann (2000), who links understanding of interpersonal trust with an individual's inner risk-taking as part of an individual's decision making process, postulates: "trust is based on a circular relation between risk and action, both being complementary requirements. Action defines itself in relation to a particular risk as external (future) possibility, although risk at the same time is inherent in action and exists only if the actor chooses to incur the chance of unfortunate consequences and to trust" (p.100). The deployment of trust therefore applies in a situation with potentially highly undesirable outcome that could outweigh the gain being sought, explains Luhmann (2000). Therefore trust arises from one's action or inaction; no action means no risk and no deployment of trust (Luhmann, 2000).

The notion of trust and risk brings us to another crucial element of the *trust-building strategy*: reciprocity in the form of doing favours and engaging in reciprocity rituals. Such "reciprocal risk-taking", quoting Williams (2002, p. 116) was about sharing something of value, something not readily available, even to the initial detriment of the person sharing it. Abrams *et al*. (2003) discerned two priced resources that could be shared in such social exchange: tacit or experiential knowledge that could result in developing what they described as benevolence-based trust; and one's social capital in a form of giving access to one's contacts. Connelly *et al*. (2012, p. 68) offer this definition of reciprocity: "Essentially, a person who voluntarily and spontaneously engages in one positive behavior towards another person will implicitly invoke a similar yet unspecified reciprocal behavior. " Reciprocity rituals were self-reinforcing over time; as trust and relationship continued to develop between two individuals over time (e.g. Abrams *et. al*. (2003; Connelly *et al*. (2012). This understanding of reciprocity aligns with Bourdieu's notion of exchanges, accumulation of capital leading to more capital and of what he describes as "a viciously circular mechanism of obligations which breed obligations, (Bourdieu, 1990, 97). Reciprocity as well as trust were reported critical for research administrators in the study by Hockey and Allen-Collinson (2009) in building their social capital and establishing "most effective ways of 'getting things done', often by the circumvention of time-consuming formal bureaucratic channels or hierarchies of communication (p.152, quotation marks original).

Returning to the *trust-building strategy;* it was a cyclical process that one engaged in with the aspiration to accumulate capital by focusing on building trust, reputation (i.e. in this instance type of reputation not only stemming from academic publications' record but also from a practical experience of doing science and gaining experiential knowledge with a particular client), and gaining repeat work. Utilising a Bourdieusian lens, the *trust-building strategy* effectively represented an interest-laden investment. The cyclical nature of the strategy invites comparison to the *cycle of credibility* put forward by Latour and Woolgar (1986).

During the interviews, I asked the participating scientists whether they had repeat work with their clients and all said yes – as one put it, “that is how I survive”. The *trust-building strategy* was perceived as enabling the speeding up of the process of generating income; allowing scientists to be business winners. It acted as a valuable shortcut. Investment in a trust building strategy paid off in the future: as opposed to having to exert resources, time, and energy on making new connections, one could tap into their network of relationships to retain some historical rolling contract; speedily obtain help in navigating cumbersome online systems for a proposal submission.

The trust-building strategy nurtured quality engagement between a scientist and a policy client. Consider the discursive constructions of *Confidant* and *Educator* where the scientists had an input at the inception stage of a project with their client, i.e. they were able to shape it: the questions to be asked, the methods to be used in the project etc. This opportunity for input during incubation of a project appeared to result in more mutually positive experiences. Such arrangements appeared to be valued by both by interviewees and the clients. One may wish to point out an undue competitive advantages resulting from such a close engagement that could even effectively circumvent official tendering procedures in place by a funder. Correspondingly one would expect that an output (e.g. a tool or research report) generated through such a quality interaction would be valued and adopted by the client.

Furthermore, the *trust-building strategy* supported other means of generating income (e.g. through taking part in formal research competitions as advertised by research funders), which might generate economic capital but not necessarily other benefits (e.g. strengthening of a relationship, developing trust with a new client). Therefore, engagement in *the trust-building strategy* was critical: it complemented and balanced other income streams available at a given time.

The purported role of trust and *trust-building strategy* in successful business winning activities of the scientists interviewed then contrasted with silence on trust in the university's documents I reviewed – e.g. its competency framework or in the SAS strategy document that had no mention of the word trust.

Components from the university's competency framework presented in Table 5.4 spoke of building relationships and collaboration. An advert on the university's intranet for a new course ran by L&D in January 2013, entitled *Improve your business networking - achieve results*, read: "In order to get anything from your network you need to be prepared to give of yourself and your time and focus on how you can be helpful or of use to others, in effect, to be the person that they are most likely to turn to for help in a given field" (Cranfield University Intranet, undated, b). In light of the history of the university under study and its continued adoption of dominant ideologies as exemplified in e.g. its mission statement presented in Chapter 4, this wording in L&D material could be unlikely viewed as signalling a shift in understanding of scientific practice within this traditionally *hard-entrepreneurial* university; rather it seemed an internal anomaly of straying from the commanding discourse.

It must be acknowledged that during the interviews a relatively small number of interviewed practising scientists – 11 out of 30 – explicitly articulated trust as an important facet of interaction with clients. This indicates some congruence on individual and institutional level of not considering explicitly trust as an important element for the practice of interacting with clients in general.

The relatively low occurrence of mention of trust in my data may also be attributed to the current ideological preferences for other types of practices for science—policy interaction. One such practice is presented in the next section

6.4.2 *Accountable and transparent* practices for science—policy interaction

The single case study I conducted took place at a UK university that was classified, using Barnett's (2011) typology, as a *hard entrepreneurial* type in which the ideology of neoliberalism and knowledge economy dominated and in which NPM proliferated. O'Neill (2002) suggested that reforms carried out in name of these ideologies within the public sphere were done in the name of installing control: where trust was to be the desired outcome generated, not a means of input. How successful these reforms have been in restoring and strengthening public's trust has been questioned (e.g. O'Neill, 2002 and also Radder, 2010).

Nevertheless the university under study had a long history of embracing neoliberal values and entrepreneurialism as part of its survival strategy – as demonstrated in the example given in Barker (1996) of how, as a relatively small institution, it successfully resisted from being amalgamated into another HE institution in the post-Robbins period of 1960s and instead adapted to become a thriving STEM-oriented university of today. Adoption of *hard entrepreneurialism* had its downsides: e.g. devolution of budgets was bound to fragment the organisation, described by interviewees as "lacking social fabric" and as a "collection of cottage industries" where internal fractions were set to primarily compete against each other as oppose to collaborate. As part of the transformative changes adopted, a new business winning identity was promoted amongst all its staff.

Such environment, immersed in neoliberal values and *hard entrepreneurialism,* introduced and supported *accountable and transparent practices* for science—policy interaction. These gave preference to the arrangement between a scientist and a policy maker as described by my interviewees in the discursive construction of *Contractor*. The arrangement had no prerequisite for a personal relationship between a scientist and a client. The primary concern in these situations was with transparency and efficiency that were to be achieved via competitive tendering.

The competitive tendering arrangements for research projects that were in place gave preference to rational, impersonal forms of interaction between scientists and policy makers, through formal announcement of research calls. These were situations where a research funder made a research call and opened up a bidding process. Such arrangement was linear, with a set start and end date. The scientist had no input at the inception stage of making up the research call and could only get involved at the point when such a research call was advertised. This arrangement applied to the majority of research funders including government departments and their agencies: Research Councils, EC, Defra, EA etc.

The envisaged effect of these policies had been a significant reduction/ eradication of the practice of any historical roll-on contracts between scientists and their clients from these organisation. Such historical contracts were not considered transparent and fair. This was compounded by the practice of moving civil servants within government departments after a certain period of time.

However, my findings suggested that these policies appeared to hinder scientists in engaging in their cycles of *trust-building strategies* that, in some instances, formed a fundamental part of their scientific practice. Moreover, the discursive construction of *Contractor* was not described favourably by the interviewees; it meant that they were being treated, as one put it, “rather like a normal contractor rather than an academic”. They felt vulnerable in this type of arrangement to exploitation during the delivery of a research project by their clients who as customers had to be satisfied with the service they received. Clients were described as “quite dictatorial”, “stroppy” and “[t]hey squeeze every last drop of blood out of you, in terms of delivering projects”. Some interviewees subsequently described their interaction during the delivery of a research project as a battle with a client who was difficult, fidgety, ruthless, and exploitative.

The following observations could be made. Firstly, the drive for *accountable and transparent practices* forced scientists to be me more competitive with each other

and thus re-enforced the model of science as a competition. It then seemed inevitable that imposing *accountable and transparent practices* could produce negative outcomes such as those reported in HE research and presented in Chapter 4: e.g. a loss of collegiality (Saunders, 2006) and "a drastic" loss of academic identity among those labelled suddenly as "'non – research active'" (Henkel, 2000, p. 260, quotation marks original).

Secondly, the call ignored understanding of science—policy interaction as an ultimately social practice that was built on its ability to amass and transform capital. This was demonstrated in my data especially in the discursive construction of a *Contractor* that led to an enactment of a specific intermediary/ broker function: matchmaking. In my data a situation would arise when a research call would be advertised and a scientist would either mobilise their interpersonal contacts in order to submit a proposal, or would be themselves in a situation where their contacts would rally them for such a purpose. So matchmaking arose as a by-product of the formal *accountable and transparent practices* – practices that were considered as stifling growth of social capital activities and in direct conflict with the *trust-building* strategy scientists engaged in. Such matchmaking opportunities then enabled scientists to further accumulate and strengthen their own symbolic capital – an activity that has repeatedly appeared in my data as a fundamental element of scientific practice.

Thirdly, the drive for *accountable and transparent practices* seemed to devalue the cultural capital of scientists: i.e. the academic authority and respect traditionally enjoyed by scientists who were seen as, in Wildawsky's (1979) words, "speaking truth to power". Under the drive for *accountable and transparent practices,* the dynamics of the relationship between scientists and policy makers had changed. It was unequal. It was the clients, including those from governmental quangos, who had the upper hand: they were to be viewed as customers and consumers who had to be satisfied with the service they were paying for. Recall the words of Lyotard (1984, p.4-5), cited in Chapter 4: "Knowledge is and will be produced in order to be sold, it is and will be consumed

in order to be valorized in a new production". Thus the drive for *accountable and transparent practic*es did not only indicate a change in relationship between scientists and policy makers but also signalled an era in which scientific knowledge was primarily conceptualised as a commodity.

The drive for the adoption of *accountable and transparent practices* might have delivered tangible benefits to the worlds of science and policy at large. Still the results of my study pointed to its serious shortcomings. My results add to a growing body of research on the negative impacts of the overt drive for transparency and accountability: e.g. Cunningham *et al*. (2014) in their study of barriers to the work of scientists as PIs found it encroached on PI's research autonomy whilst the administrative requirements left limited amount of time for conducting actual research.

