

Concurrent Power

The Role of Policy Networks in the Multi-level Governance of Science and  
Innovation in Scotland

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## Declaration

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## Abstract

This thesis examines the operation and evolution of the new system of governance for science, technology and innovation (STI) in Scotland following devolution. One of the founding aspirations of the Scottish Parliament was to develop a policy-making process that fostered a move away from a narrow conception of top-down government towards a more inclusive notion of associative governance. At the same time, the Parliament inherited a suite of existing UK policies for STI as well as a distinctive Scottish trajectory in regional innovation and economic development. In order for a small country to benefit fully from its investments in STI, it might seek to adopt an integrated research and innovation strategy. However, the Scottish situation is particularly complicated: with certain aspects devolved and others reserved, science and to a significant extent innovation, are “concurrent powers”. This thesis investigates how the science base and technology-based firms engage with the Scottish system of governance and, more specifically, how devolution has affected their role in the policy-making process. This empirical study adopts the “multi-level governance” model to investigate the complex assemblage of actors operating *within* and *between* the multiple levels of governance for STI and uses a policy network approach as a tool to analyse the nature of these relationships through interviews with policy targets (universities, research institutes and SMEs) and policy-makers in the Scottish life sciences sector. By focusing on policy learning, the research examines the extent to which actors within a regional system of innovation can actually shape the policy domain. Despite apparently having all of the necessary precursors to facilitate a network-based regional polity for STI, Scotland is still failing adequately to co-ordinate its policies or foster more cohesive policy networks: while inter-personal networking occurs, this has not so far led to inter-organisational policy networks. The predominance of the public sector and the gate-keeping roles therein present significant barriers and militate against an integrated, participative policy environment. This Scottish case study thus provides evidence of broader relevance to policy debates on the regionalisation of research and innovation policy within Europe and, through its synthesis of conceptual frameworks from innovation studies, regional science and political science, demonstrates why an interdisciplinary approach is often necessary in order to engage effectively in policy-related research.

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## Abbreviations

ABPI	Association of the British Pharmaceutical Industry
ACF	Advocacy coalition framework
BIA	BioIndustry Association
BIGT	Bioscience Innovation and Growth Team
BLC	Bioscience Leadership Council
BMFT	Bundesminister für Forschung und Technologie (German Federal Ministry for Research and Technology)
BRC	BioRegio competition
CAQDAS	Computer-assisted qualitative data analysis software
CBI	Confederation of British Industry
CEO	Chief executive officer
CIA	Chemical Industries Association
COSHEP	Committee of Scottish Higher Education Principals
COSLA	Convention of Scottish Local Authorities
CSA	Chief Scientific Adviser
CSAC	Chief Scientific Adviser's Committee
DA	Devolved administration
DECHEMA	Gesellschaft für Chemische Technik und Biotechnologie (German Society for Chemical Engineering and Biotechnology)
DEFRA	Department for Environment, Food and Rural Affairs
DFES	Department for Education and Skills
DOH	Department of Health
DTI	Department of Trade and Industry
EEDA	East of England Development Agency
ELLD	Enterprise and Lifelong Learning Department
EMEA	European Medicines Agency
ERA	European Research Area
ERBI	Eastern Region Biotechnology Initiative
ESRC	Economic and Social Research Council
EU	European Union

FE	Further education
FEDS	Framework for Economic Development in Scotland
GM(O)	Genetically modified (organism)
GO-EAST	Government Office for the East of England
HE	Higher education
HEI	Higher education institute
HIE	Highlands and Islands Enterprise
HMT	Her Majesty's Treasury
ICT	Information and Communication Technology
IPU	Innovation Policy Unit
ITI	Intermediary Technology Institute
LEC	Local enterprise company
MISG	Ministerial Industry Strategy Group
MLG	Multi-level governance
MNC	Multinational company
MSP	Member of the Scottish Parliament
NDPB	Non-departmental public body
NGO	Non-governmental organisation
NICE	National Institute for Clinical Excellence
NSF	National Science Foundation
NSI	National system of innovation
ODPM	Office of the Deputy Prime Minister
OECD	Organisation for Economic Co-operation and Development
OST	Office of Science and Technology
PICTF	Pharmaceutical Industry Competitiveness Task Force
PSRE	Publics sector research establishment
RDA	Regional development agency
RSA	Regional Selective Assistance
RSE	Royal Society of Edinburgh
RSI	Regional system of innovation
RTD	Research and technological development
RTP	Regional Technology Plan

SABRI	Scottish Agricultural and Biological Research Institute
SASA	Scottish Agricultural Science Agency
SCDI	Scottish Council Development and Industry
SCVO	Scottish Council for Voluntary Organisations
SE	Scottish Enterprise
SEBCC	Science and Engineering Base Co-ordinating Committee
SEERAD	Scottish Executive Environment and Rural Affairs Department
SEN	Scottish Enterprise Network
SET	Science, engineering and technology
SHEFC	Scottish Higher Education Funding Council
SMART	Small Firms Merit Award for Research and Technology
SME	Small-medium sized enterprise
SPUR	Support for Products under Research
SQA	Scottish Qualifications Authority
SSAC	Scottish Science Advisory Committee
SSI	Scottish system of innovation
SST	Science Strategy Team
STI	Science, technology and innovation
STUC	Scottish Trades Union Congress
SUPRA	Scottish Universities Policy Research and Advice
SURF	Sustainable Urban and Regional Futures
WTO	World Trade Organisation

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## Chapter 1 Research Focus and Methodology

*Shall the practitioner stay on the high, hard ground where he can practice rigorously...but where he is constrained to deal with problems of relatively little social importance? Or shall he descend to the swamp where he can engage the most important and challenging problems if he is willing to forsake technical rigor? (Schön 1983, pp.42)<sup>1</sup>*

### 1.1 Introduction

When the Scottish Parliament was formed in the summer of 1999 one of the founding aspirations was to develop a new policy-making process in Scotland that engendered a shift from a narrow conception of government to a more inclusive notion of associative governance (Brown 2001). At the same time, in the field of science, technology and innovation (STI) policy, the Scottish Parliament inherited both a suite of existing UK policies and also a distinctive Scottish trajectory in regional innovation policy and economic development, supported by a number of significant pre-existing institutions. This research examines how the science base and technology-based companies are engaging in the Scottish system of governance and, more specifically, how devolution has affected their role in the policy-making process.

The devolution settlement gives Scotland some scope to develop its own distinctive policies for STI but also presents some limitations as many of the factors that influence this policy field are reserved to the UK Parliament at Westminster (for example, research funding, defence policy, European policy). While it is clear from the devolution settlement that the Scottish Parliament has limited fiscal and monetary autonomy, the situation surrounding STI policy is more complex. With certain aspects devolved and others reserved, science policy, and to a significant extent

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<sup>1</sup> Quoted in Tait, 1987.

innovation policy, are “concurrent powers” shared between Westminster and Holyrood.

For the purposes of this thesis, Scottish devolution is therefore used as a laboratory in which to examine how policy processes have changed and to discover whether devolution has facilitated more participative governance or whether, conversely, it has resulted in a more complex policy system where the Scottish government is not the authority on many key policy arenas, forcing Scottish firms and universities to maintain a dialogue at multiple levels of governance in order to influence policy.

A key related issue concerns the development of STI policy within the context of multi-level governance (at regional, national and supra-national levels) and the extent to which steps are being taken to ensure policy co-ordination and integration both within Scotland and between Scotland and the rest of the UK and Europe. This leads to further questions about how Scotland contributes to the national STI debate and how it creates institutional structures that permit more effective knowledge flows between the relevant agents.

This thesis will argue that, while the Scottish system of innovation should provide all of the necessary ingredients to encourage associative governance and support a participative policy-making process, a number of constraints have so far prevented it from performing optimally.

## **1.2 Conceptual framework**

This thesis follows authors such as Edler *et al.* (2003) in attempting to synthesise two analytical systems concepts – “the political system” and the “innovation system” – by drawing on two theoretical frameworks derived from political studies and innovation studies. Theories of innovation have traditionally focused on the firm as the main repository of knowledge but it is increasingly argued that this focus is too narrow and that, if we are to develop a better understanding of innovation, we need to focus not on the individual firm but on the ensemble of relations in which firms, states and systems interact (Cooke and Morgan 2000). As we shall see in Chapter 2, the concept of national systems of innovation (NSI) (Edquist and McKelvey 2000; Nelson 1993a; Walker 1993) and, in particular, the role of the public sector within

NSI, will be used as a starting point to develop an understanding of the multi-level governance of STI in Scotland and the range of external influences, reflecting on how this approach has led to the development of a regional system of innovation approach (Braczyk *et al.* 1998); regional governance; and an emphasis on networks across the disciplines of innovation studies, regional studies and political studies (Rhodes 1997; Marsh 1998a; Morgan *et al.* 1999; Morgan 1997).

Regional policy is no longer simply concerned with re-distribution but increasingly about affecting capabilities to absorb change. The focus of regional policy has widened from investing regional support funds in infrastructure and attracting foreign companies, to investing in the capacities of indigenous industries and the competences of local people (Cooke *et al.* 2000). Over the last two decades, new paradigms of regional development have emerged, based on the importance of knowledge and innovation, and this shift has been used by policy actors at the regional level to argue for an increased role in the governance of science, technology and innovation (Regional Studies Association 2003).

If governments wish to influence technological and innovation capacity at the regional level they must develop policies that support learning processes, that develop policy networks to improve communication and co-ordination within the region and that foster policy learning by ensuring that regional bodies understand their own strengths and weaknesses, compare their situation with other regions and learn from their experiences (Cooke *et al.* 1997; Cooke 1998a). But, there are limits to what a “region-state” such as Scotland can achieve when it seeks to use STI policy to foster regional economic growth. Maskell and Tornquist (1999 p.50) describe regional development policy as mainly a process of “making do” with the historical legacy of institutions and routines, maintaining that economic processes are so strongly path dependent that we can never build anything entirely new. Politics can both enhance and constrain the governance of science and innovation at the regional level. Although regional states are limited in their legislative and policy aspirations, major political developments, such as the re-establishment of the Scottish Parliament, can create expectations and motivate individuals in ways that can



circumvent long-standing constraints and create unexpected outcomes (Latouche 1998).

As discussed further in Chapter 2, “governance” is, itself, a term that takes different meanings in the hands of different authors. Some take a “state centric” view of governance (Pierre and Peters 2000, p.25) in contrast to Rhodes’ approach (Rhodes 1997), which downplays the role of central government. Others focus on the complexity, dynamics and diversity of interactive social-political governance where the state still has a role in steering society (Kooiman 1993). In this scenario, there has been a shift from formal powers to political capabilities so that there is now less reliance on coercive policy instruments and a greater reliance on more subtle techniques. This has led to a restructuring of state institutions, creating agencies, quangos and other institutional forms that operate at considerable distance from control by the political elite (Pierre and Peters 2000, p.195). Nevertheless, these authors contend that states as centres of governance still play a defining role in the economy, in international relations, and in many areas of domestic politics and policy. What we are witnessing is the gradual transformation of the power of the state from “power over” towards “power to” (Pierre and Peters 2000, p.196) and this perspective highlights concerted public-private efforts and co-operative rather than adversarial policy strategies. Pursuing this collective interest through different forms of governance on and between different institutional levels requires closer, more continuous and more informal contacts between political institutions and their environment (Pierre and Peters 2000, p.196-199). The result is a complex network of policy-making institutions that constitute a new form of governance of regional development where regional institutions gain power not only from above but from the creation of new regional structures with new capacities and greater autonomy (Cameron *et al.* 2000).

Policy networks are central to the concept of governance and currently dominate the literature on policy-making. However, as we shall see in Section 2.4, there is considerable variation in perceptions of what constitutes a policy network. The policy network approach takes account of the influence of various governmental and non-governmental actors at different stages in the policy process and emphasises the

linkages between actors at all stages of the process, including implementation, to explain policy-making (Bache 1998). Indeed as we shall see later, others take the concept further and argue the case for *self-organising* policy networks (Rhodes 1997).

The term “multi-level governance” (MLG) was first developed as a conceptual framework to recognise the roles played by various actors on the European policy stage (Marks *et al.* 1996; Sloat 2002a; Bache and Flinders 2004, pp.2-4) . The MLG approach challenged the state-centric view that national governments were the central players in European policy-making (Sloat 2002a, p.35) and is now considered to have relevance to policy relationships between actors organised at different territorial levels as well as cross-sectoral interaction through horizontal policy networks, particularly in the context of devolution (Bache 2003).

In discussing multi-level governance, the “actor-centred” approach, which specifies the role of particular individuals and institutions in the decision-making process, is often adopted (Danson *et al.* 2000). The policy network approach recognises the importance of a multitude of actors exchanging information, expertise and other resources at the sub-national, national and supra-national levels and breaks down the boundaries of a more traditional institutional approach to the policy process (Atkinson and Coleman 1992).

### **1.3 Policy context**

There appears to be general agreement that an active civil society is necessary for a healthy democracy (Sloat 2002b). Amin (1999) describes how many of the prosperous regions of Europe are also regions of participatory politics, active citizenship and civic pride – societies “brought back into the art of governance”. But, despite frequent references to the need for more integrated approaches to policy development, new governance initiatives in the UK are largely socially-oriented and ignore STI-related issues (Lyall and Tait 2004). Although others do argue that recent social backlashes against certain technologies *have* opened up a new era in the governance of science and innovation at the EU level (Borras 2003, pp.5-6), the EC recognises that innovation policy will only work if there is an efficient dialogue

among innovation stakeholders, including “policy-makers, regions, research, civil society and enterprises” (Anon 2004).

From an academic standpoint, the governance perspective might just be “a simplifying lens to a complex reality” (Stoker 1998) but policy-makers believe that improved participation in the policy-making process will create more confidence in the resulting policies and in the institutions that deliver them:

*The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain – from conception to implementation* (Commission of the European Communities 2001, p.10)

The development of new governance structures, for example in the UK under the *Modernising Government* agenda (HM Government 1999), focuses on modernising the processes of government, including a framework for excellence in policy-making and a strong emphasis on learning lessons from policy experience in other countries. The over-arching ethos is “what matters is what works” with, at least in theory, a much free-er flow of ideas between government departments and from one level of governance to another, focusing on ideas that can contribute to an effective system of governance, rather than on the ideology that generated the ideas (Lyall and Tait 2004).

Devolution was described as a crucial part of the government’s modernisation programme, intended to provide a “stimulus to fresh thinking about the business of government” (HM Government 1999, p.11) and adopting an inclusive approach to policy-making by:

*[I]nvolving others in policy making...[and]developing new relationships between Whitehall, the devolved administrations, local government and the voluntary and private sectors; consulting outside experts, those who implement policy and those affected by it early in the policy making process so we can develop policies that are deliverable from the start* (HM Government 1999, p.16)

This implicitly acknowledges the growing importance of policy networks and suggests a commitment to developing more extended networks incorporating new categories of actor (Newman 2002, p.66). This quote also epitomises why

participatory policy-making is desirable “so we can develop policies that are deliverable from the start”: buy-in at the outset by those affected by the policy is more likely to guarantee successful policy implementation. However, Parsons’ (2001) critique of the *Modernising Government* agenda suggests that the prevailing model is still predicated on “a centralised and top-down view of what policy-making is about” and is thus more to do with controlling the message than communicating with, and listening to, stakeholders: it therefore tends to forget that policy-making is about *dialogue* (Parsons 2001).

The White Paper (*ibid.*) also highlights the current government’s preoccupation with evidence-based policy which has been gaining currency over the past decade (Solesbury 2001):

*This Government expects more of policy makers. More new ideas, more willingness to question inherited ways of doing things, better use of evidence and research in policy making and better focus on policies that will deliver long-term goals* (HM Government 1999, p.16)

More recently, the British Prime Minister launched the “Big Conversation” (Blair 2003); an attempt to engage the British public in discussion across major policy areas in order to foster a “progressive, imaginative, vibrant public debate”. Although Blair did not actually use the term “governance” in his speech, he talked about abandoning the top-down approach to policy and developing a more consensual style of policy-making with public consultation and public debate, acknowledging that “the old top down approach won’t work any more”. Inevitably, critics of the idea have dismissed this as a New Labour “gimmick” (BBC News 2003).

Many aspects of the new governance-based policy-making systems are relevant to STI policy, such as initiatives on policy integration, evidence-based policy, the use of standards and guidelines linked to policy evaluation, encouragement of openness, stakeholder involvement and consultation, and avoidance of unnecessary regulatory burdens. The *cri de coeur* of the current Labour Government for “joined up” policy is reflected in the goal of the *Modernising Government* initiative to develop a more integrated approach to policy-making, and a series of Cabinet Office publications (e.g. Cabinet Office Performance Innovation Unit, 2000; Cabinet Office Strategic

Policy Making Team, 1999) aims to improve policy formulation and implementation in areas that cut across the policy boundaries of traditional government departments. However, this integrated, participatory approach has not yet been extended to cover STI policy *per se* where stakeholder involvement still tends to focus on public understanding of science and fostering the public acceptance of scientific advances.

Co-ordination between policy domains (research, innovation, industrial policy, education, training, employment) in the UK, as in other European countries, is probably still the “exception rather than the rule” (Cooke, *et al.* 2000, p.123) and there has been a confusing plethora of initiatives in recent years aimed at improving UK competitiveness (Anon 2001a). In Scotland there have been complaints about congestion and duplication in the provision of economic development services (Enterprise and Lifelong Learning Committee 2000), which has led to restructuring within Scotland’s regional development agency, Scottish Enterprise. Others complain that most of the schemes that the Scottish Executive has put in place are aimed at the wrong target: increased commercialisation of research in universities, rather than the need to increase the involvement of SMEs, in particular, and Scottish industry in general in the exploitation of Scottish science and technology (Rennie 2002). With 50% of the Scottish Parliament’s legislative agenda predicted to be initiated by Brussels, many argue that businesses in Scotland are still affected more heavily by UK legislation on financial and economic matters than by devolved areas (Sloat 2000a) and that, while the Scottish Parliament may influence business decision-making, the Parliament’s powers may be largely confined to the public services (Kerley 1999). Any sub-national government’s ability to enhance its region’s competitiveness and capabilities is constrained by the overarching structure of policies and regulations instituted by national or supra-national (*e.g.* EU) governments and the degree to which a regional government can hope to change the relative attractiveness of its economy in the short run except by project-specific inducements is limited (Gray and Dunning 2000, p.418).

Across Europe, and elsewhere where regional governance systems already exist or are newly emerging, science and innovation policy is becoming an area of shared competence between national and regional governments, to a greater or lesser degree.

In the UK, where STI policy has, up until now, been largely a national activity, this leads to a range of novel debates on the multi-level governance of STI policy including:

- the location of science funders and major science infrastructures
- the potential for regional interests to be involved in shaping STI policy priorities
- the regional development implications of STI exploitation (Charles *et al.* 2004, pp.3-5)

As we shall now demonstrate, the current research has been designed to explore the impact that the policy initiatives described in this section have had on the policy-making process for STI policy in Scotland.

## **1.4 Research design**

### **1.4.1 Research themes**

This thesis explores the theme of “Concurrent Power” in the context of science, technology and innovation (STI) policy in Scotland. As we shall see in Chapter 3, this is the technical term used to describe policy matters that are partly devolved to the Scottish Parliament and partly reserved to the UK Parliament<sup>2</sup>. In this sense, the term “concurrent power” indicates shared policy competences between governance levels and exemplifies the concept of multi-level governance.

However, Scottish devolution was intended not only to transfer powers downwards territorially but to foster a new type of politics with more participation that would lead to more consensus politics, stronger Parliamentary committees, and power

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<sup>2</sup> Although the Scotland Act 1998 (Chapter 46, Section 56) uses the term “shared powers” to describe the functions that are to be exercisable jointly by Scottish and UK ministers (see [www.hmso.gov.uk/acts/acts1998/80046--e.htm#56](http://www.hmso.gov.uk/acts/acts1998/80046--e.htm#56), last accessed 08/02/05), the term “concurrent power” seems to have been adopted into general parlance by the Scottish Parliament to describe these circumstances (see Scottish Parliament Official Report Wednesday 2 June 1999, [www.scottish.parliament.uk/business/officialReports/meetingsParliament/or-99/or010504.htm](http://www.scottish.parliament.uk/business/officialReports/meetingsParliament/or-99/or010504.htm), last accessed 08/02/05).

sharing between the Executive, Parliament and the civil service, so this research extends the concept of concurrent power to include power sharing – or at least power relations – between key Scottish policy actors whose roles will be introduced in Chapter 3. In this context, the research considers how policy responsibilities for STI are negotiated and co-ordinated between these policy-making bodies and investigates whether Scottish devolution has resulted in a more integrated policy approach in this area.

Finally, a key focus is on the impact that devolution has had on the actual processes of policy-making and policy learning for STI. As described in more detail in Section 1.5, the research adopts an ethnographic approach to examine the interactions between policy-makers<sup>3</sup> and representatives from the academic and commercial life sciences sector (“policy targets”) to explore whether the policy-making process has become more interactive and participative. So this is the third sense in which this thesis uses the term “concurrent power”: to reveal power sharing between policy-makers and policy targets.