Furthermore, *accountable and transparent practices* led to an emergence of a counter-practice, of another modus operandi that I label as a *risk-taking practice* for the science—policy interaction.

6.4.3 *Risk-taking practices* for science—policy interaction

A core element of the *trust-based practices*, interpersonal trust, was earlier described as conditional on internalised risk and action (Luhmann, 1990). Therefore trust-based practices were *risk-based*. The practices described in this section required one to take additional risk as part of their actions because of external influences.

Risk-taking practice emerged as a result of *accountable and transparent practices* being imposed on scientists' as the only legitimate practices. *Risk-taking practice* occurred when a scientist effectively tried to engage in all the stages of *the trust-building* strategy, including those elements that were unrecognised and thus threatened by the *accountable and transparent practices*. These unacknowledged elements were: trust, relationship building, repeat work, and doing favours/reciprocity (Figure .6.2).

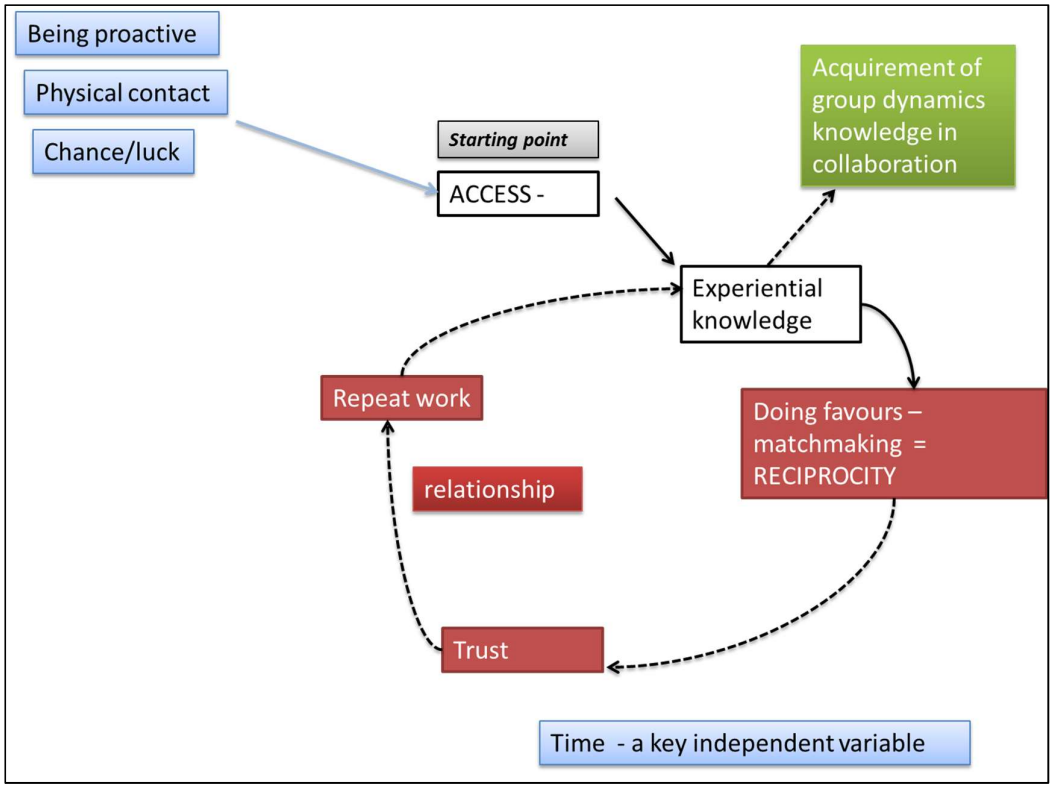


Figure 6.4 *The trust-building strategy* and its components under threat (shown in red)

There were instances in my data where relationship building with a client might call, for example, for delivering pieces of work for free or for passing a research opportunity to a colleague who might be even external to one's organisation. To reconcile these seemingly opposing demands – i.e. to be seen as winning business whilst building and strengthening own social capital - some scientists resolved to carry out activities that were not recognised as valid by the university's formal policies and thus were outwardly illogical and certainly could be viewed as risk-taking. "Consider one of the interviewees and their story how taking risk paid off (although recall them saying that they were at the time only partially sure that the risk would lead to a gain: "well, if you put me up against a wall, I would have said maybe 50:50"). This astute Interviewee was subsequently able to transform the outcome of this activity into a social capital (through new contacts) and then into economic gain (leading to a new grant on the back of the first piece of work), as well as cultural capital (writing up an academic publication that could be included in the RAE).

This example could be compared to the risk taken by an entrepreneurial scientist-cum-PI in the study by Kidwell (2014) who gave grant money back due to a perceived mismatch of objectives: in exchange this highly precarious act led to a deepening of trust between the funding provider and the PI; with the funder subsequently awarding the PI further funding. I assume the PI was able to take such a risk as he was not employed directly by a university but was effectively a CEO of a university a spin-off company. An action of returning grant money by a scientist employed at a university appeared improbable to occur; especially at a HE institution obsessed with business wining as Cranfield University.

The examples in my data highlighted the difficulty of attempting to apply transparency and accountability measures within the public sector sphere into interpersonal interactions – an issue highlighted by Sennett (2004). Moreover, these *risk-taking practices* could be described as examples of "fudging" – where one tried to reconcile policies driven by the need for accountability and transparency but that were actually contradictory and non-reconcilable in practice: in fact they offered "incentives for arbitrary and unprofessional choices" (O'Neill, 2002, p. 53 and 56 respectively).

Risk-taking practices clashed with university's policies and procedures that demanded scientists to prioritise the institution's economic interests, as was shown in the SAS strategy and other documents reviewed in Chapter 4. My data suggested the *risk-taking practices* were not eradicated but were rendered invisible. These were, in the words of one of my interviewees, "not a formal a formal aspect of client management. Even divulging such practice during an interview as part of this research presented itself a risk to the interviewed scientists that not all wished to take. Recall the interviewee who made a comment "ring my lawyer". Therefore the practice might be more widespread than my data suggest. A concern of exposing my interviewees who freely disclosed such practice had implications on what interviewees' demographic data I considered 'safe' to include in the thesis.

Risk-taking practice was essentially a balancing act of reconciling different demands and a survival strategy the scientists adopted. *Risk-taking practice* provided a worthwhile alternative to the constraints of the *accountable and transparent practice*. It allowed scientists to keep participating in an activity that was at the core of scientific practice: amassing own symbolic capital that could be later, at least partially, exchanged for economic or other types of capital.

What would happen if risk *taking-practice* was eradicated completely? Such states of affairs assumes annihilation of trust. In the LKM literature lack of trust was recounted to lead to difficulties with knowledge sharing and even to knowledge hiding as reported by Connelly *et al.* (2012) in their mixed methods study. Similarly, Szulanski (1996, p. 32) observed: ""An arduous (i.e., laborious and distant) relationship might create additional hardship in the transfer"; concluding that relational factors such as lack of an interpersonal relationship between a sender and a recipient were more significant barrier to knowledge transfer than motivational factors. These insights could be used to postulate that solely relying on *accountable* and *transparent type of practices* would only exacerbate any current difficulties experienced and subsequent efforts in improving the science—policy interactions.

On that note, Luhmann (2002) offers these thoughts on what could happen if trust and its associated practices were to disappear, in this case from the repertoire of the scientific practice: "The *lack of trust,* on the other hand, simply withdraws activities. It reduces the range of possibilities for rational action... It prevents, above all, capital investment under conditions of uncertainty and risk... It may reduce public interest in innovative art which is not yet recognized and confirmed by the establishment of experts. Through lack of trust a system may lose size; it may even shrink below a critical threshold necessary for its own reproduction at a certain level of development" (p. 104, italics original).

6.5 Boundaries revisited

The reviewed studies from the environmental sector that represented the model of science as rational knowledge (e.g. Konijnendijk, 2004; NcNie, 2007; Holmes and Clark, 2008; Shaxon, 2009; Holmes and Harris, 2010; Sheikheldin *et al*., 2010) portrayed science and policy as two distinct homogenous entities for which knowledge brokering had been proposed as a solution for bridging the alleged science—policy gap.

The following observations can be made based on my results:

- The UK HE sector, a traditional home of science and scientists introduced in Chapter 4, was found not to be independent but dependent on the government; at least because of its need for funding; and due to its adoption of ideologies of neoliberalism, knowledge economy, and NPM as propagated by consecutive governments (e.g. Deem *et al*., 2007; Lock and Lorenz, 2007; Diefenbach, 2009; Shattock, 2012).

- Neoliberal values were evident in the positivist studies from the environmental sector that promoted knowledge brokering and that were reviewed in Chapter 2: for example, Holmes and Lock (2010, p. 31) described ministries as "intelligent customers for research" and Bielak *et al*. (2008, p. 222) discussed how knowledge brokering would lead to "a marketplace of products".

- In contrast the practising scientists I interviewed did not use the term knowledge brokering when discussing their practices of spanning the science—policy boundary. Their usage of the related terms knowledge exchange and knowledge transfer in the interviews pointed to preferred vocabulary of the UK government and EU research funders at the time.

The above suggests that the recent sudden rise of popularity of the concept of knowledge brokering in the environmental sector, as reviewed in Chapter 2, had

indeed a similar trajectory to the status of the knowledge translation metaphor in the health sector that was examined Greenhalgh and Wieringa (2011). Therefore the emergence of the concept of knowledge brokering as a trend in the published environmental sector research could be overwhelmingly attributed to the government's rhetoric and its preferences, at a given time, on what counted as valid research and what it should look like. If this is so, any author's suspected readiness to use specific terminology in their research publications solely due to perceived pressures to satisfy research funders and/or to meet own publishing targets potentially discredit findings of these studies.

Drawing from sociological research by Lamont and Molnár (2002), the nature of the science—policy boundary could be seen as principally symbolic. Equally it is considered to be having a very enduring hold which could be potentially preventing recognition that the world of science and policy are indeed in flux.

In particular, opening of a new space between science and non-science is being increasingly recognised: in HE research Shelley (2010) calls it a "shifting arena" and Whitchurch (2008, 2009) the "third space".

According to the HE research the emergence of new research roles is associated with blurring of long-established boundaries e.g. between science and non-science and academic and administrative work. Drawing from the Bourdieu and his theoretical concepts, Shelley (2010) defines the "shifting arena" as a critical place of tension; one "where the research manager field crosses into the academic field" (p. 41); and in which research administrative staff and scientists compete for opportunities to amass capital through activities such as "research grant capture, research bidding experience, writing research policy, and networking with policy makers (p. 56, Figure 1).

Whitchurch (2008) describes "third space" as "an emergent territory between academic and professional domains" (p. 377); into which both traditionally administrative "bounded" roles within generalist (e.g. registry), specialist (e.g.