We are currently seeing a new set of regional and sub-national policy institutions emerging in the UK with links to regional economic development and regional competitiveness policy. The Scottish Executive has made a play for science, even though it is largely a reserved power, and was the first of the UK devolved territories to have a science strategy. Nevertheless, it appears to be following its pre-devolution policy trajectory with regard to regional innovation and its focus on the commercialisation of the science base. As discussed further in Chapter 2, the overall context for the current research is evident in the Europe-wide shift towards regionalisation, albeit using very different models of devolution which makes generalisations from a single case more problematic. The Scottish case study described in this thesis does, however, provide evidence of broader relevance to discussions of the regionalisation of research and innovation policy within Europe and explores policy-relevant themes related to the shaping of science, technology and innovation policies and the evolution of policy-making in multi-actor spaces: does

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<sup>3</sup> Specifically, unelected officials, *i.e.* civil servants, rather than elected policy-makers.

this new regional context for science and innovation policy, for example, automatically lead to new forms of engagement in the policy-making process? The concept of policy networks thus forms a significant component of governance theory and is a topical issue in the current devolutionary climate. Meanwhile, the concept of governance, itself, is moving on from the domain of political studies and being adopted by innovation studies specialists in the context of national and regional systems of innovation.

In a study of regional science and technology policy in Ontario, Salter (1998) pointed to the limits of associative governance and suggested that future research should consider where and when associative participation is useful and necessary. Closer to home, Mackinnon (1998) found, in a study of local government and economic development, that local governance in the Scottish Highlands continues to be underpinned by government while, in an early study of the Scottish Parliament, Sloat (2000b) demonstrated the lack of public debate about the external process of policy-making (in the context of European policy). She recommended that future researchers should examine how various consultative and participative mechanisms enable new forms of governance and she highlighted the challenge of enabling civic organisations and business interests to voice their opinions in the legislative process while preventing the dominance of the “usual suspects”.

#### **1.4.2 Research questions**

This research design therefore adopts the governance model as the overall framework for looking at reality. As outlined above and discussed in more detail in Chapter 2, the concept of policy networks derives from this model and is used to explore the phenomenon of participative policy-making. The study draws on the theory of multi-level governance to test the hypothesis that the nature of the devolution settlement in Scotland, which has resulted in shared competences for many policy areas related to STI, is actually preventing Scotland from achieving good associative governance and is hampering the development of policy networks and preventing policy learning.

While recognising that policy research does have to be grounded in theory (Bechhofer and Paterson 2000, p.128), the focus on this research lies at the nexus



between theory, policy and practice and errs more towards drawing inferences for policy (Finch 1986) than in expanding theory. The opening quote (Schön 1983) reflects on some of the tensions experienced by researchers working at the interface between research and policy. Indeed, as discussed in Chapter 2, the theoretical constructs of governance, systems of innovation and policy networks are all contested within the literature which raises issues about the utility of the research design when there is a lack of consistency about definitions, making it difficult for others to adopt this approach as a research tool. This research is, however, firmly located within a substantial body of UK research efforts currently considering the impacts of constitutional change and the rise of regional governance (see, for example, the ESRC Programme on Devolution and Constitutional Change<sup>4</sup>) although few scholars focus on the topic of science and innovation which marks one of the key distinctions of the current study<sup>5</sup>. We therefore contend that these constructs provide a useful framework or series of stepping stones to move this research forwards towards its overall goals of exploring the impacts of devolution on the Scottish system of governance for science and innovation and, more specifically, examining how devolution has affected the role of stakeholders in the policy-making process.

This thesis therefore asks whether, rather than leading to more cohesive policy networks and greater integration of policies for science and innovation, the nature of the Scottish devolution settlement has resulted in greater complexity and a disintegrated policy environment where policy targets (universities, research institutes, technology-based firms and their representatives) are subject to a range of external drivers for science, technology and innovation and must now engage with policy-makers at multiple levels of governance if they are to influence the policy agenda?

These concepts are operationalised in the following research questions and the methods used to address these questions are discussed in Section 1.5:

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<sup>4</sup> <http://www.devolution.ac.uk> (last accessed 28/10/04).

<sup>5</sup> Notable work in this regard is also being carried out by one or two projects in the ESRC Science in Society Programme (see <http://sbs-xnet.sbs.ox.ac.uk/scisoc/>) (last accessed 28/10/04).

- Who participates in policy-making at the regional level in Scotland and through what mechanisms are policy targets engaging in the policy process in Scotland?
- Has participation in the policy-making process been facilitated by the establishment of the Scottish Parliament?
- Is there evidence that this engagement is leading to the formation of a distinct Scottish policy network for STI?
- Is there any evidence of changes in practice or outcomes (“policy learning”) as a result of this dialogue between policy-makers and policy targets?

These research questions were inspired by substantive policy concerns relating to theories about the nature of the policy process within a system of innovation. However, as we shall see in Chapter 2, the systems of innovation approach tends to say little about the processes or policy regimes that underpin that system. So, as the following section explains, a significant methodological question that also motivates this research explores why it is often necessary to adopt an interdisciplinary approach, synthesising theories from more than one disciplinary domain, in order to engage effectively in policy-related research.

### **1.4.3 Advancing knowledge and expanding disciplinary domains**

This thesis aims to advance academic knowledge and contribute to the wider policy debate in a number of ways. First, it will apply the MLG approach to a novel area of policy by exploring STI policy-making in a devolved context within the UK. As noted above, others have applied this approach in other countries and in other policy domains and have highlighted a number of features that remain to be addressed. Secondly, by shifting the focus onto *policy* learning, rather than learning between firms, this approach aims to expand our understanding of the dynamics of policy interactions between policy-makers and other actors within systems of innovation. This point is explored further in Section 2.5. A key problem with policy learning is that governments typically introduce new systems (or new elements to an existing system) and do not learn sufficiently from previous experiences, so that, for example, policy learning does not become embedded following policy evaluation (Lyall *et al.*

2004). Finally, this research seeks to extend the boundaries of academic knowledge domains by contributing to a new interdisciplinary field as we shall now discuss.

In order to reach these overall research objectives, this thesis will examine who participates in policy-making at the regional level in Scotland and whether this has been facilitated by the establishment of the Scottish Parliament. The changing nature of regional policy, and its particular application to STI, crosses traditional disciplinary boundaries; and research on arrangements for new patterns of institutional change, governance and regional development and their effects is in the relatively early stages of development (Cameron *et al.* 2000, p.274). No one, single discipline or approach has been adopted to explain these developments. Increasingly, there are calls for more interdisciplinary approaches to solve complex social problems, along with encouragement for greater collaboration and networking to develop interdisciplinary research where one discipline on its own cannot provide an answer (Bruce *et al.* 2004). Real life, and hence policy, can rarely be compartmentalised into neat, discipline-based boxes. Within the context of the multi-level governance of science and innovation this research takes the relatively novel approach of integrating insights from innovation studies, regional science and political science following the example of a few pioneers in this area<sup>6</sup>. This research design is therefore firmly located within the Mode 2 “new production of knowledge” genre of research (Gibbons *et al.* 1994) that cuts across disciplinary boundaries in order to resolve complex societal problems, and will use empirical research to try to capture the variety of degrees of influence and decision-making authority operating within the new Scottish system of innovation to explore whether policy learning is taking place at the regional policy level. As discussed in Section 8.5, such an interdisciplinary approach can present certain challenges, not least the imperatives of maintaining a research focus and exercising critical judgement.

### **1.5 Research methodology**

This thesis describes an empirical piece of research that set out to test whether Scottish devolution has in fact promoted participative policy-making through the role

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<sup>6</sup> For example, Cooke *et al.* (2000), Cooke *et al.* (2004) and Smits and Kuhlmann (2004).

of policy networks or whether, conversely, the nature of the devolution settlement is preventing good associative governance. The research is therefore a contemporary study of the early impacts of Scottish devolution with respect to STI policy and is embedded in the current policy and academic debates, alluded to in the previous sections, that are prevalent in the UK and EU on the inter-related topics of devolution, new modes of governance, policy integration (“joined up” policy) and wider participation in the policy-making process. This research is timely as the Scottish Parliament has recently completed its first session and the new institutional structures have now had five years to establish themselves. It takes as its timeframe broadly the period of the first term of the Scottish Parliament (1999-2003) but does also draw on experience prior to devolution. The research was carried out between autumn 2000 and autumn 2004.

This research was spurred by the premise of “starting where you are” (Lofland and Lofland 1995); taking a topic with which the researcher was familiar, having worked in policy-related roles for a number of years, and relating it to an academic context. However, the process of “deciding to decide” (Hogwood and Gunn 1992, pp.4-8) in terms of issue search and setting the actual research agenda proved something of a challenge. While the concurrent nature of STI policy provided the starting point for the study, the initial theoretical framework – that of systems of innovation – proved inadequate. Like many economic models, the focus of NSI is upon the revealed collective performance of the innovation system (an approach that is much less appropriate when the system itself is new and evolving) and little attention is paid to the factors that set the rules of the game, *i.e.* as discussed in the following chapter, the policy regime in which the system operates remains something of a black box. A serendipitous encounter opened the door to a different body of literature on the policy-making process, introduced the term “governance” to the researcher’s vocabulary, and provided the tools to start exploring the Scottish system of innovation in a different way.

The thesis adopts a qualitative research design to assess the role of policy networks for science and innovation in Scotland. The research design uses an exploratory case study approach in an attempt to illuminate the process whereby policy targets are

involved in the governance of STI policy in Scotland post-devolution. As described by Yin (1994), a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, which relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and benefits from the prior development of theoretical propositions to guide data collection and analysis. The core methodology therefore involved a series of semi-structured, qualitative interviews complemented by case studies of Scotland's post-devolution flagship science strategy and comparative policy networks drawn from different levels of governance in the UK and Germany.

The unit of analysis for this study is the Scottish system of innovation and, more specifically, the Scottish biotechnology industry. The biotechnology/life sciences sector has been a priority area for Scottish and UK policy-makers in terms of competitiveness both pre- and post-devolution in an attempt to develop a world-class biotechnology cluster in Scotland. The Scottish biotechnology sector includes a range of new and maturing companies along with a number of support and representative organisations that formed the core of the survey sample for this research. The interview sample included policy-makers (in government departments and agencies in Scotland, London, Cambridge and Brussels) and what have been termed "policy targets", *i.e.* those whose actions STI policy seeks to influence (primarily universities, research institutes, technology-based firms and their representatives). A small sub-set of interviews was carried out with a parallel community in Cambridge to try to identify those aspects specific to the Scottish policy arena rather than UK wide.

Interviews were conducted between June 2002 and October 2003. While recognising that interviewing over an extended period is less than ideal given the possible impacts of changes taking place during that time on the system being studied, this was unavoidable due to the part-time nature of the study. A total of 48 respondents representing 28 organisations were interviewed (see Appendix for further details). All respondents were guaranteed anonymity so no interviewee is identified but, broadly, interviews were conducted with the following categories of respondent:

Policy-makers: officials in the Scottish Executive Enterprise and Lifelong Learning Department (ELLD), Health Department and Policy Unit; officials in the Scottish Higher Education Funding Council (SHEFC), Scottish Enterprise (SE), Scotland Europa and Scotland Office. At the UK level, interviews were conducted with officials in the Department of Trade and Industry (DTI), the Office of Science and Technology (OST) and the Government Office for the East of England (GO-EAST).