HR), and niche (e.g. equality) functions gravitate as part of evolution of these roles in response to HE sector changes; whilst mainstream academic roles' direction of travel towards this territory is the result of their engagement in e.g. academic management, pastoral support and in partnership activities (p. 385, Figure 1). In the "third space" one can then find activities including "widening participation; employability and careers; business/technology incubation; "regional/community development; leadership / management development" Whitchurch (2008, p. 385, Figure 1).

The emergence of new roles and "blended professionals" out of traditionally low paid administrative "bounded" roles have been subject of study by HE researchers such as Allen-Collinson (2009); Hockey and Allen-Collinson (2009); Shelley, (2010). Quoting ARMA (2008), Allen-Collinson (2009) noted that the membership of Association of Research Managers and Administrators (ARMA) grew from 75 in more than a decade to circa 1200 members at that time. Growth in number of new research support roles across UK universities is also shown in HESA figures. The new roles have led to new organisation structures being introduced, with new teams and central or local departments such as the Research Development & Support Office established at the University of Bath: http://www.bath.ac.uk/rdso/.

An example of movement of mainstream academic roles towards "third space" as put forward by Whitchurch (2008) can found in the emergence of new hybrid roles of scientists as PIs that drew interest within the business and management research (e.g. Boehm and Hogan, 2014; Mangematin *et al*., 2014; Cunningham *et al*., 2016).

What these traditional academic and administrative roles have in common, as they transmute during their travel towards the shifting arena" /third space", is ambiguity: in studies on research administrators and knowledge exchange staff reported respectively by Whitchurch (2008 and 2009) and Knight and Lightowler

(2011); in studies of scientists as PIs reported by Cunningham *et al*. (2014) and Cunningham *et al*. (2015).

In my data the evidence of shifting boundaries could be seen in the range of practices scientists engaged in. The *trust-building practice* could be perceived as the original tacit and innate practice that scientists participated in as part of their day to day pursuit of research. In contrast the *accountable and transparent* as well as the *risk-taking* practices emerged in response to the policies introduced through NPM and knowledge economy ideologies that applied quasi-market forces to HE sector at large, both at governmental and institutional level.

Through a Bourdieusian lens, the emergence of "shifting arena" or "third space" could be interpreted as an emergence of a new joint field. Revisiting Tuuinamen (2005) and his observations about HE sector's current preoccupation with administrative and political issues to the detriment of scientific practice; and Albert and Kleinman (2011, p. 270), who drew from Bourdieu, and their comments about changes within the HE sector such as "the entry of players whose primary goal is not the acquisition of scientific authority but the use of scientific knowledge for economic purpose or political ends" leads to a sense that as well as an emergence of a new joint field, we may be witnessing the diminishing authority of the scientific field.

6.6 Summary

Chapter 6 started with a research overview including aims and methods. The results of my study were discussed by drawing from four distinct areas of research: environmental sector literature that promoted knowledge brokering; HE research; literature on boundary spanning and social networks that belongs within the broad umbrella of LKM research; *cycle of credibility* by Latour and Woolgar (1986) and Bourdieu's theoretical concepts that fall broadly within SSK. This research thus brought together disparate literatures with range of perspectives and concepts.

Specifically, my discussion focused on three interwoven aspects:

Research approach and design: How are science—policy interactions studied? Utilising typology by Callon (1995) I identified contrasting philosophical and theoretical streams in the literature review of environmental sector studies presented in Chapter 2. Following advice from Albert and Kleinman (2011), I adopted a multifaceted research design incorporating both a micro and macro focus (Figure 6.1). Such multi-layered research design allowed flexibility; in this research this was achieved by introducing additional theoretical concepts in light of research findings. I put forward that the model of science as competition and Bourdieu's lens and his theoretical concepts are considered most appropriate for the study of science—policy interaction. In the words of Reay (2004, p.31), scientists are ultimately "cultural capitalists".

Boundary spanning roles within HE sector: Environmental sector studies put forward a generic call for the introduction of designated knowledge brokers. My results suggests that designated knowledge brokers/ boundary spanners, as roles performing relatively low capital-amassing activity of one-directional science communication and research dissemination from science to the public might be suitable to a pure research – traditionally "ivory tower" type of HE environment. Within applied research environment it was likely that scientists in post were already performing informal boundary spanning roles albeit most possibly incognito as part of their day to day activities of exchanging and amassing capital, whether social, cultural or economic - which are recognised as core activities of scientific practice.

The actual practice of science—policy interactions: Not one but multiple practices were identified; highlighting scientific practice is complex and sometimes contradictory. It invokes Bourdieu's metaphor of scientists as investors in the game of scientific field. The common thread for all practices was the paramount importance of interpersonal relationships and building of trust and social capital.

- *Trust building practices* were considered the innate, tacit and informal practices for science—policy interaction. At their core was a cyclical process built on trust, and reciprocity and thus also on risk.

- *Accountable and transparent* practice emerged in response to government policies and ideologies of neoliberalism, NPM and knowledge management. The nature of interaction in these practices was not cyclical but linear, with a definite start and end. These were the formally-recognised practices; comprising explicit routines. They could be measured, monitored, and controlled; as required by a bureaucratic type of university (Barnett (2011).

- In contrast, the *risk-taking practices* were effectively counter-practices to the only practices increasingly recognised within HE sector as legitimate, the *accountable and transparent* practices. The *risk-taking practices* emerged as part of scientists' survival strategies, with aim at getting things done and succeed in business wining. It appeared these informal practices were resilient, not eradicated but rendered invisible.

The discussion of the results in this chapter concludes with a summary of the contributions to knowledge made by this research (Table 6.2).

Table 6.2 Summary of research contributions to knowledge

Research findings	**Contributions to knowledge**
The study of science—policy interactions	Refutation of the suitability of the positivist stance emanating from natural sciences paradigm for the study of science—policy interactions Refutation there was a science—policy gap Refutation that science and policy were two distinct separate entities: science and policy were interlinked; HE sector affairs have been increasingly micromanaged by government and its research funders on whom science is dependent for funding its research Addition of linking the emergence of the concept of knowledge brokering to overbearing influence and preferences of research funders on what counted as useful knowledge and its terminology Confirmation that scientific practice is a social endeavour Confirmation that a compelling understanding of the scientific field could achieved by seeking to understand both local practices and broader discourses

Research findings	Contributions to knowledge
	Confirmation that the model of science as competition was ideal for the study of science—policy interactions Confirmation of the relevance of a Bourdieusian perspective and the concepts of symbolic and social capital for the study of science—policy interactions Confirmation of the relevance of the cycle of credibility by Latour and Woolgar for the study of science—policy interactions
The practice of science—policy interactions	Addition of three discursive constructions of a scientist as a *Contractor, Confidant, and Educator* Confirmation that trust is a key ingredient in the practice of science—policy interactions Confirmation that at the core of scientific practice is the activity of amassing and converting of an individual's symbolic capital Addition to the of cycle of credibility by Latour and Woolgar by the trust building strategy Addition of the trust building strategy as a cyclical process with five core attributes: access, experiential knowledge, doing favours, trust, and repeat work Addition of three practices: *trust-building practise, accountable and transparent practices, risk-taking practices* Confirmation that we are in the era of science commodification where scientific knowledge is considered primarily as a tradable commodity
Knowledge broker role	Addition of expanding on the options of boundary spanning roles within Higher Education Refutation of the feasibility of a universal call for the introduction of designated knowledge brokers for science—policy interactions Addition to the understanding of a feasibility of the appointment of a designated knowledge broker role as an outcome of accountable and transparent practices enforced by government funders Addition to the understanding of a feasibility of the appointment of a designated knowledge broker role within a setting where pure research was conducted Confirmation that an appointment of a designated knowledge broker might be not effective either due to: 1) lack of symbolic capital, 2) knowledge broker viewed as a threat by others with strategic positions within an interpersonal network Confirmation that scientists were informally acting as boundary spanners in practice Addition to the understanding of informal boundary spanning activity in practice as a resource – i.e. symbolic capital amassing activity Addition to the understanding of which practices enact the intermediary/matchmaking role

CHAPTER 7: CONCLUSIONS

Chapter 7 has four sections. Theoretical implications are presented in Section 7.1 whilst in Section 7.2 practical implications are discussed. The limitations of this research are outlined in Section 7.3. Suggestions for further research are put forward in Section 7.4.

7.1 Implications for theory

The theoretical implications are discussed, followed by implications for practice.

7.1.1 Contributions to the study of science—policy interactions

My findings uphold the view expressed by Albert and Kleineman (2011), and in effect of Pierre Bourdieu whose work inspired the authors, that in order to make sense of the current world of science one must adopt multiple research lenses to study it.

Drawing from SSK and constructionism I interviewed individual scientists; before adding a dimension of a single case study in a form of a UK university where the interviewees were employed at the time. To complete the picture, I called on findings from Higher Education research to paint a broad canvas into which my case study was embedded. Such a multifaceted research design that I carefully assembled for the purpose of this study (Figure 6.1) is unique if compared against the studies advocating knowledge brokering concept that were reviewed in Chapter 2

In Chapter 2, the majority of the reviewed studies from the environmental sector were found to represent the model of science as rational knowledge whilst a smaller group of the studies symbolised the model of science *as* sociocultural practice. None appeared to explicitly utilize the model of science as competition and to adopt a Bourdieusian perspective

The findings that emerged from the application of my multifaceted design corroborate the relevance theoretical concepts from STS; notably *the cycle of credibility* by Latour and Woolgar (1986) and the teaching of Pierre Bourdieu. The model of science as competition is identified as of utmost relevance for the study of scientific practice

In that respect the emergence of the concept knowledge brokering in the positivist studies that took a rational view on science—policy interactions could be viewed as an example of reinventing the wheel – a metaphor used by Edge (1995), a distinguished SSK scholar: i.e. how many researchers, unaware of SSK body of research, repeatedly put forward the idea of science as detached, objective, and representing one Truth. The sudden rise of the knowledge brokering concept within the environmental sector literature by researchers predominantly representing the rational view of knowledge could be perceived as a return to the historical question of: what is science? Is it about a disinterested pursuit of scientific facts or a social endeavour? These are important questions to consider because they determine the options of what interaction between science and policy could be like.

Firstly, the scientists I interviewed, in Callon's (1995, p.33) words, were no disinterested "statement utterers". They were social beings, who actively operated within interpersonal networks. They constructed science as overwhelmingly a social endeavour: a complex multifaceted practice; a resource amassing activity; subtle and dependent on relationships embedded within interpersonal networks that scientists could mobilise for various purposes (e.g. bidding for a new research contract). Furthermore, the practice was very context specific. It also depended on the skills of the individual person spanning the boundary between science and policy. Moreover, such interaction preferably took place on a one-to-one basis via a mutual dialogue in which understanding develops, with the scientist acting in a role similar to those found in the discursive constructions of *Confidant* or *Educator*. Such interaction between a scientist and a policy maker was deeply personal; stemming from a relationship built on trust,

reciprocity and reputation. During this practice, favours were exchanged; new doors were opened; luck was called for; social relationships were reinforced, trust deepened; judgements made; fudging done; risk undertaken; contacts brokered; symbolic capital accrued.

Additionally, not only scientific knowledge was exchanged, but other different types of knowledge were involved in the process: experiential knowledge gained through the practical experience of working on a piece of research; group dynamics knowledge shaped during the process of working in research teams; and knowledge of how to navigate through the complex tendering procedures in client organisations and policies within own institution.

This suggested that it was unlikely that interaction between science and policy could be reduced to an unproblematic mechanical transfer of scientific knowledge. Moreover, Chapter 4 showed profound changes in the UK HE sector have been the direct outcome of government policies and how science was dependent on government and its research funders for funding. Thus science was intertwined with the policy; the two were not distinct separate entities as portrayed in some of the studies from the environmental sector reviewed in Chapter 2 (e.g. Owens and Rayner, 1999).

The dominant model of science as rational knowledge utilised in the reviewed literature from the environmental sector that promoted knowledge brokering was limited in how it could grasp the complexity of science—policy interactions; its abstract depiction of science—policy interface as a gap between two distinct and homogenous worlds that had to be bridged was simplistic and redundant. Additionally, this model ignored the constitutive power of language – an aspect that was not to be overlooked in science—policy interactions but paid attention to. Knowledge brokering could then be compared to the ““diagnosis-of-the-era’’ type of theorizing” that was discussed in the study by Tuunainen (2005, p. 283; citing Miettinen 2002 and Tuunainen, 2002).

My research demonstrated that for a study of science—policy interactions, adopting a SSK lens was particularly pertinent; given its view on science as a multifaceted sociocultural practice that was not epistemologically special from any other social practice. However, the findings of this research also suggested that the answer to the question, 'what is science' was no longer about whether it was a disinterested pursuit of truth or rather a social endeavour. In light of my findings, this division and discussion now appears outdated – science is undisputedly a social practice.

7.1 Implications for practice

7.1.1 Contributions to the practice of science—policy interactions

The literature from the environmental sector that was introduced in Chapter 2 described the current interaction between science and policy as inadequate: fourteen shortcomings were identified ranging from the performance measurement in academia with its bias towards publishing in peer-reviewed journals (e.g. Holmes and Savgård, 2009) to institutional barriers in academia and its structure's emphasis on narrowly defined disciplines (Pereira *et al*., 2009) and dissimilar technical language in use by different scientific disciplines adding to the complexity in communication (Michaels, 2009). Such a disparity of ailments is unlikely to be addressed by one universal solution such as knowledge brokering was presented to be and by viewing knowledge as a commodity that can be simply moved from one place to another. In line with the studies representing the co-construction view and that were reviewed in Chapter 2, the linear model of science—policy interaction was found to be simplistic and impractical: it ignored the social nature of the interaction that was more accurately described as a cyclical process.

As a whole, the call for the introduction of knowledge brokering as a solution to bridging the science—policy gap, found in positivist studies from the

environmental sector, mostly ignored two important aspects of scientific practice and thus science—policy interaction:

- The importance of symbolic capital; i.e. capital that was not necessarily economic;
- The utmost importance of social capital in the form of interpersonal relationships

The research findings presented in Chapter 4 and 5 showed that the concept of symbolic capital was critical for scientific practice, such as building relationships with clients. Symbolic capital could be amassed and converted into other types of capital whilst other important ingredients were interpersonal relationships and trust. As Williams (2002, p. 116) put it, in conclusion of his review and empirical study of boundary spanners within the public sector: "trust must underpin effective relationships at both an individual and organizational level." Similarly, amongst the studies reviewed in Chapter 2 there was a call for "safe and authorised space" where scientists and policy makers could meet and develop a "constructive dialogue and building of mutual trust" (Pereira *et al.*, 2009, p. 5,427: also Michaels, 2009).

In my study the paramount importance of symbolic and especially social capital appeared unrecognised. The longstanding policies within the university where the scientists were based and within the public sector organisations from which their clients came, ultimately exerted pressure on the cycle of *the trust-building strategy* that they engaged in to be broken into a linear process with a designated start and end. The pressure was driven by the ideologies of NPM and knowledge economy, disguised as calls for accountability and transparency.

The findings of this research suggested that what was needed for improving the state of science—policy interaction were not novel solutions and interventions, such as knowledge brokering was purported to be. Instead, simply focusing on nurturing interpersonal relationships between scientists and policy makers would help; by universities creating supportive environments that would allow scientists

to complete their own cycles of *trust-building strategy* without fear of repercussions; and by trusting them to work not only in their own best interests but also in the interests of their colleagues and the university they represented.

The *trust-building strategy* offered practical ideas on how one may positively intervene and thus contribute to forming a new cycle with a new client; e.g. by being proactive and recognizing physical contact and chance as important ingredients that could enhance the formation of the cycle. Equally, by understanding that *the trust-building strategy* takes time to build and develop; yet once in place the time to engage in the process will be reduced and it will be possible to continuously re-deploy it. Thus *the trust-building strategy* would serve as an invaluable shortcut for speeding the process of accumulating capital including economic one. Therefore *the trust- building strategy* was found to be an indispensable weapon in the arsenal of an astute scientist wanting to be or having to be a business winner.

Some may wish to point that there is an (un)ethical dimension to gaining business advantage through contacts and networks (which is why public funding bodies devised impersonal systems for the application and distribution of funding that are deemed to be fair). However, it could be argued that these new systems research funders implemented as a way of striving for accountability and transparency were not less unscrupulous than the other system of reliance on interpersonal relationships: figures of grant league tables showed that majority of research councils' funding was allocated to a small proportion out of all the UK universities (Jump, 2013).

Moreover, my findings showed that having formal online systems in place (with the aim to reduce reliance on subjective means of personal interaction) to be used for the application and distribution of funding did not eradicate reliance on personal relationship: it might paradoxically lead individuals to cling even more to their personal contacts as a way of grappling with the complexity of these systems. Impersonal systems might be used as a formality and a necessity when

in reality a research spec had been already prepared and written jointly by a scientist enacting the discursive construction of *Confidant* or *Educator* and his long term client who happened to be working in a given governmental department or a quango that issued the research call; with the outcome that the research funding was allocated to the scientist who co-created the research spec and call. Similarly, a formal research call advertised through an online system might act as a trigger for new personal interactions and lead to symbolic capital amassing activities through matchmaking.

So despite a strong drive by the government to introduce transparent and accountable practices based on impersonal online systems, the practice of repeat work as arising from one's interpersonal network had not been eliminated completely; enduring relationships with clients allowed some scientists to overcome these barriers and to continue strengthening their relationships with their clients.

Alternative models for science—policy interaction – i.e. in between those two extreme scenarios of research funding allocation based on sole reliance on accountable and transparent practices and exclusive reliance on interpersonal relationships - could be explored, i.e. those that would balance these arrangements with mechanisms in place that would encourage a flow of new ideas.

Finally, the importance of equality of the footing of scientists and policy makers appeared to be fundamental to quality of interaction between these actors: i.e. for both to be viewed as equal as opposed to the unequal relationship that was enacted between a producer (of knowledge) and a consumer of that knowledge.

7.1.2 Contributions the concept of a knowledge broker role

In this section I outline practical implications for the university under study in light of my findings that contribute to the discussion about the knowledge broker role.

Such implications are conjectural but considered plausible based on the knowledge reviewed in this thesis.

My research took place at Cranfield University, one of the 115 universities in the UK at the time. In Chapter 4 this relatively small and only postgraduate HE institution was presented as hard entrepreneurial: a model Thatcherite University with a long history of embracing neoliberal values; and with prescribed core business in this strategy document as wining and delivering research, selling postgraduate courses, and increasing short course income (Cranfield University Intranet, undated, c).

The state of the HE sector, as portrayed in Chapter 4 through the lens of HE research, illuminated the drivers behind Cranfield University's irreversible transformation over the course of its short history into primarily a HE institution whose core values centred on commodifying knowledge. Consecutive UK governments enforced policies that under the guise of calls for reducing spending and accountability and transparency introduced free-market ideologies prioritising economic gain into every sphere of the public sector (e.g. Deem et al., 2007; Lock and Lorenz, 2007; Radder, 2010). The emergence of the concept of knowledge brokering within the environmental literature reviewed Chapter 2 could thus be viewed as part of one political and economic juggernaut that had transformed universities and science beyond recognition: beyond the medieval portrayal of a university as a distinct neutral ivory tower into an entrepreneurial powerhouse, likely to be operating as a charity-cum-corporation promoting actively in commodification of scientific knowledge as Cranfield University was doing. Some compare these changes to universities being turned into "government supermarkets" Holligan (2011, p. 60).

Whilst many organisations with the HE sector had been implementing radical changes to their staffing and structure for some time; Cranfield University where I conducted interviews appeared slow at adopting such initiatives. For example, my interviewees raised the issue of lack of dedicated business administrative

support at the time when HE research showed such new support roles were already established at other UK universities (e.g. as shown in studies by Whitchurch, 2008; Allen-Collinson, 2009, Hockey and Allen-Collinson, 2009).

Similarly at the time I conducted my research Cranfield University had only one designated knowledge manager out of its 650 scientists and 1040 support staff (HESA, undated). In contrast, for example, the University of Edinburgh was reported to have at least twelve such dedicated knowledge roles (Knight and Lightowler, 2010). At the time of my research the division of labour could thus be considered as very traditional - as, for example, described in Whitchurch (2008, 2009). This meant scientists at Cranfield University performed standard academic roles of teaching and conducting applied research for external clients whilst the support staff were in primarily bounded roles based in e.g. registry and finance departments.

HE research presented in Chapter 4 alerts us to gradual but fundamental changes occurring in the HE sector at large; resulting from exerted pressure on HE institutions by consecutive governments wedded to the ideologies of knowledge economy, NPM, and neoliberalism and demonstrated through, example, increased demands to account for research impact through monitoring and evaluation exercises (e.g. Deem et al., 2007; Disensbach, 2009). The changes resulting from adoption of new ideologies led to a shift, a movement of boundaries between what was considered scientific and non-scientific work: what researchers in HE sector label as a “shifting arena” (Shelley, 2010) and “third space” (Whitchurch 2008, 2009, 2013).