Policy targets: CEOs of biotechnology firms (start-up companies and well-established firms) in the Edinburgh and Cambridge areas; representatives from business support organisations and trade associations in Edinburgh, London and Cambridge; directors of Scottish public sector research establishments; and academic staff and university managers from the University of Edinburgh and the University of Cambridge.

The sample selected for interview attempted to embrace a “heterogeneity of experiences” (Devine 1995, p.142) by seeking a diversity of views from both policy-makers and policy targets at a variety of levels of governance<sup>7</sup>. The sampling process was essentially purposive in order to select relevant respondents from each of the key institutions engaged in STI policy and drew initially on the previous professional experience of the researcher. Some “snowballing” took place during the interview process as respondents alluded to other possible interviewees and a degree of participant observation was undertaken through attendance at various STI events and fora linked to the researcher’s professional role which further helped to identify suitable interviewees who were active in the science and innovation policy community in Scotland (see Appendix for details of events attended).

An initial sample of firms was identified from various biotechnology directories and then discussed with industry commentators to select a number of companies that

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<sup>7</sup> Interviewees from SMEs were at the level of CEO/Vice-President while the remainder of interviewees from business and policy organisations were generally Directors or Heads of Teams. The academics interviewed were all of a professorial or director level, as were the PSRE representatives.

seemed both fairly typical of the sector (including larger and well-established companies as well as smaller, start-up firms) and also moderately engaged in the policy process. The industry sample included only biopharmaceutical companies in the Edinburgh and Cambridge areas (EH and CB postcodes) in an attempt to screen out any possible variations between different types of biotechnology company and also variation due to geographical location.

The experience of interviewing these policy-makers and policy targets lay somewhere between elite interviewing (Dexter 1970) and interviewing one's peers (Platt 1981c) given the researcher's previous professional experience. Whichever the case, informants were interviewed as holders of roles (Hakim 1987), where interviewees were of interest because of information and opinions they were able to provide by virtue of their professional position and experience. Interviews took the form of structured conversations steered by a topic guide (see Appendix), which aimed to explore, through a series of relatively open-ended questions, whose voices are heard by policy-makers, whether a coherent policy network exists and what processes are used to influence the policy agenda within the multi-level governance context. The topic guide was developed following a series of pilot interviews in spring 2002.

The interviews generally lasted one hour. A statement about the project, its aims and conduct was circulated to informants prior to interview to ensure informed consent. Each interview was tape recorded, transcribed in full and the transcripts augmented with field notes. Transcripts were then analysed using computer-assisted qualitative data analysis software (CAQDAS), QSR N6<sup>8</sup>. This had the advantage of providing a relatively rapid data management tool, enabling the researcher to explore a range of analytical questions, and introducing an element of rigour, transparency and traceability into the analytical process (Searle 2000).

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<sup>8</sup> See [www.qsrinternational.com/products/productoverview/N6%20brochure.pdf](http://www.qsrinternational.com/products/productoverview/N6%20brochure.pdf) for details (last accessed 28/10/04). Training in the use of this data analysis method was provided by the ESRC's computer-assisted qualitative data analysis (CAQDAS) networking project at the University of Surrey.

N6 is a document management and data analysis software package that enables code-based interrogation and searching of qualitative data. As described graphically through a series of evolving coding schema included in the Appendix (Figures A.1-A.7), the data analysis began with a fairly straightforward code-and-retrieve approach using the topic guide to develop the initial coding framework (or “node structure”) to identify key themes and responses to the research questions (see Figure A.2). One of the primary advantages of a data analysis programme such as N6 is the flexibility it confers, allowing codes and coding structures (“tree nodes”) to be readily modified and the whole data set to be rapidly searched. These facilities enabled the data to be explored further using a more grounded theory technique (Glaser and Strauss 1967) to begin to develop theories about the Scottish polity for science and innovation and the performance of policy networks.

As well as coding for content, each transcript was also ascribed base data codes (*i.e.* demographic codes) such as geographical location and type of respondent (see Figure A.6 for a complete listing of base data codes). This enabled the application of various search algorithms within N6 to try to detect *inter alia* trends in views expressed by different categories of respondent. This process generated 20 node searches (see Figure A.7) that compared the views of different categories of respondent in five areas: impact of devolution; impact of MLG; views on evolving policy networks; evidence of impact on policy; evidence of policy learning. Although a summary of some form of aggregated view is attempted in Section 4.6, the analysis explicitly resists the temptation to treat this qualitative data in a quantitative fashion by eschewing statements such as “x% of respondents from the policy-making community said y”.

The result of this iterative process of assembling and reassembling the data in different configurations was a substantial set of extracts from the interviews, structured under a series of headings corresponding to the research questions (see Figure A.4). The memo facility in N6 was then used to begin to construct an analytical narrative around this data. (Figure A.1 in the Appendix draws an analogy between this data analysis technique and a common purification method where the substrate (in this case the interview data) is gradually passed through a series of



successively finer filters in order to condense and refine the information, resulting finally in a distilled, analytical narrative and a few key quotes which are reported in Chapters 4-7.)

This methodology therefore uses the voices of the interviewees, through direct quotation where appropriate, to illustrate or emphasise a particular point being made in the narrative which is, itself, grounded in the summation of views on that topic, termed the generation of “meaning through comparison” by Mackinnon (1998, p.24). Selected quotations are not necessarily representative of opinions held by the interview sample as a whole, or indeed by any one particular category of respondent, and care has been taken to avoid selectively picking statements that are unduly negative or positive with respect to the overall tone of the interview data. This “key quotes in context approach” (Mackinnon 1998, p.26) therefore selects illustrative quotes for their significance in addressing key research questions and the desire to present a range of perspectives on these issues.

Yin (1994) argues that a case study database, as represented by the QSR N6 database constructed for this project, increases the reliability of the case study whereby other investigators, in theory, (subject to the constraints of data confidentiality) could review the data and data analysis protocols directly. However, the CAQDAS approach is not without its critics. Qualitative data, of the type reported here, can always be criticised for being partial and selective, and other analysts might offer different, but equally valid, interpretations of the data. Significantly, the process of “coding” does not equate to “analysis” but it does facilitate the process by making it easier for the analyst to develop and examine linkages within the data. The benefit of a software package such as N6 therefore lies in its ability to manage and manipulate interview data more readily and efficiently than traditional manual methods. One disadvantage of the CAQDAS approach, however, is the rapid fragmentation of the data into disjointed sections of text. Other researchers have described the process of “decontextualisation before recontextualisation” whereby sections of text are lifted from the original interview transcript and placed with related (or in some cases contrasting) segments from other interviews and the analysis then proceeds “by examining and contrasting the juxtaposed segments”

(Mackinnon 1998, p.23). However, a clear advantage of N6 over the traditional, pre-computerised “cut and paste” method, where text units were physically separated from the original transcript, is that in a keystroke it is possible to expand the text segment and revert back to its original context, thereby enabling particular comments or phrases to be located within the discourse from which they originated.

In order to further counter the risk of fragmentation and to explore the broader context of some of the interviews, a number of transcripts were also analysed using a mind-mapping tool, Banxia Decision Explorer<sup>9</sup>, which provided a visual map of the main points and logical threads for a sample of the interviews to aid theory development (a sample map is included in the Appendix, Figure A.8).

Qualitative research designs are most appropriate when research is seeking to explore people’s subjective experience and are also useful for studying processes (Devine 1995): in this case the experience of the devolution process and its perceived impacts. Policy impacts take a long time to accrete<sup>10</sup> and Scotland is probably still working through the impacts of pre-devolution policy. Given this situation, and the focus of the research on actors’ personal experience of the devolution process, quantitative indicators were deemed to be inappropriate. However, there is a danger of interview-based research just confirming views of participants and recording how they reached decisions (John 1998, p.11). Bevir and Rhodes (2003, p.22) describe such an ethnographic approach as a “soft science that guesses at meanings, assesses the guesses and draws explanatory conclusions from the better guesses” but they also suggest that “(history and) ethnography are the best tools for constructing our story of other people’s constructions of what they are doing: that is, thick descriptions of individual beliefs and preferences” (Bevir and Rhodes 2004). However, it would appear from the debate in the literature that this methodological approach is relatively novel in political science (Bevir and Rhodes 2004).

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<sup>9</sup> See [www.banxia.com/dexplore/pdf/DEbrochure.pdf](http://www.banxia.com/dexplore/pdf/DEbrochure.pdf) for details (last accessed 28/10/04).

<sup>10</sup> If, indeed, it is ever truly possible to make direct correlations between a single policy initiative and outcome: “policy” is rarely about one specific event and only seldom has a discrete beginning and end.

Qualitative methods can be criticised on the grounds of reliability, validity and objectivity (Devine 1995) and qualitative analysis can be considered by some to be incomplete or partial: it is only one possible interpretation amongst many. Hill (1997, pp.1 and 25) suggests that studies of the policy-making process are, of necessity, often qualitative and interpretive, making them particularly vulnerable to this charge. Such interviews can also be subject to bias (both response bias on the part of the informant and interviewer bias due to poorly constructed questions) and poor recall (Yin 1994). There is also the danger of the interviewee giving the interviewer what they think they want to hear although this is arguably less of an issue where the respondent is an “elite” interviewee. Indeed, there might be quite separate issues when studying a system that is in a state of transition and might be subject to controversy where respondents may try to send messages to policy-makers through the research or attempt to portray their position or actions in a particular manner.

An additional weakness in the current design may have been the danger of the researcher subconsciously interviewing as an “insider”, one who had previously worked as a civil servant and NGO policy officer, and who may, therefore, make assumptions about the policy-making process. At the same time, Hakim (1987, pp.73-74) describes the interviewing of public role-holders as quite different in nature from standard research interviewing where such interviews often require the interviewer to demonstrate prior knowledge of the subject, to treat the interviewee as an informant as well as a respondent, and to display sensitivity to the fact that views offered by role-holders may not coincide with the interviewee’s personal opinions.

In an attempt to counter these possible limitations, the research design did not rely solely on interview data but also encompassed a case study of the Scottish Executive’s policy document *A Science Strategy for Scotland* (Scottish Executive 2001a) and the subsequent Scottish Science Advisory Committee (SSAC) in order to analyse the extent to which policy targets’ views influenced the development of this strategy. This case study includes a documentary analysis of submissions made during the consultation process, participation in the consultation process itself, attendance at related events, interviews with key informants, an analysis of the final

policy document and a review of SSAC outputs. However, documentary analysis of government policy documents is also not without problems. Platt (1981a; 1981b) portrays documentary research as not being a clear cut and well-recognised category like survey research and asks “does it tell the truth?”, a particularly apposite challenge when analysing documents that have been written for a political agenda.