At the university where I conducted the interviews the incrementally emerging shifting arena” / “third space” appeared either invisible, un-recognised, or simply ignored. For example, the university had no L&D lead for number of years (2005 – 2008) whilst deficiency of dedicated business support was highlighted by my interviewees. This development, or lack of it, points to the corporate culture at Cranfield University and its *hard entrepreneurial* stance aggressively fixated on

maximising economic profits, potentially to the detriment of other activities. This environment demanded that scientists, working as individual experts, performed a diversity of roles themselves in a very internally competitive environment where colleagues and departments were forced to compete against each other, having to protect their symbolic capital from being encroached by internal colleagues. The lasting changes introduced under the reign of Lord Henry Chilver as its Vice-Chancellor effectively erected new boundaries internally that were previously not there before.

It is postulated that a lack of conscious and considerate strategic direction by the university's senior management in response to the emergence of the "shifting arena" / "third space" meant that the new void was not filled by newly appointed support staff (such as research and business administrators as it happened at other UK universities who featured in the HE research studies introduced in Chapter 4) but covered by existing academic staff whose roles and practice was being increasingly stretched into this emerging "shifting arena" / "third space". In effect the practicing scientists at Cranfield University, were to lesser or greater extent forced as individual experts to expand their remit and acquire specialised knowledge in areas originally considered outside of the science boundary, as part of going about their day to day activities.

Such arrangements are considered unsustainable long term. On a personal level many of my interviewees appeared to already experience high level of stress: In Section 4.5 I included quotes from five of my interviewees who spoke of: "so many demands on my time", "headless chicken stuff", "I am full on really, "I just get swamped"; "you live for work rather than work to live." Whilst the two interviewees who initially agreed to be interviewed subsequently declined to due to lack of time (which could be taken as a genuine reason or as a polite excuse for changing their mind in their desire to participate). Nevertheless unless the university in question introduced a radical change the situation I describe could result in serious implications for staffing levels; due to academic staff either being off ill long term with stress and burnout and/or leaving the university entirely.

At the same time an increased pressure from government funders could stipulate appointments of designated knowledge broker roles as a condition for a receipt of funding. Thus it seemed inevitable the university under study would eventually follow examples of other UK universities and eventually start appointing dedicated research support staff and creating new hybrid roles as those described by e.g. Allen-Collinson (2009) and Shelley (2010). Such change would involve increasing the number of non-academic staff by appointing dedicated research administrators and managers who would work alongside practising scientists/academics in order to optimise and intensify research activities.

However, in light of the understanding gained from the numerous research strands reviewed in this thesis, there are implications for Cranfield University in creating these new research support roles in a much delayed fashion in comparison to the HE sector at large.

Firstly, scientists at Cranfield University already had to stretch themselves over a prolonged period of time into “shifting arena” / “third space” to cover the emerging void. As I stated earlier, as part of their individual survival strategies, they were pushed into this expanding space in the first instance, during a period of absence of new research support roles at Cranfield University. In the process, they adopted various strategies in the process for doing so. Some resisted or at least might had pretended to resist in the eyes of senior management. Through a Bourdieusian lens, at least some would had recognised the unparalleled opportunities for amassing cultural and social capital that were opening themselves to them within this new space. Being good at calculating interests and profits, in Latour and Woolgar’s words, they would had staked their positions in this new emerging field. Drawing from the HE research reviewed in this thesis, one can postulate that in the future some would go as far as utilising their newly acquired knowledge and experiences including the ability to navigate the shifting arena” / “third space” with ease by even abandoning their traditional academic role altogether (in recognition to the diminishing value of such roles), and instead

taking up a new powerful position in research management or leadership/management development.

The above can be used to prognosticate that an initial resistance of at least some scientists to first stretch into the “shifting arena” / “third space” could equally be replaced with resistance to then withdraw from “shifting arena” / “third space” in order to allow this space to be occupied by new entrants - research support staff upon their eventual appointment. Scientists who would had built valuable capital within the new field of “shifting arena” / “third space” would be fiercely protecting their turf. This fierceness would have been amplified at Cranfield University that made its academic staff to hone their competitiveness and ruthless business wining identify over many years.

As a result it is envisaged the new research support roles created at Cranfield University in the future would not have the flexibility and freedom to shape their roles and expand their boundaries as reported in the studies by e.g. Whitchurch (2008, 2009), Allen-Collinson (2009), Knight and Lightowler (2010), Shelley (2010). Instead, the will end up in highly prescribed, bounded-type of roles as outlined by Whitchurch (2008, 2009): relatively low-paid roles with limited opportunities for amassing valuable social capital and suitable for candidates with limited cultural capital.

The university’s management could of course also decide to ignore the position and expert knowledge acquired by its scientists within “shifting arena”/ “third space” as well as the evidence that exists in literature on the pitfalls of appointing designated boundary spanning roles without consideration of individual’s prior capital their poises and position within a network (e.g. Scanlan and Tushman, 1981, Nochur and Allen, 1992, Levina and Vaast, 2005; Kim and Jarvenpaa, 2008, p.3). Subsequently higher grade research support and managerial roles could be created. Such move would be considered very unfortunate: effectively pitting one set of staff against each other.

The scientists faced with yet another losing battle with the university's management, might decide to leave the university altogether to the detriment of the university that would lose not only its highly experienced staff but also the knowledge they hold. The new staff in the research support roles could be equally unhappy and frustrated if e.g. the opportunities to shape their roles and cross boundaries would not materialize and they would experience tensions as described in Whitchurch (2009) and "moral exclusion" as highlighted in Allen-Collinson (2009); leading to also high staff turnover on their part.

There could be an alternative to following the mainstream approach in the HE sector of introducing new research support staff and filling the void of the new shifting arena" / "third space". Creating a bespoke solution by Cranfield University would appear pragmatic in light of the experiences, knowledge and specialised skills that its scientific staff would have accrued already over time they would had spent stretching themselves into the "shifting arena"/ "third space". Especially given that the university under study is well placed in developing a bespoke solution. Its unique advantage is in the form of its own highly reputable School of Management; ranked as 5th best UK business school, according to Financial Times (2011). Experts at this business school could tailor a bespoke solution by applying the breadth of knowledge and insights from areas of research such as LKM, social network analysis, knowledge sharing within organisations, and informational boundary spanning outlined in this thesis.

Developing a bespoke solution, in response to the emergence of the "shifting arena"/ "third space", at the time of prevailing ideologies of NPM, knowledge management and neoliberalism would be a bold step for any HE institution. The decision would be likely to be viewed as an example of *risk-taking practice, not* at an individual but an institutional level. Referring to Barnett (2011), it would require a visionary leadership on the university's part, not management; one that would nurture strong ethos and spirit of the university. Such imaginative leadership, recognising the development of an alternative approach to the emergence of shifting arena" / "third space" within HE sector as a "feasible

utopia", again in the words of Barnett (2011, p.154), would welcome and embrace such a challenge.

7.2 Limitations

The following limitations were acknowledged in this research:

Context: The findings of this research were based on one case study set within a *hard entrepreneurial* type of university, according to the Barnett's (2011) typology of universities. I thus recognised that my data were local constructions. Different findings might be reported from a research set within a dissimilar type of a university, i.e. within a *soft-entrepreneurial* type strongly oriented towards civic form of entrepreneurialism and committed at large to engagement with local communities and the wider public.

Sampling procedure: My sampling was not incremental, as was a common practice in exploratory social sciences' studies. All of my potential interviewees were selected at once. This might have prevented further and more suitable individuals from being identified as the research progressed.

Additionally, two of my interviewees were from a different school – Cranfield Health – as opposed to SAS. However, during the interviews, it became apparent that their experience of scientific practice was very similar to the other interviewees, apart from a unique funding arrangement that one of these interviewees experienced. These two interviewees led me to consider that the experiences the other twenty-eight interviewees from SAS were not unique to staff in that particular School (and Department), but rather represented broader patterns of scientific practice to be found across the academic institution in which the study took place.

Size of the sample: At the start of conducting my fieldwork, I was not aware of the recommended sample size of an exploratory social sciences' study. Finding no suitable guidelines as to how many interviewees to have, I went on to

persuade all of the scientists on the streamlined list of potential interviewees. Only afterwards I came across the advice by Kvale and Brinkmann (2009, p. 113) who suggested the recommended sample size for this type of study to be “around 15+/-10”. The authors commented:

> “A general impression from current interview studies is that many would have profited from having fewer interviews in the study, and instead having taken more time to prepare the interviews and analyze them. Perhaps as a defensive overreaction, some qualitative interview studies appear to be designed on a misunderstood quantitative presupposition – the more interviews, the more scientific.” (Kvale and Brinkmann, 2009, p. 113)

Reflecting on my experience of carrying out this research, I agree with Kvale and Brinkmann (2009). In this case, the number of interviewees I had was not an outcome of my “defensive overreaction”. I consider the high number of interviewees to be actually not detrimental, but a positive element of my research. This is because in almost all of the interviews, new aspects were brought up. For example, the issue of the designated knowledge broker role being incompatible with the university’s practice of measuring business winning through the SAS loading form was only brought up in the penultimate interview.

Gender: My sample was skewed in terms of gender; I interviewed 7 female and 23 male scientists. I did not differentiate further how the experiences of scientific practice could differ by gender.

Terminology: At the time when I conducted this study, networking was still a relatively new term used in scientific practice and more commonly associated with advancing one’s career (e.g. Vitae, 2012) rather than with pursuing business opportunities. This might explain why some interviewees seemed unsure when I asked them what networking they did. Therefore it may had been clearer if I asked my interviewees about relationship building with their clients as opposed to networking with their clients. However, other scientists I interviewed spoke of

“living for networking” and appeared very actively performing this practice. This suggested, coupled with the ongoing changes in HE sector, that networking for business was on the way of becoming a mainstream term and practice within academia.

Higher Education research: It is acknowledged there are other areas of research that could be considered relevant to the discussions within this thesis. These are concerned with study of academic identities:

Mary Henkel, a prominent HE scholar on the topic of academic identities who wrote about their “drastic loss” (Henkel, 2000, p. 260) and about the critical breakdown of traditional academic identities (e.g. Henkel, 2010).

The concepts of “third space”, “blended professionals” and “bounded professionals” were put forward by Celia Whitchurch (2008, 2009, and 2013). Thus my findings would support the notion that academic roles were moving into the “third space” and that the scientists in my study, acting as boundary spanners in practice, resembled the “blended professionals”, as theorised by Whitchurch (2008, 2009, 2013).

My data revealed glimpses of individual incongruences with the prevalent view, both at institutional and national level, of doing research primarily as a business winning activity. These instances may be interpreted as examples of “academic identity schism”: a phenomenon described by Richard Winter (2009, p. 121, quote marks original): in which the key was “the notion of person–organisation values fit and the degree to which the ideologies and values of academics were congruent (the ‘academic manager’) or incongruent (the ‘managed academic’) with the prevailing discourse of corporate managerialism.”

In my study I drew from SSK and Callon’s (1995) model of science. It is acknowledged other models are out there in other disciplines outside of SSK and

these models will be considered highly relevant to my study (e.g. for those from HE research the ideas of Gibbons *et al*. (1994) of Mode 1 and Mode 2 science).

The focus of my study was the practice of spanning boundaries between science and policy. I followed the advice of Albert and Kleineman (2011) who called for studies into scientific practice to adopt a specific research design that would enable to examine relationships between local practices and wider discourses. Therefore Higher Education research was used primarily as a backdrop into which my case study was embedded: to help to illuminate the wider forces that might have influenced the emergence of knowledge brokering within the environmental sector. A thorough discussion drawing from research on academic identities or on models of knowledge production emanating from HE research is beyond the scope of this thesis.

Boundary work: Although utilizing the lens of SSK, I did not explicitly set out to examine the concept of boundary work, as outlined by Gieryn (1995). Yet instances of boundary work were found in my data, for example, in the discursive construction of *Educator* where scientists positioned themselves into the role of translators and interpreters between scientific and non-scientific language (i.e. the language spoken and understood by a client).

Knowledge versus information: I have not delved into philosophical discussions about the difference between knowledge and information. Yet given the label of knowledge brokering, such discussion seemed pertinent. The need to engage in such discussion had been raised in the reviewed literature from the environmental sector by Surridge and Harris (2007) and earlier by Litfin (1994).

7.3 Further research

The findings of this study pointed to further research that could be carried out in order to further illuminate the practice of operating at the science—policy interface:

Use of sociometric data and social network analysis: There might be other instances when practising scientists performed a social role of boundary spanners in practice between science and policy that were not captured in my data. This could stem from my choice of method for data collection that relied on interview accounts as opposed to sociometric data. Further research could investigate in more depth the role of scientists as boundary spanners in practice.

The optimal size of a scientist's network: In the discussion of *the credibility cycle* and *the trust-building strategy*, I stated that the practice was restricted by the capacity of one person being able to engage in several cycles of *trust-building strategy* simultaneously with a range of clients. It raised the question of what was the ideal size of a network of clients for a scientist to have, in order to optimise, for example her or his productivity? The answer to this question might vary depending on whether *the trust-building strategy* would be the only business winning strategy utilised or whether it would be supplementing other means such as responding to official research calls by funders. It would be interesting to know whether there is an ideal ratio between the different strategies deployed for successful business winning.

Trust within an entrepreneurial university: My findings invoke the question: What role, if any, does trust play within a university in its relationship with clients from policy making and policy implementation organisations?

Interpersonal trust emerged as a key variable in my results on the practice of science—policy interactions, showing scientists as engaging in a *trust-building strategy* and other *trust-based practices.* Still less than half of the interviewed scientists spoke of trust whilst the word trust did not feature in any of the university internal documents – e.g. its competency framework or in a school strategy document. So little worth was being placed on this aspect formally by the interviewees' institution and this could be reflected in the considerations of the interviewees as employees of the organisation.

Research suggests that effective relationships must be underpinned by trust at both interpersonal and organisational level (Williams, 2002). Trust at a personal level can influence a trust in a system and vice versa, confirms Luhmann (2000). The impact on trust resulting from influence of dominant ideologies, as noted by O'Neill (2002), warrants further examination. Radder (2010) reported that increased commodification of knowledge has led to diminished trust in science by the public. With the LKM literature, the need for further research on trust was identified in the review by Noe and Wang (2010).

The role of luck/chance: This was the second most quoted element of the practice of relationship building after trust, with 10 interviewees referring to luck. Examples of speech in the interviews included: "a lot of it is to do with luck, you know, you have to have the luck" and "There is luck, the whole thing is around luck, but you've got to be proactive to make the luck come to you." Elsewhere a relationship with a client developed as a result of a chance meeting: "I met him in a queue at the [government organisation building] [laugh] to go through security, I did not know him, I just happened to be standing next to him…" In the reviewed studies from the environmental sector it only featured in Bielak *et al*. (2008) who when describing science—policy relationships developed in Environment Canada admitted: "Sometimes, they result from serendipity —chance encounters at workshops, exchanges at bus stops" (pp.209-210). As with the concept of trust, luck/ chance appear intangible and difficult to pin down exactly. Although subject of interest to a diversity of research fields including philosophy and ethics, luck as a concept was found to be understudied (e.g. Coffman, 2007).

Business and management research: Given the pervasive reforms of HE sector that led universities to adopted and internalised neoliberal values, and that transformed an average UK scientist from *Homo Academicus* into *Homo Economicus*, it then seemed natural to call on research findings from business and management sector to elucidate current scientific practices. When the scientists I interviewed spoke of the importance of not being "a bringer of bad news" (Interviewee 8) and about "giving the client way out" and "turning

something negative into something positive" (both quotes Interviewee 14) – these were effectively forms of business and marketing strategies. As my interviewees had the opportunity to attend the *University Business Skills Development Programme* where they could learn and acquire selling skills and how to make business pitches in person (Cranfield University Intranet, undated, e), it might be equally beneficial to consult with scholars from the business and management fields in order to illuminate workings at the science—policy interface. For example, a study mirroring mine could have been conducted from an organisational research perspective, as opposed to being embedded in SSK.

The proposed linkage between knowledge brokering, as depicted in the environmental sector literature, and the commodification of scientific knowledge, as discussed across the disciplines of HE research (Shumar, 1997) and philosophy of science (e.g. Radder 2010, Fuller 2010) is novel – and not one found to be made in the reviewed literatures.

Use of rhetorical devices in the practice of spanning science—policy boundaries: My research supported the idea that scientists did engage in some form of framing, as discussed by Litfin (1994) and Lövbrand (2007); and that they did use their discursive competence as debated in Litfin (1994) - in particular as exemplified in the discursive construction of *Confidant* introduced in Chapter 5 that revolved around a close relationship between an individual scientist and their client. Further research could reveal how discursive competence was deployed in such interactions, but focusing on the rhetorical devices and fact construction done during these processes. Such research would be vested within discursive psychology.

Aphorisms: The interview accounts contained aphorisms such as: "You need a sprat to catch a mackerel" (Interviewee 22); "It is important not to hide your light under a bushel," (Interviewee 26); and speaking of science: "It is a lottery really" (Interviewee 32). Aphorisms, according to Levine and Bleakley (2012, p. 153), are "succinct sayings that offer advice". The authors, investigating aphorisms in

the field of medicine, noticed that these are rarely researched. Yet aphorisms are not mere “historical curiosities”; instead they can be used for promoting best practice: to “affirm identities” within a particular professional field and to be utilized as valuable “educational tools” (Levine and Bleakley, 2012, p. 153 and 154). It appeared that aphorisms in use in the practice of spanning the science—policy boundaries have not been collected and researched either.

SSK studies*:* Examples of boundary work, a concept emanating from STS and defined as “examinations of when, how, and to what ends the boundaries of science are drawn and defended in natural settings often distant from laboratories and professional journals” (Gieryn, 1995, p 394, quotation marks original) were discerned in my data. Notably, in the discursive construction of scientist as an *Educator* who would engage in boundary work between science and non-science through the translation and interpretation of complex scientific information and knowledge into a non-scientific language of their client.

A more full-blown investigation into the emergence of knowledge brokering from the perspective of boundary work would be warranted. Particularly interesting could be research done from one specific SSK perspective - its branch versed in studying science controversies.

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APPENDICES

Appendix A List of reviewed studies (Chapter 2)

Table A-1 Published environmental sector studies utilizing knowledge brokering.

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
rational knowledge	Cullen (1990)	1990	Freshwater Biology	ecology/catchment management	No	knowledge broking, scientific information broker	individual
sociocultural practice	Litfin (1994)	1994	Book	atmospheric chemistry/climate change	Yes	knowledge broker	individual
rational knowledge	Bouma (1997)	1997	Geoderma	agriculture/ soil	No	knowledge broker	individual
rational knowledge	Owens Rayner (1999)	1999	Journal of Environmental Policy and Planning	environmental science-policy	Yes	knowledge broker	organisation
competition/ social network analysis	Sverrisson	2001	Acta Sociologica	economic sociology	Yes	knowledge broker, knowledge brokerage, collective entrepreneur, environmental brokerage	individual

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
rational knowledge	Konijnendijk	2004	Scandinavian Journal of Forest Research	urban forestry	No	knowledge broker	organisation
social network analysis	von Malborg	2004	Business Strategy and the Environment	planning	No	knowledge broker	organisation, individual
sociocultural practice	Lövbrand	2007	Environmental Science and Policy	atmospheric chemistry/climate change	Yes	knowledge broker	individual
rational knowledge	Bammer	2007	Ecology and Society	Integration and Implementation Sciences	No	knowledge broker	individual
social network analysis	Feng *et al.*	2007	IEEE	agriculture/ soil	Yes	knowledge broker	individual
sociocultural practice	Rydin *et al.*	2007	Planning Theory and Practice	planning	No	knowledge broker, knowledge worker	organisation, individual

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
rational knowledge	Surridge and Harris	2007	Interdisciplinary Science Review,	ecology/catchment management	No	knowledge broker	individual
rational knowledge P M	Bielak *et al.*	2008	Chapter 22 in Chen *et al* (eds.) Communicating Science in Social Contexts	environmental science – policy	No	knowledge brokering, knowledge broker	approach, individual, unit within an organisation
rational knowledge P M	Holmes and Clark	2008	Environmental Science and Policy	environmental science – policy	Yes	knowledge broker, interpreter, science arbiter, honest broker,	individual
rational knowledge M	Holmes and Savgård	2008	Science and Pubilc Policy	environmental science – policy	Yes	knowledge brokering, interpreter, intermediary,	organisation, individual
rational knowledge	Kiparsky	2009	Water Policy	ecology/catchment management	No	knowledge broker	individual, process
rational knowledge P M	Michaels	2009	Environmental Science and Policy	environmental science – policy	No	knowledge brokering, knowledge broker, boundary spanning	strategy, individual

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
rational knowledge	Pereira *et al.*	2009	Atmospheric Environment	atmospheric chemistry/climate change	Yes	science communicator, translator, interpreter	individual
rational knowledge M	Shanley and López	2009	Biotropica	ecology/catchment management	Yes	knowledge broker	individual
rational knowledge P M	Shaxon	2009	Philosophical Transactions of the Royal Society - B	environmental science – policy	No	knowledge brokering, knowledge broker	approach, individual
rational knowledge	Sheate and Partidário	2009	Environmental Impact Assessment Review	environmental assessment	Yes	knowledge brokerage	appoach, individuals
rational knowledge	Sterk *et al.*	2009	Land Use Policy	environmental modelling	Yes	knowledge broker	ideotype of a boundary arrangement of a science and policy interaction
rational knowledge P	Sheikheldin *et al.*	2010	Environmental Management	ecology/catchment management	Yes	knowledge brokering, knowledge broker	appoach, individuals