The research design also encompasses a further comparative element, considering related policy activities taking place at different levels of governance throughout the UK and beyond. The research analyses the conduct of two examples of industry participation in national (UK level) STI policy in the form of the Pharmaceutical Industry Competitiveness Task Force (PICTF) and the Bioscience Innovation and Growth Team (BIGT). It then explores the role of policy networks in a successful regional biotechnology system in Cambridge (UK) and concludes with an international comparator in the shape of the German STI system and the BioRegio scheme.

These four short cases are based on documentary analysis of primary and secondary data sources together with a limited number of interviews with key informants. As such, they offer a comparative perspective rather than provide a highly developed comparative case study<sup>11</sup>. As discussed in Section 8.5, there can be difficult trade-offs with any such comparative approach. As a small, semi-autonomous territorial region located within a nation state, it is difficult to identify an exact homologue for Scotland: countries such as Denmark or Finland have similar population sizes (and possibly a more consensual style of government) but are sovereign nations; regions within, say, Spain or Germany have some similar, although not identical, political features but are generally more populous and tend to have different economic profiles. The four cases were therefore selected for illustrative purposes and, although not without its limitations, this comparative element was considered worthwhile in order to draw some lessons for Scotland on the role of policy networks in the multi-level governance of science and innovation. Hence, for example, the

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<sup>11</sup> Grand plans for extensive inter-country case studies were tempered by the reality of resource constraints (not just money but, perhaps more significantly given the part-time nature of this research, time) but also by the realisation that the Scottish case on its own offered a very rich source of data.

contrasts afforded by studying German biotechnology policy networks are instructive when considering the Scottish situation, first, because there is a closer interaction between interest groups and less of a clear-cut divide between public and private sectors in the German administrative structure than in the Anglo-Saxon tradition of policy-making (Diederer *et al.* 1999, p.4) and secondly, because Germany has both a long tradition of regional governance and a strong biotechnology sector.

Triangulation of research methods is one of the central tenets of the qualitative research process (Blaikie 2000, pp.262-270) in order to strengthen the validity of empirical research and counter researcher bias. The methodology adopted in this research design collects data from a variety of sources, including at different levels of governance (regional, national and to a lesser extent supra-national), from different categories of respondent (policy-makers and policy targets) and in different formats (interview data, documentary analysis and comparative case studies) in the pursuit of methodological rigour although, as acknowledged in Section 8.5, other research approaches may also have had merit.

Finally, a few words on what this research design has not attempted to do. While the focus of the research is on Scotland in the context of multiple levels of governance, this does not extend to local government. Nor does the study of participation in the policy-making process extend to civic participation or the general public's engagement with STI. Many authors have studied the process of innovation and the role of innovation networks from a sociological standpoint (*e.g.* Callon *et al.* 1986). While the current research is located within the systems of innovation approach, its focus is on policy processes and the convergence of innovation studies and political studies perspectives. It does not attempt a study of the sociology of networks and rejects the social networks analysis approach on the grounds that this can be highly descriptive without actually examining how networks operate in practice (Atkinson and Coleman 1992).

## **1.6 Chapter overview**

This chapter has introduced some of the complexities surrounding the Scottish devolution settlement as they pertain to STI policy and has broached the concept of

policy networks within the context of multi-level governance. It has described the research design and offered a short critique of the methodology employed in this study. Chapter 2 discusses the theoretical framework for this research (outlined in Section 1.2 above) which lies at the nexus between the systems of innovation literature and the political studies literature on governance and the role of policy networks in the policy-making process. We shall see that these academic domains are undergoing an elision into the emerging, interdisciplinary field of the regional governance of science and innovation.

Chapter 3 argues the case for the existence of a Scottish system of innovation. This chapter discusses the constraints on the system in terms of the external drivers that influence STI policy and explores the multi-level nature of policy-making in Scotland and the need for greater policy integration at the regional level. It introduces the key institutional actors and discusses their role in the policy-making process.

Chapter 4 presents the findings from the survey of policy-makers and policy targets. It analyses the policy-making context for STI in Scotland and the degree to which users are involved in this process in an attempt to gauge whether the impact of Scottish devolution on the government to governance shift is borne out in reality or is merely political rhetoric.

Chapter 5 takes the Scottish Executive's key science policy document, *A Science Strategy for Scotland* (Scottish Executive 2001a) as an exemplar of regional STI policy and examines the consultation process and the work of the ensuing Scottish Science Advisory Committee to assess further the engagement of users in the development and implementation of Scotland's science policy. In so doing, this chapter will argue that, rather than using the opportunity of greater policy autonomy to achieve greater policy integration, the Scottish Executive is perpetuating the out-moded linear model of science and innovation in its current policy pursuits.

In order to avoid an overly parochial view of Scotland's STI policy, Chapter 6 attempts to make some comparisons with related policy activities taking place at different levels of governance. It analyses the activities of two national (UK level)

STI policy fora in the form of the Pharmaceutical Industry Competitiveness Task Force and the Bioscience Innovation and Growth Team, considers whether there is a role for policy networks within the biotechnology sector in the Cambridge region and includes an international comparator in the shape of the German BioRegio scheme.

Chapter 7 explores the theme of “joined up” government, examines the gate-keeping function of certain key government agencies in Scotland and demonstrates why, despite having all of the necessary precursors to facilitate a network-based regional polity for STI, Scotland is currently failing adequately to co-ordinate its policies for science and innovation or foster more cohesive policy networks.

Chapter 8 concludes this thesis by summarising what has been learnt about the practice of governance in Scotland as it pertains to the policy-making process for STI in a multi-level context. It relates key findings to policy issues and indicates both the potential contribution to the academic study of the regional governance of STI and some lessons for policy-makers. This chapter reflects on the limits of the research design and offers some suggestions for future research directions.

## Chapter 2 Changing boundaries: systems, governance and networks

### 2.1 Introduction

The research literature on the policy-making process for science, technology and innovation (STI) spans a number of knowledge domains. It is, as others have noted (de la Mothe 2001b), a demanding area of study because it is, by definition, multi-disciplinary, encompassing *inter alia* economics, sociology, politics and the machinery of government. The innovation studies literature, and the systems of innovation literature in particular, have tended to focus on the structure of firms and on inter-firm networking and learning rather than on the interactions between firms and other agents that might help to inform the policy regime. The political studies literature on governance and the role of networks in the policy-making process meanwhile demonstrates that these relationships span the boundaries between the public and private sector, and between administrative units within government, as well as between different territorial units of the state. However, because of their specific focus, each of these literatures tends to identify only certain aspects of the networked polity: the systems of innovation model tends to down play the policy-making process, while the policy networks model usually focuses on aspects of social policy rather than embracing STI as a distinct policy domain worthy of study.

STI policy has evolved from supply-oriented “science policy” (concerned with creating the circumstances and facilities that enable the advancement of scientific knowledge) and mission-oriented “technology policy” (such as the development of Concorde) to diffusion and demand-oriented “innovation policy” which seeks to achieve successful exploitation of new ideas but recognises that innovation involves more than just technical issues and includes many organisational and managerial aspects. As we shall see in this chapter, a further, more recent, evolution acknowledges the regional dimension of STI policy.



In the UK, the Labour Government's new regional policy (see for example, DTI 2001; Regional Studies Association 2001) emphasises innovation and enterprise and promotes a bottom-up approach to regional renewal with local inputs and tailoring to local needs, in contrast to the previous imposition of policy derived from the centre. The systems of innovation literature argues that policies of national governments can make a difference. The question to be addressed now is whether recent changes in the governance of STI policy in Scotland have led to transformations in the way these policies are developed.

In discussing the theoretical framework for the research, this chapter makes the case for a new governance of STI by synthesising the innovation studies and political studies perspectives in order to shed light on the impact of devolution on the policy-making process for STI and the implications this has had for policy learning in Scotland.

Research into innovation emphasises its multi-actor nature and one of the chief aims of innovation policy must be to facilitate flows of technology and information between these actors (including firms of all sizes, public and private research institutes) with the aim of improving the capacity of firms, networks, industries and entire economies (Dodgson and Bessant 1996, p.4). Early attempts to model the process of innovation and to use such models for policy-making were based on linear and simplistic views of how innovation occurs in firms. While effective innovation does rely on the exchange of knowledge between the science base of R&D undertaking bodies and firms, it is much more than the linear one-way process traditionally implied by technology transfer.

Innovation research has demonstrated the inadequacy of this linear model and instead promotes an interactive coupling of the various inputs recognising that effective innovation requires both push and pull as well as extensive interaction and feedback loops. However, although discredited in the academic community, versions of this linear approach still dominate public policy for technology transfer and innovation (Tait and Williams 1999) as evidenced by the Scottish Science Strategy (see Chapter 5).

As our understanding of the innovation process has evolved, a more systemic approach to innovation has emerged and with it a change in policy emphasis: encouraging the learning process within firms and creating and increasing the effectiveness of intermediaries between users and suppliers have become legitimate policy goals. The 1993 White Paper (OST 1993), on which much of contemporary UK STI policy is based, identified the lack of UK technological progress not as a lack of innovative capacity but rather the inability to exploit science through innovation processes. UK policy recognises that technological change is the key to competitiveness but that the strong science base in UK universities is not reflected in industrial competitiveness. Hence the proposed remedy was not increased investment but improved co-ordination to strengthen links between science (*i.e.* universities) and industry (Diederer *et al.* 1999, p.46).

Nowadays, it is unlikely that innovation would be thought of in purely technological terms and STI policy has become less focused on the individual firm and more focused on networks and multiple actors. Networks can diffuse and modulate policy so the task of government becomes one of facilitating networks and designing robust and flexible policy that can effectively be adapted and used through networks. The network model of innovation also highlights the important role of intermediaries and innovation agents such as technology brokers, university industry liaison departments, and regional technology centres so that, in parallel with the decentralisation of innovation policy, there has been a corresponding growth of intermediary services.

This chapter begins by discussing the national systems of innovation (NSI) approach which emerged in the late 1980s/early 1990s when authors such as Freeman, Lundvall and Nelson started to view innovation from a perspective that emphasised country specialisations and recognised that there were significant differences between countries of seemingly similar industrial structures in the level and trends in R&D and related activities (Pavitt and Sharp 1993). This review then explains why, partly as a result of the influence of European Union policy, which promoted innovation by networking and developed a focus on regional economic development,

the emphasis began to shift from the national level to the regional level in systems thinking about innovation, leading to a “new regionalism” approach (see, for example, Cooke *et al.* 2000). Hence we see a boundary change from the national to the regional level.

Turning to the literature on political and policy studies more generally, the discussion then focuses on the transition from top-down legislative styles that attempt to regulate the behaviour of people and institutions in quite detailed ways (characterised as “government”), to an approach that attempts to set the parameters of the system within which people and institutions behave so that self-regulation achieves the desired outcomes (termed “governance”).