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
sociocultural practice	Gutiérrez	2010	An International Journal of Policy, Administration, and Institutions	ecology/catchment management	Yes	knowledge brokerage , knowledge broker	individual
rational knowledge M	Holmes and Harris	2010	Evidence and Policy	environmental science – policy	No	knowledge brokering, knowledge broker, interpreter, intermediary	individual
rational knowledge M	Holmes and Lock	2010	Marine Policy	marine policy/fisheries	Yes	knolwedge broker, interpreter	organisation
rational knowledge	Koski	2010	Policy Studies Journal	environmental science – policy	Yes	knowledge broker	people
rational knowledge	Bouma *et al.*	2011	Advances in Agronomy	agriculture/ soil	No	knowledge broker	individual
social network analysis	Pettit *et al.*	2011	Australasian Journal of Environmental Management	ecology/catchment management	Yes	knowledge brokering	individual

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
social network analysis	Eastwood *et al.*	2012	Agricultural Systems	agriculture/ soil	Yes	knowledge broker, translator	individual
non-realist/ innovation	Kingiri and Hall	2012	Review of Policy Research	agriculture/ soil	Yes	knowledge broker, policy broker, knowledge brokering	organisation
These studies utilise the term "knowledge brokering" or similar once and therefore were excluded from further stages of analysis	Verweij and Densen	2010	Marine Policy	marine policy/fisheries	Yes	knowledge broker	individual
	Hegger at al.	2012	Environmental Science and Policy	atmospheric chemistry/climate change	No	knowledge brokering	process
	Krueger *et al* .	2012	Environmental Modelling and Software	environmental modelling	Yes	knowledge broker	organisation, individual
	Klerkx and Proctor	2013	Land Use Policy	agriculture/ soil	Yes	knowledge broker, network broker	individual
	Pietri *et al.*	2011	Coastal Management,	marine policy/fisheries	No	knowledge broker	organisation
	Sharman and Holmes	2010	Environmental Policy and Governance	energy/biofuels	No	knowledge broker, policy entrepreneur	individual
	Phadke	2005	Society and Natural Resources	ecology/catchment management	Yes T	knowledge brokering	individual

Theoretical origins	Author(s)	Year	Publication	Research topic area	Empirical	Term used	Knowledge broker
	Lake *et al*	2010	Marine and Freshwater Research	ecology/catchment management	No	knowledge broker	organisation

M = the study is citing McNie (2007), *Reconciling the supply of scientific information with user demands: an analysis of the problem and review of the literature.*

P = the study is citing Pielke Jnr (2007), *The honest broker*: *Making sense of science in policy and politics.*

Appendix B Initial email sent to potential interviewees

Dear *Name*,

My name is Kristina Sodomkova and I am a researcher based in Centre for Water Science working with Prof. Paul Jeffrey on an EC-funded project called PSI-connect (http://www.psiconnect.eu/). The project is exploring how the quality of interactions between science and policy might be influenced by specific forms of communication and practice.

Your Cranfield web profile suggests that, like many staff at Cranfield, you work very closely with practitioners and play a role in providing scientific knowledge to support decision making. In this context I'd like to ask if you might be willing to spend 30-45 mins talking to me about your experiences.

Please use the voting buttons at the top of this email to indicate whether you'd be happy to help us out with this study.

Alternatively, if you are not using Outlook rich format, please reply to me by sending me an email.

If you are willing to participate, then I will provide further details of what I'd like to talk about and we can organise a day / time to meet.

With best regards,

Kristina Sodomkova

Researcher/ PhD student
Centre for Water Science, Bld 52
School Of Applied Sciences
E: k.sodomkova@cranfield.ac.uk
Ext: 5595

Appendix C Interview template

Note: Remind interviewee at the start about the topics I am interested to discuss with them:

1. Communicating/building relationships with clients and colleagues + The value of these interactions
2. Essential skills for effective interaction with clients

Topic 1 COMMUNICATING/ BUILDING RELATIONSHIPS WITH CLIENTS – COLLEAGUES + THE VALUE OF THESE INTERACTIONS

Science diagram – projection technique: I ask my interviewees to draw their position on the diagram and then said:
I now would like to use this diagram to build our conversation around it, first looking at communicating and building relations with clients.

1. (clarifying, looking at the diagram) Who are the people you do research for? How do you refer to them? (terminology)
2. For what purposes do clients make use of your work?
3. Do you get repeat work with these clients?
4. How does it compare; working with an industry client and working with a government agency? Could you give a specific example that illustrates the difference?
5. Now turning to networking: what networking, if any, do you do?
6. What value do you see in networking?
7. What forms of communication do you have with clients outside work?

   Some researchers told me that they industry clients have their personal mobile number and are free to call them anytime; some play squash with their government contact once a month, some said they have their alumni in a client company and they keep in contact about new opportunities via email. Some said they have no other communication with research clients outside of a specific research project. What about you?

8. Now turning to your contacts at Cranfield. What staff from other departments/schools do you interact with as part of your work?
9. This next question is aimed directly getting at what you personally like and dislike about interacting with clients. What are some of things that you like? What about some things you don't like so?
10. If you had the option to solely concentrate on research in your work and leave communication and interaction with clients to others, what would you do?

11. Now imagine that you were approached to change the focus of your role from conducting research to a role that is about communicating with and developing client relationships. What would you do?
    If yes: do you see this role as a business management role, PR role or science communication role?

Topic 2 ESSENTIAL SKILLS FOR EFFECTIVE INTERACTION WITH RESEARCH CLIENTS

We've been talking about communicating and building relationships with clients and the value of such interactions. This last section of questions is concerned with researcher's essential skills in communicating with clients.

1. What do you think about the training and professional development opportunities that are available to staff at Cranfield University with regard to client interaction?
2. Have you ever received any training – for example, in communicating science to clients or the public?
3. Suppose I was a new inexperienced researcher who just came into Cranfield University and I asked you what I should do to effectively interact with my clients. What would you tell me?
4. How many years of experience do you have in academia?
5. That covers the things I wanted to ask. Anything you would like to add?

Appendix D Field note example

I wrote a field note after each interview, in order to capture further details from the interview encounters. These also served as a form of reflection. The field notes were structured using questions suggested by Patton (2002) and by Glesne (2010). Below is an example of my field note, written following an interview number 09:

Where did the interview occur?

In building 52, meeting room 8. The Interviewee chose a seat with a view towards the window so I sat opposite them. The room was bit small thought, at one point my chair kind of haphazardly moved as I tried to make myself comfortable. The Interviewee had a problem opening the door, the chair was in the way a bit, as the Interviewee tried to go out to answer a personal call. This call occurred just as we started with the interview so it did not pose a huge disruption to the interview. The Interviewee then switched their mobile phone off after they returned to the meeting room to continue in our conversation.

Under what conditions?

I got to work about 20 min before the start of the interview. I got bit stressed as I did not know exactly what was the meeting room number and I did not have a print out of the Interviewee's profile from the Cranfield University's web. As always, my PC was taking forever to load up, I had to reboot it at one point. It was then getting circa 8 min to the start of the meeting – I tried to call the Interviewee and they was not there. So I prepared some water and carried it into the meeting room (2 glasses). I then put on my coat on and went downstairs to wait for the Interviewee by the main entrance. I was just about to call the switchboard using my mobile phone when the Interviewee appeared. The Interviewee had a hat on but took it off – that is how I recognised the Interviewee from their picture on their staff profile on the university's website. I asked if the Interviewee would like a coffee and the Interviewee said yes – a medium latte. So I ordered two and paid for them. The Interviewee was chatting to some lady while I was ordering the coffee. The Interviewee asked me and sounded surprised when I said that our

meeting room was upstairs so that we were to go up there as opposed to staying downstairs in the open cafe area. We then went into the lift, going to the first floor. As we got out, we met a group of Water Science people and then the Interviewee went to turn the wrong way so it took me a bit of an effort to navigate the Interviewee in the right direction. The Interviewee liked the view in the meeting room and sat themselves in a seat so they could fully admire it.

How did the interviewee react to questions?

Well. Although I thought the Interviewee could have opened up a bit more.

How well do you think you did asking questions?

The standard questions were fine; additional questions I struggled a bit with finding the right words (e.g. knowledge depository) otherwise it was good.

How was the rapport?

I was bit surprised, the Interviewee seemed to be distant or a bit shy or a bit not totally confident, which surprised me. Because I expected the Interviewee to be quite an extroverted person, at least judging from his picture on the web staff profile and the type of work that the Interviewee has done.

Reflect on the quality of information received.

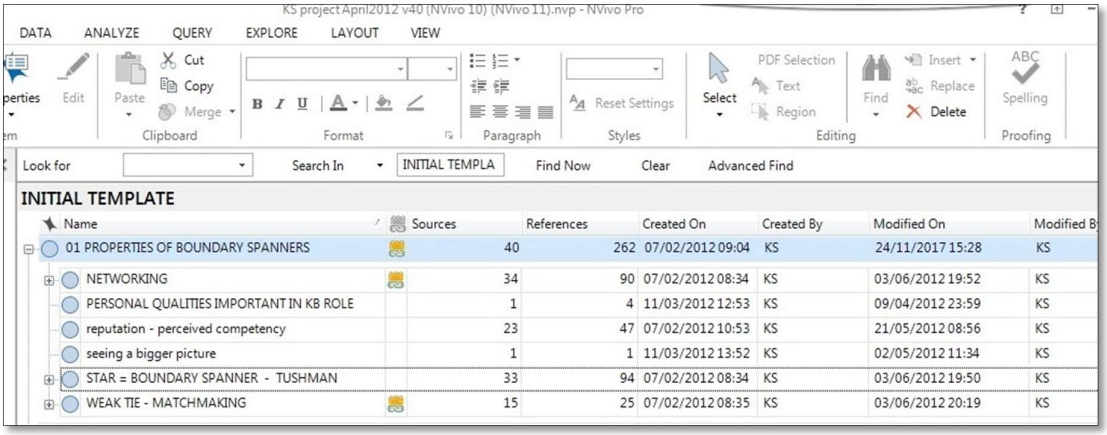
After transcribing the interview; I now see why this interview felt constrained – with this person a truly open interview would be the best. A structured interview was constraining the flow of communication, I should have more followed from what the Interviewee said as opposed to being concerned with strictly following the interview template. The interviewee is a person who is not comfortable with structure and rigidity: instead this Interviewee likes fluid, organic process to a conversation. The physical configuration of space – i.e. a formal meeting room – also did not help in that aspect.

The Interviewee's favourite word was "by and large.

Appendix E Template analysis: 1st and 2nd order coding

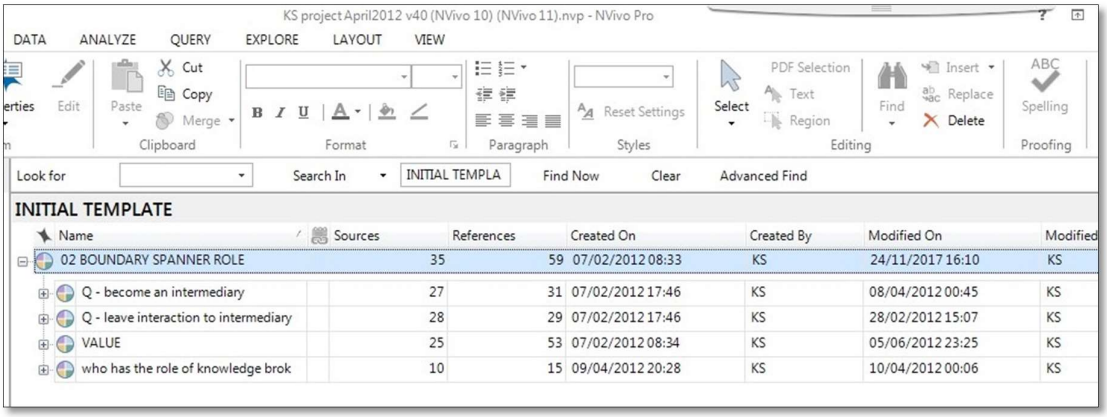
NVivo software print screen shots. The origin of the 1st order coding is outlined in Table 3.3.

Theme 1 – Properties of boundary spanners



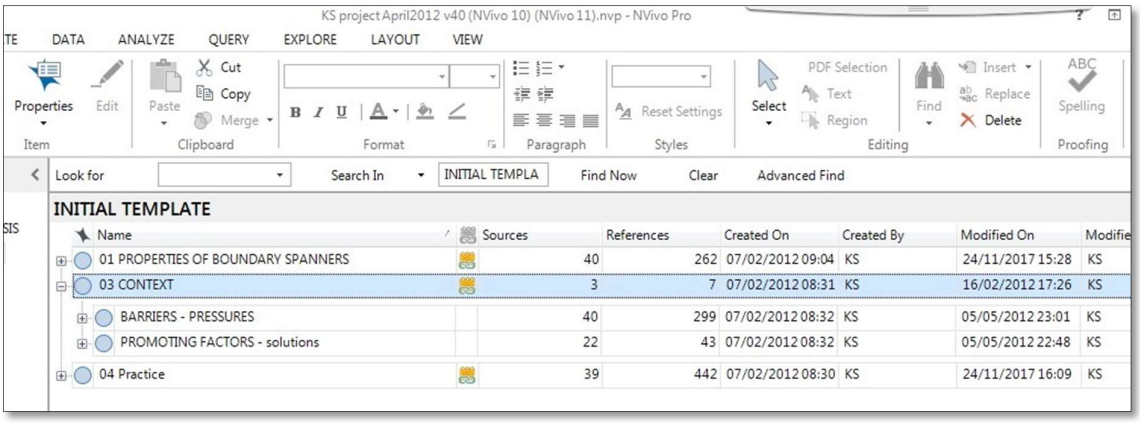
Name	Sources	References	Created On	Created By	Modified On	Modified B
01 PROPERTIES OF BOUNDARY SPANNERS	40	262	07/02/2012 09:04	KS	24/11/2017 15:28	KS
NETWORKING	34	90	07/02/2012 08:34	KS	03/06/2012 19:52	KS
PERSONAL QUALITIES IMPORTANT IN KB ROLE	1	4	11/03/2012 12:53	KS	09/04/2012 23:59	KS
reputation - perceived competency	23	47	07/02/2012 10:53	KS	21/05/2012 08:56	KS
seeing a bigger picture	1	1	11/03/2012 13:52	KS	02/05/2012 11:34	KS
STAR = BOUNDARY SPANNER - TUSHMAN	33	94	07/02/2012 08:34	KS	03/06/2012 19:50	KS
WEAK TIE - MATCHMAKING	15	25	07/02/2012 08:35	KS	03/06/2012 20:19	KS

Theme 2 – Boundary spanner role

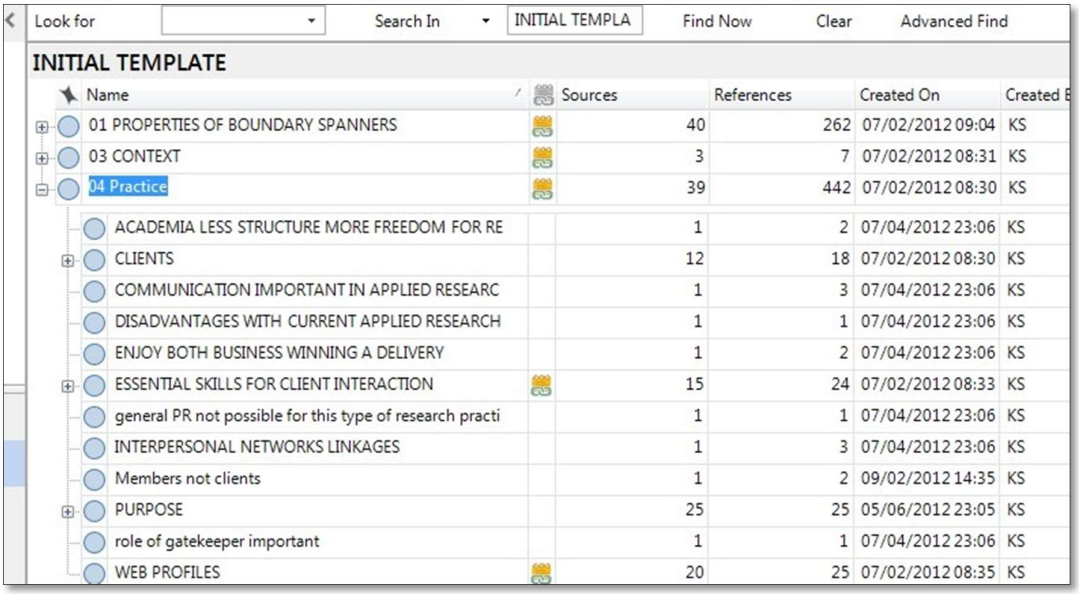


Name	Sources	References	Created On	Created By	Modified On	Modified
02 BOUNDARY SPANNER ROLE	35	59	07/02/2012 08:33	KS	24/11/2017 16:10	KS
Q - become an intermediary	27	31	07/02/2012 17:46	KS	08/04/2012 00:45	KS
Q - leave interaction to intermediary	28	29	07/02/2012 17:46	KS	28/02/2012 15:07	KS
VALUE	25	53	07/02/2012 08:34	KS	05/06/2012 23:25	KS
who has the role of knowledge brok	10	15	09/04/2012 20:28	KS	10/04/2012 00:06	KS

Theme 3 – Context



Theme 4 – Practice



Appendix F Content analysis: networking (Chapter 5)

Table F-1 Key relationship networking components per interviewees and their demographic information.

Interviewee	Job tile	Years of experience in academia	Access	Luck/ Chance	Being proactive	Physical contact	Experiential knowledge	Reciprocity	Trust	Knowledge transfer / knowledge exchange
4	Lecturer	20-29	Yes							
5	Lecturer	10-19								
6	Professor /Reader	30 or more	Yes	Yes	Yes	Yes			Yes	
7	Professor/ Reader	20-29								Yes
8	Research Fellow	0-9	Yes	Yes	Yes	Yes				Yes
9	Professor/ Reader	20-29			Yes					
10	Professor/ Reader	10-19					Yes		Yes	Yes
11	Research Fellow	10-19		Yes						
12	Professor/ Reader	30 or more				Yes			Yes	
13	Professor/ Reader	20-29	Yes	Yes				Yes	Yes	
14	Research Fellow	10-19		Yes			Yes			
15	Lecturer	30 or more		Yes		Yes				
16	Lecturer	10-19								
17	Professor/ Reader	10-19	Yes	Yes					Yes	

Interviewee	Job tile	Years of experience in academia	Access	Luck/ Chance	Being proactive	Physical contact	Experiential knowledge	Reciprocity	Trust	Knowledge transfer / knowledge exchange
18	Research Fellow	0-9		Yes					Yes	
19	Research Fellow	0-9								
20	Research Fellow	10-19		Yes		Yes				Yes research impact
21	Lecturer	10-19					Yes			
22	Research Fellow	30 or more						Yes	Yes	
23	Lecturer	0-9								Yes
24	Research Fellow	30 or more								
25	Lecturer	10-19								
26	Research Fellow	20-29								Yes
27	Professor/ Reader	20-29		Yes			Yes			Yes
28	Research Fellow	10-19						Yes	Yes	Yes research impact
29	Lecturer	20-29								
30	Lecturer	0-9				Yes				
32	Lecturer	10-19	Yes			Yes		Yes	Yes	
34	Research Fellow	10-19	Yes						Yes	Yes
35	Research Fellow	10-19						Yes	Yes	
		Total	**7**	**10**	**3**	**7**	**4**	**5**	**11**	**9**

Appendix G Demographic and interview information

Table G-1 Demographic and interview information.

Interviewee	Job tile	Years of experience in academia	Interview duration	Transcript n. of A4 pages
4	Lecturer	20-29	00:47:09	21
5	Lecturer	10-19	00:52:02	20
6	Professor/Reader	30 or more	01:40:37	41
7	Professor/Reader	20-29	00:56:22	2
8	Research Fellow	0-9	01:24:39	37
9	Professor/Reader	20-29	00:49:17	22
10	Professor/Reader	10-19	01:47:29	47
11	Research Fellow	10-19	01:43:22	31
12	Professor/Reader	30 or more	00:35:24	18
13	Professor/Reader	20-29	02:00:30	47
14	Research Fellow	10-19	01:32:10	31
15	Lecturer	30 or more	00:49:42	29
16	Lecturer	10-19	01:05:46	29
17	Professor/Reader	10-19	02:18:43	57
18	Research Fellow	0-9	00:55:13	26
19	Research Fellow	0-9	00:35:07	18
20	Research Fellow	10-19	01:23:46	33
21	Lecturer	10-19	0:35:24)	18
22	Research Fellow	30 or more	01:51:27	37
23	Lecturer	0-9	00:32:48	16
24	Research Fellow	30 or more	00:42:09	21
25	Lecturer	10-19	00:50:50	21
26	Research Fellow	20-29	00:54:56	24
27	Professor/Reader	20-29	01:19:31	28
28	Research Fellow	10-19	01:27:20	29
29	Lecturer	20-29	01:16:47	27
30	Lecturer	0-9	00:58:21	27
32	Lecturer	10-19	01:17:54	31
34	Research Fellow	10-19	01:00:14	29
35	Research Fellow	10-19	00:57:54	25
		Total	**34:27:29**	**842**