Rhodes (1999) uses the phrase “hollowing out the state” to describe the changes that he suggests are taking place in British government in relation to this shift from government to governance:

- privatisation and limiting the scope and forms of public intervention
- the loss of functions by central and local government departments to alternative delivery systems
- the loss of functions by British government to EU institutions

and to this we would also now add:

- the devolution of policy-making powers to self-governing, devolved territories.

This “hollowing out” shorthand therefore implies boundary changes with a loss of function upwards to the EU and other international bodies, and downwards and outwards to agencies and devolved regions.

A corollary of this should be the emergence of more collaborative and consensual forms of working, breaking down the boundaries between policy-makers and stakeholders, and leading to the development of networks of multiple actors involved in the policy-making process with consequential improvements in the development, implementation and integration of policy initiatives. While this is becoming evident

in social policy arenas less has been written about whether this shift from government to governance has facilitated networked interactions within a regional system of innovation between policy-makers and policy targets or whether this interaction, if it occurs, has resulted in policy learning.

Finally, this chapter will demonstrate that the boundaries between these academic domains are becoming blurred and undergoing an elision into the emerging interdisciplinary field of the regional governance of science and innovation.

## ***2.2 Systems of innovation: changing the boundaries from nations to regions***

### **2.2.1 The NSI model**

The rationale for beginning this discussion with the NSI model is twofold. First, it introduces the concept of a system of innovation which is discussed further in Chapter 3 in terms of the particular characteristics of the Scottish system of innovation and, secondly, it provides, in a sense, a stepping stone to thinking about STI policy in a regional rather than a national context. NSI is considered to be a useful concept because it helps to explain differences between the ways different countries promote and manage innovation as well as helping us to identify institutions that promote or discourage innovation (Patel and Pavitt 1994). The NSI approach stresses that firms do not innovate in isolation but in interaction with other organisational actors such as other firms, universities, financial institutions and standard-setting agencies.

This NSI approach developed in parallel with work dealing with related concepts such as networks or clusters in contemporary social science thinking about innovation (Edquist and McKelvey 2000). Although authors take different slants on the NSI concept, their approaches share a number of common characteristics. In general, these approaches place innovation and learning at the centre, they take a historical perspective, emphasise interdependence, and consider the role of institutions (Edquist 2000).

In simple terms, a NSI is:

*[t]he network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies* (Freeman 1987, p.1)

but, according to Freeman (1988, p.2), the “NSI is not just a set of laboratories but a cumulative process of learning by producing, learning by using and learning by the interaction of producers and users”. Nelson’s (1993a) approach is empirically based and focuses on the institutions whose interactions determine the innovative performance of national firms but does not assume that the system was consciously designed or that its constituent parts work smoothly together (Nelson and Rosenberg 1993). Given that Nelson takes a broad view of what constitutes innovation there are no hard and fast rules about what should be included in the innovation system, and what can be left out; the “system” in Nelson’s approach is a “set of institutional actors that, together, play the major role in influencing innovative performance” (Nelson 1992). Edquist (2000) argues that this does not make the systems of innovation approach incompatible with the notion that processes of innovation are largely characterised by interactive learning.

To some extent at least, a nation’s innovation system is shaped by factors such as its size (see Section 2.2.4) and natural resource base but a nation’s innovation system tends to result from conscious decisions to develop and sustain economic strength in certain areas (Nelson 1993b). However, the system is much more than simply the actors doing R&D (Nelson and Rosenberg 1993). Key themes in any NSI are the distribution of R&D activity; funding sources for R&D; characteristics of firms and important industries; the roles of universities; and, significantly for this study, government policies aimed at encouraging innovation (Nelson 1992).

Writing in the early 1990s, Walker (1993) characterised the UK NSI as one where the heavy reliance on Stock Market finance, the loss of a strong technological culture, the diminishing status of manufacturing industry, the shortcomings of education and training and the heavy commitment to defence spending had led to weaknesses in the UK innovation system. Government policies in the previous

decade had given priority to squeezing more out of less and “value for money” had been a guiding principle when defining policies for science, R&D, education and training. Significantly, Walker signals a weakness in co-ordination within the UK NSI noting that Britain is poorly endowed with bridging institutions. He attributes this to the British management style (which is traditionally hierarchical rather than participatory), a lack of a close co-ordinating relationship between banks and industry and a lack of “collective integration” in the British economy.

Surely now, a decade on from the seminal works on NSI, the attempts of national governments to define and support a national industry will be frustrated by internationalisation and questions have to be asked about what level of analysis is appropriate – national, regional, sectoral, supra-national at the European level or global. Jacobs (1998) asks what scope remains for national policy-making in innovation policy given the increasing trends towards globalisation. Now that business and technology are trans-national, are national policies (especially in smaller countries) doomed to fail?

Nelson’s case studies (Nelson 1993a) show that there are differences between various national systems in terms of institutional set up, R&D, and performance, and Edquist (2000) believes that it is still sensible to talk about a national system because most public policies influencing the innovation system as a whole are still designed and implemented at the national level. Technological systems are at least partly consciously built by the state but Nelson implies national systems are not designed or developed by policy-makers. Edquist (2000) takes the middle ground by saying that some elements of NSI are consciously designed by actors such as policy-makers but other important elements evolve spontaneously over time, agreeing that a national system as a whole cannot be designed.

In his survey of the systems of innovation literature, Carlsson (forthcoming 2005) finds that one quarter of the publications surveyed deal with policy issues, focusing on policies to improve technology infrastructure, but he allows that there is “considerable confusion about what institutions are and what role they play” and “little analysis or discussion of the specific mechanisms through which institutions

work”. As discussed further in Section 2.5, systems of innovation models can be criticised for generally offering a rather apolitical account that *assumes* a relationship between the policy regime and the innovation system but does not pay *explicit* attention to interactions with policy actors and the impact that such interactions might have on *policy* learning as opposed to technological learning.

Nelson (1992) acknowledges that the term NSI “suggests much more uniformity and connectedness within a nation than is the case” but maintains that nationhood matters because “a distinctive national character pervades the firms, the educational system, the law, the politics, and the government, all of which have been shaped by a shared historical experience and culture”. Nelson and Rosenberg (1993) argue that it does make sense to think of a national system of innovation “if one is careful to recognize the shadiness and to some extent the arbitrariness of both the institutional and national borders” although Rip (2002) points out that these systems are “leaky” and that it is more realistic to consider them as a “mosaic of sectoral systems and networks with a national boundary imposed upon them”. Kaufmann and Tödtling (2001) offer a further criticism of the NSI model for being too inclusive. They note the “tendency to broaden the system to include any possible source of influence without dealing with the question where an innovation system starts and ends” and cite Padmore *et al.* (1998) who argue that “a system approach accepts that in principle ‘everything interacts with everything’ but recognizes that in practice, some interactions matter more than others”. Kaufmann and Tödtling (*ibid.*) further criticise the system model for failing to take proper account of boundaries and conclude that there is not one single system of innovation but several social systems participating in the process of innovation. We shall return to the issue of boundaries and external influences in Chapter 3 when discussing the Scottish system of innovation.

### **2.2.2 The RSI model**

In parallel with the debate about whether it is still meaningful to talk about a *national* (rather than global) system of innovation there is, almost paradoxically, a move towards a greater *regional* dimension to innovation. Over the past two decades,

innovation has assumed an increasingly important role in the theories of regional economic development. It seems that globalisation and regionalisation, far from being mutually exclusive, are in fact concomitant, partly because foreign direct investment is often attracted to, and has a reinforcing effect on, "innovation clusters" within a specific region. As multinational companies (MNCs) increase R&D investments abroad these facilities represent "listening posts" to access foreign sources of learning and innovation (Morgan 1997); hence globalisation and regionalisation are seen as complementary parts of the process.

A number of factors are driving this "new regionalism" and different academic disciplines have approached it from various standpoints. Since the early 1980s, social scientists have increasingly focused on the significance of the region to the organisation of economic life while economic analysts see the regional level as the key to international competitiveness. European policy to promote cohesion has highlighted the role of the regions within Europe as part of a broader EU programme to improve the competitiveness of EU regions through the promotion of innovation, while in the UK the devolution of powers to its territories, not just in the form of the Scottish Parliament and the Welsh Assembly, but also to Regional Development Agencies in England has raised the profile of regional governance.

European Union support for innovation in the form of the early Framework Programmes was directed towards centres of excellence generally located in prosperous regions while less favoured regions (areas of low income, high unemployment and underdeveloped infrastructure) had little research and technological development (RTD) activity (Morgan 1997). Such schemes were regarded as increasing the technology gap between the most advanced countries in the EU and the less developed regions. It was recognised that measures to promote innovation within European regional policy were vital if the EU was to implement effectively the principle of social and economic cohesion. Closing the inter-regional technology gap became a precondition for closing the cohesion gap (Landabaso 1997).



A Regional Technology Plan (RTP) to align regional development and RTD activities was launched in 1994 with the objective of encouraging less favoured regions to develop a regional innovation process involving stakeholders in the development of a bottom-up strategy attuned to the needs of their region. The EU came to the conclusion that successful regions were those that set a high premium on consensus, collective success and long-term objectives (Morgan 1997). RTP signalled a decisive break from the traditional infrastructure-led approach of EU regional policy because it addressed the processes of stimulating innovating by networking and of building a collective learning capacity (Morgan 1997). RTP was superseded in the late 1990s by the Regional Innovation Strategies which took on the role of shaping emerging regional economic policies as part of a broader EU programme to improve the competitiveness of EU regions through the promotion of innovation.

In academia there has also been a convergence in recent years between the disciplines of regional studies/economic geography and innovation studies with the former becoming interested in innovative capacity as a way of explaining uneven regional development with respect to learning, innovation and the role of institutions in regional development (Morgan 1997). This “new regional science” approach encompasses a shared interest in systemic interaction within political economies and the role of institutions and their evolution over time (Cooke 2002a). However, as Thomas (2000) describes, there is a body of literature that is sceptical of the regional approach (see, for example, Lovering (1999)). Critics question the ability of even successful regions to respond to globalisation pressures and doubt the long-term viability of success models and their transferability to peripheral regions that are unlikely to achieve regional competitiveness without strong macroeconomic recovery programmes<sup>1</sup>.

Cooke *et al.* (1997) query the appropriateness of the national level as a starting point for the analysis of innovation processes and investigate whether or not systemic

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<sup>1</sup> Indeed, as we shall see in Chapter 6, government policy does not always seem to be a prerequisite for a successful cluster such as the Cambridge biotechnology cluster.

innovation should also be sought at the regional (and even sub-regional) level. The concept of a regional system of innovation (RSI) in contrast to a national system started to crystallise by the mid 1990s. The RSI concept lies in two main bodies of theory and research – systems of innovation research and regional science with its interest in explaining local distribution and policy impact of regional high technology industry – and is characterised by the key notions of trust, co-operation and networking (Cooke 1998a). As with NSI, the RSI approach looks for constituent elements and their specific characteristics, the relationship between these elements, the boundaries of this system and the interaction with its environment.

Cooke *et al.* (1997) describe the following necessary elements for identifying a regional system of innovation:

- firms with access to other firms acting as customers, suppliers or partners via formal or informal networks
- knowledge centres, *i.e.* universities, research institutes, contract research organisations and technology transfer agencies
- a governance structure of private business associations and public economic development training and promotion agencies and government departments

They conclude that, if there is regular, two-way interchange on matters of importance to innovation and the competitiveness of firms, then a regional learning system exists. Where the financial infrastructure also exists to enable firms to access venture funding in order to innovate, this may then be termed a regional system of innovation. We return to these criteria in Section 3.5.9 when discussing the evidence for a RSI in Scotland.

A RSI approach stresses the importance of diffusion of knowledge and interactive learning within and beyond the region as a system. As with NSI, a central concern of RSI is to identify the particular institutional arrangements in the areas of training, research and finance and the forms of inter-firm networking that serve to increase technological capability and hence competitive advantage within that region (Lawson and Lorenz 1999).

Over the past decade there has been growing support for the view that innovation is an interactive process – between firms and the science base, between users and producers – and that this process constitutes a process of interactive learning. The literature on “the learning region” stresses that what counts in the long run is firms’ capacity for continuous learning and, specifically, product innovation (Lawson and Lorenz 1999). Authors differ on the extent to which proximity is a key ingredient. Nauwelaers and Wintjes (2000) find that, while the role of geographic proximity might be important to nurture learning relationships, it is not a necessary ingredient everywhere, while Cooke *et al.* (1997) support the view that learning has important specific and local characteristics and can be improved through certain institutional changes and active policies.

### **2.2.3 The associative governance model**

In parallel with the systems of innovation approach, the focus on interactive learning has given rise to the “network” or “associational paradigm” of regional development (Cooke and Morgan 1993). Associative governance involves a shift from state regulation of economic affairs to a degree of self-regulation by responsible societal groups. Cooke (1998a) sees institutional learning as a crucial part of this associative approach, which promotes the principle of innovating by networking and the potential of social capital<sup>2</sup> at the regional level (Morgan 1997): where social capital is well developed it can facilitate collaboration between firms and the science base or between finance and industry.

Intangible factors such as know-how and tacit knowledge are recognised as playing a key role in economic development. This has led to the acceptance of the notion of “untraded interdependencies” as a major feature of the learning aspects of economic development which extend beyond traditional customer/supplier and servicing relationships to embrace formal and informal collaborative and information

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<sup>2</sup> Social capital is a term used to describe certain features of social organisation such as networks, norms and trust that facilitate co-operation for mutual benefit (Morgan 1997).

networks, interactions through local labour markets and shared conventions and rules for developing communications and interpreting knowledge (Storper 1995).

In the UK, the promotion of industry clusters and networks has been part of a recent drive to dynamise business and promote a knowledge-based, high technology economic future (Thomas 2000). Innovation agencies in the UK have moved from supporting “hard” infrastructure (land reclamation, advance factory building and inward investment) to the “soft” infrastructure of business support services, technology transfer, skills development (Morgan 1997). Despite Porter’s (1990, p.655) caution about institutional intervention (“Governments can reinforce, not create clusters”), governments have promoted economic development based on industry clusters as the key to regional competitiveness (Thomas 2000) and a powerful consensus in favour of network-based new regionalism built up over the 1990s.

However, in an analysis of 40 policy tools in 11 European regions Nauwelaers and Wintjes (2002) found that too many policy tools still take the form of traditional subsidies and not enough are innovative instruments that enhance the learning process: the content and modes of delivery of regional innovation policies were in most cases not interactive and followed a hierarchical rather than a systems approach. Although a move towards interactive support was visible, the authors again commented that linear policy tools predominated and did not form a system: a lack of co-ordination between tools was the norm, the majority of tools were developed in a top-down fashion and policy learning was still rare and underdeveloped.

As discussed later in Section 7.2.1, Cooke (2002a) describes associative governance as a system where key regional administrative bodies are interactive and inclusive with respect to other regional actors. If governments wish to influence technological and innovation capacity at the regional level they must develop policies that support learning processes, that develop policy networks to improve communication and co-ordination within the region and that foster policy learning by ensuring that regional bodies understand their own strengths and weaknesses, compare their situation with

other regions and learn from their experiences (Cooke *et al.* 1997; Cooke 1998b; Cooke *et al.* 2000).

#### **2.2.4 Implications for small countries**

A country's size has implications for the way its national innovation system functions (Diederer *et al.* 1999, p.11). Small countries face certain obstacles to successful technological innovation, international competitiveness and economic growth (Walsh 1988) and may struggle to initiate more than a very small part of the new developments in world science and technology and will have particular problems in staying at the forefront of world-class science and technology. They have less money to spend on R&D and fewer trained personnel but are still faced with the same breadth of possible research areas as large countries. Small countries face hard choices – they must either spread their resources more thinly or specialise – and this issue must lie at the heart of their policies for science and technology.

Johnson (1988) argues that international competitiveness is a question of institutions and institutional change and that competitiveness requires flexibility. Small, developed countries have to be able to adapt to changes in international competition primarily by producing for markets with high and rising demand. This means a constant reallocation of resources and a high rate of product and process innovation. Changes in technology require institutional adaptation and institutions that facilitate change are important. There may be some specific institutional characteristics of small countries that encourage competitiveness as a result of the relatively small number of important decision-makers operating in an environment of relatively high cultural homogeneity and with many possibilities of face-to-face contacts. Jacobs (1998) comments that “in such smaller countries, there is no illusion of being able to manipulate the international system, which keeps governments and enterprises focused”. There should also be greater opportunities for people to overcome professional boundaries than in larger countries which should lead to informal networks of relationships between scientists, entrepreneurs, bankers, government officials and industrialists (Walsh 1988) so that small countries should be better able to bring about governance changes and systemic approaches (Edler *et al.* 2002, p.21).

However, the dominance of certain key individuals (which is discussed in more detail in Section 4.5.2 in the context of the “star” system) within a small country can potentially exclude legitimate participants from the policy process. A key challenge may therefore be to retain the interpersonal links engendered by a small country while keeping entry to the system or network open to others (Sloat 2002b). The account of the Scottish system of innovation, which follows in Chapter 3 and the results of the fieldwork reported in Chapter 4, will explore the extent to which these observations hold true for Scotland.

### **2.3 Governance: changing the boundaries between the state and society**

As noted above, the expanding role of supra-national institutions such as the EU, coupled with the trend towards globalisation on the one hand and enhanced devolution to sub-national levels of government on the other, is contributing to the “hollowing out of the state” (Wolfe 1997; Rhodes 1999) which is delegating its authority either downwards or upwards to other levels of governance. Cooke (2002b) explains how these multi-level governance hierarchies have evolved whereby national governments are mainly responsible for delivering science policy and basic research funding, while regional governance systems (involving public and private actors) deliver innovation programmes. Cooke (*ibid.*) describes this “discovery of the regional” by policy-makers worldwide as the most striking change in policy theory in the past decade, while Danson *et al.* (2000) note that these apparently contradictory developments are creating the need for an evolving research agenda and a better understanding of the underpinnings of successful regional governance structures.

This “rise of the region” discussed in the systems of innovation and regional science literature above is mirrored by the governance debate in policy studies more generally with its antecedents in various disciplines including: institutional economics, international relations, organisational studies, development studies, political science and public administration (Stoker 1998). As Sloat (2002b) points out, the term “governance” is currently applied to “everything from corporations to

rural society” and the academic literature on the subject of governance has been described as “eclectic and relatively disjointed” (Stoker 1998). The meaning of the term “governance” is contested and often lacks definitional clarity (Bache 2003) although most commentators accept that “governance” is no longer a synonym for “government”. However, Stoker (1998) argues that, as governance is ultimately concerned with creating the conditions for ordered rule and collective action, its outputs are no different from those of government. What is significant is the difference in processes.

Most would accept that governance refers essentially to the increased role of non-government actors in policy-making (Bache 2003). Some use the term to refer to “a pattern of rule characterised by networks that connect civil society and the state” (Bevir *et al.* 2003a) and it is generally regarded as implying an increasingly complex set of state-society relationships in which networks, rather than hierarchies, dominate policy-making (Bache 2003). The current work adopts the view that “governance” refers to the development of governing styles in which boundaries between and within public and private sectors have become blurred, where governing mechanisms do not necessarily rely on the authority of government (Stoker 1998). Thus, governance is used as shorthand to describe the changing nature and role of the state in advanced societies and the changing boundary between state and civil society (Bevir *et al.* 2003b).

In this approach, the role of the state changes from being the main provider of policy to one of facilitating interaction among various interests (Sloat 2002b) so that government’s role is increasingly one of co-ordination and steering (Bache 2003). Most would agree that, in a governance relationship, no one organisation can easily command although one organisation may dominate a particular process of exchange (Stoker 1998). Some take this further and downplay the role of the state entirely, focusing instead on the role of self-organising, inter-organisational networks (Rhodes 1997, p.15), whereby networks involve not just influencing government policy but taking over the business of government (Stoker 1998).

From a governance perspective the process of governing is an interactive one because no single actor has the knowledge and resource capacity to tackle problems unilaterally (Kooiman 1993) and the powers of government tiers are no longer clearly distributed, as co-operation replaces hierarchy and legislative competences are shared among several levels (Sloat 2002b). In summary, this perspective focuses on the co-ordination of multiple actors and institutions to debate, define and achieve policy goals such that the state no longer dominates the policy-making process and decisions are made by “problem solving rather than bargaining” (Sloat 2002b).

From an academic standpoint, the governance perspective might just be “a simplifying lens to a complex reality” (Stoker 1998) but policy-makers believe that improved participation in the policy-making process will create more confidence in the resulting policies and in the institutions that deliver them:

*The quality, relevance and effectiveness of EU policies depend on ensuring wide participation throughout the policy chain – from conception to implementation (Commission of the European Communities 2001, p.10)*

There appears to be general agreement that an active civil society is necessary for a healthy democracy (Sloat 2002b) and Amin (1999) describes how many of the prosperous regions of Europe are also regions of participatory politics, active citizenship, civic pride, and intense institutionalisation of collective interests – societies “brought back into the art of governance”. He sees the challenge for the regions as finding ways of developing a pluralist and interactive public sphere that draws in both the state and a considerably enlarged sphere of non-state institutions so that regional government does not draw solely on a small elite from the regional government offices, local authorities, development agencies, business leadership, *etc.* His concern is that governance has always been in the hands of elite coalitions, and the resulting “institutional sclerosis” has been a source of economic failure by acting as a block on innovation and the wider distribution of resources and opportunity. To overcome this, regional actors ask whether their decision-making processes constitute an obstacle to institutional renewal, away from a culture of hierarchy and rule-following, towards one that focuses on “informational transparency, consultative



and inclusive decision-making, and strategy-building on the basis of reflexive monitoring of goals” (Amin 1999).

For Cameron and Danson (2000) the advantages of such a partnership approach include:

- increasingly innovative policies and better operational decisions arising from dialogue and interaction among organisations with different responsibilities and perspectives on problems
- increased continuity and consistency in policy as a result of the building of trust and understanding with others
- co-ordination and integration of disparate actions and aggregations of separate budgets to enhance policy impacts
- high level strategic planning and decision-making through shared agreement reached on essential needs and priorities

However, there may also be limitations and this approach to policy-making could lead to generalised, “lowest common denominator” policies and an inefficient and time-consuming process as a result of the extensive communication necessary (Cameron and Danson 2000).

The value of the governance perspective rests in its capacity to provide a framework for understanding changing processes of governing (Stoker 1998). Stoker suggests that governance as an organising perspective makes a theoretical contribution by providing a set of assumptions and research questions and a language with which to identify key features of a complex system (Stoker 1998). This systemic co-ordination goes a step further by establishing a level of mutual understanding and embeddedness whereby organisations develop a shared vision and joint working capacity that leads to the establishment of self-governing networks as discussed in the next section (Stoker 1998).

## **2.4 Policy networks: breaking down institutionally imposed boundaries**

Policy networks are central to the concept of governance and this theoretical approach currently dominates much of the literature on policy-making. Newman (2002, p.66) suggests that states may have an interest in promoting policy networks because they “make policy-making predictable and reduce policy conflicts”. Nevertheless, there is considerable variation in perceptions of what actually constitutes a policy network. Borzel (1998) offers a working definition of a policy network as a relatively stable set of relationships that are non-hierarchical and interdependent in nature, linking a variety of actors who share common interests with regard to a policy and who exchange resources to pursue these shared interests and in so doing acknowledge that co-operation is the best way to achieve common goals.

The policy network approach takes account of the influence of various governmental and non-governmental actors at different stages in the policy process and emphasises the analysis of links between actors at all stages of the process to explain policy-making (Bache 1998, pp.25-28). It recognises the importance of a multitude of actors exchanging information, expertise and other resources at the sub-national, national and supra-national levels and breaks down the boundaries of a more traditional institutional approach to the policy process (Atkinson and Coleman 1992). According to the Rhodes Model (Rhodes 1997) a policy network is a set of resource dependent organisations and such networks will have different structures depending on the mix of interests, membership, vertical and horizontal interdependence and the distribution of resources.

The network approach is said to have developed in response to the failure of pluralist and corporatist explanations<sup>3</sup> in accounting for variations in government-interest group relations in different policy sectors (Bache 1998, p.25) although Ansell (2000)

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<sup>3</sup> Pluralism recognises the dispersal of power in society and acknowledges that people operate not only as individuals but also within groups with specific interests so pressure groups can exert influence on government policies. Corporatism is regarded as a version of pluralism and recognises that the organised interests most often involved in corporatist relationships are groups of employers (Brown *et al.* 1998).

contends that the networks approach draws from both of these bodies of political thought: like corporatism, a policy network implies a co-operative mode of governance based on long-term exchange that differs from the more competitive mode of pressure group tactics implied by pluralism yet, like pluralism, policy networks imply a multiplicity of organisations with overlapping jurisdictions (Ansell 2000).

Lowndes and Skelcher (1998) argue that a partnership approach is analytically distinct from a policy network as a mode of governance and the creation of a partnership does not imply that relations between actors are conducted on the basis of mutual benefit, trust and reciprocity which characterise the network mode of governance. This distinction is significant in the light of the current approach to user engagement adopted by the Scottish Executive as discussed in Chapters 3 and 4.

The notion of a policy network is not, however, an uncontested concept (see, for example, Thatcher 1998) and there is disagreement both on how to define policy networks (Hay and Richards 2000; Blom-Hansen 1997), and on the utility of the concept as an explanatory device (Atkinson and Coleman 1992; Blom-Hansen 1997). Theorists argue about whether policy networks constitute a “mere” metaphor, a useful analytical tool or a “proper” theory (Borzal 1998) and some conclude (Hay and Richards 2000) that the policy network approach is:

*less a theory or perspective (far less an explanation) so much as a theoretically neutral attempt to introduce a (once) new and (still) significant analytical concept to the study of the policy-making process*  
(Hay and Richards 2000)

Dowding (2001) criticises the “pointless theorising about policy networks” and argues (Dowding 1995) that, while the identification of different types of network is a useful heuristic device, the policy networks metaphor is limited in its utility and may only become a theory by developing along the lines of sociological network analysis, although this too can be a highly descriptive approach without actually examining how networks operate in practice (Atkinson and Coleman 1992). Despite this high degree of conceptual confusion there is general agreement in the literature

that the strength of the policy networks concept lies in its descriptive value (Blom-Hansen 1997).

Rhodes (1999) argues that policy networks matter because:

- they limit participation in the policy process
- they define the roles of actors
- they decide which issues will be included and excluded from the policy agenda
- they shape the behaviour of actors
- they privilege certain interests according to their access and favouring their preferred outcomes

while for Parsons (1995, p.185) policy networks draw attention to the way in which policy is the product of a complex interplay of people and organisations and provides a more informal picture of how “real” politics takes place. The policy network metaphor thus focuses on the pattern of formal and informal relationships which shape policy agendas and decision-making in contrast to the traditional, institutional approach to policy-making.

There are many definitional disputes about what constitutes a “policy network”. Rhodes (1997) identifies a continuum from policy communities, which are stable, highly interdependent, and with a restricted membership, to issue networks at the other end of the continuum, which have large numbers of participants and a limited degree of interdependence. He uses the term “policy network” to refer to dependency relationships and “policy community” to a shared framework with a more tight-knit set of relationships between actors who share core values and attitudes (Parsons 1995, p.189) and reach decisions unanimously and co-operatively: even where actors may not always agree, they are willing to accept unfavourable decisions to preserve the network (Blom-Hansen 1997).

“Issue networks” represent a much looser set of interests and are less stable, non-exclusive (Parsons 1995, p.189) and populated by a wide and unpredictable number of participants (Atkinson and Coleman 1992). They are characterised by a lack of

consensus on policy principles, and fluctuating interaction between interest groups, administrative agencies, legislators, environmentalists, consumers, journalists, researchers and experts (Greer 2003). Daugbjerg (1998) sees members of issue networks as less privileged than members of policy communities in terms of power in the policy-making process. While actors in policy communities must be recognised by each other, participation in issue networks is open to anyone with an interest who will try to force their viewpoint into a decision-making process where dominant actors make decisions unilaterally (Blom-Hansen 1997). Significantly, in the light of the forthcoming discussion in Chapter 4 on the current modes of policy engagement in Scotland, the issue network involves primarily policy consultation rather than shared decision-making because there is no shared understanding either among interests or between the interests and the bureaucracy (Rhodes and Marsh 1992). As we shall see, it is this “issue network” model that still prevails in Scotland.

Opinions also vary on the role of the state in policy networks. For Rhodes (1997, p. 15), governance refers to:

*self-organising, interorganisational networks characterised by inter-dependence, resource exchange, rules of the game and significant autonomy from the state (emphasis added)*

Even so, although the state does not occupy a privileged sovereign position, it can “indirectly and imperfectly steer” networks to varying degrees depending on the sector, the issue and the point in time (Rhodes 1999). However, the state’s relationships with other units of government and with policy networks are “asymmetric” since, for example, the state commands more legal resources than any other actor (Rhodes, 1997, p.15). As Bache (2000) found in his study of regeneration networks, the more peripheral issues are to the government’s programme and electoral success and the more limited the range of interests affected, the greater the independence of a network to run its own affairs free from state intervention (Rhodes and Marsh 1992).

Others see the state as occupying a pivotal position in networks where government is simultaneously a participant in the policy network (usually an administrative department) and a key part of the context within which the network operates (Greer 2003). Greer's study of the organic agriculture policy sector demonstrates the centrality of governments which have the capacity to reconfigure or create networks and he echoes Peters' (1997) view that the state still plays a central role rather than being a passive recipient of demands made by self-organising networks.

Ansell (2000) takes a middle line between these two positions noting the importance of central leadership in facilitating co-operation between multiple actors. However, he suggests that this leadership does not necessarily need to come from the state, although a common view implies that the lead state organisation is at the nexus of a web of networks and will adopt a critical brokerage role in bringing actors together. Where this brokerage role requires mobilisation across departmental boundaries or across the public-private divide, it may be facilitated by the creation of semi-autonomous agencies (Ansell 2000) and we shall return to this point in Section 7.4 where the gate-keeping roles of such government agencies are examined in more detail.

Policy networks can both enhance and reduce the efficiency and legitimacy of policy-making (Borzel 1998). While networks are usually favoured for their positive attributes such as flexibility and responsiveness, they tend to be dominated by producer groups, professional groups and government (Rhodes and Marsh 1992) and can be viewed as a "clique" by those excluded from the network (Hay and Richards 2000). The policy process varies across policy domains and many remain the preserve of conventional trade associations while others can also contain single-issue groups, professional lobbyists and think tanks. Effective network participation can depend on possessing technical capacity and detailed information and the exchange of information between state and private actors can create privileged relationships from which the uninitiated are excluded (Atkinson and Coleman 1992). Policy networks can also be a source of continuity and hence policy inertia rather than a source of policy innovation: networks dominated by economic or professional

interests can be particularly resistant to change (Rhodes and Marsh 1992). Tensions also exist between the more traditional depiction of networks in the literature on (central) government as institutionally dense, cumbersome and slow moving and the new governance literature on networks as flexible and dynamic, strategic alliances (Hay and Richards 2000).

In their review of the new network model of funding and governance for science and innovation, Geuna *et al.* (2003) offer a more critical view of the networked polity. While acknowledging that systems of innovation, the sociology of science and regional clusters of technological development all identify the effectiveness of networks for the exchange and distribution of knowledge as a way of fostering innovation, they believe that:

*[it] was demand that created the new networks, rather than the networks that created demand. In the case of Europe, policy has often created networks that are in search of demand (Geuna et al. 2003, p.399)*

Although the new model of funding and governance involves new patterns of social interaction and new co-ordination mechanisms that blur traditional distinctions between public and private; science and society; and science and technology (Geuna *et al.* 2003, p.395), these authors judge that “the continued promotion of networks as a panacea serves little purpose” and the key policy question must be how to manage networks to produce effective outcomes (*ibid.*, p.397), namely the use of policy to harness, support and expand private activities and to shape public choices. They do not see this call for flexibility in policy as a retreat from the role of the state: instead governments will need to become more effective policy managers, selecting and managing a wide range of different and sometimes competing policy instruments.

Morgan *et al.* (1999, p.182) describe networking as deceptively simple in principle but profoundly demanding in practice because, to be effective, it involves trust, goodwill and a capacity to forgo opportunistic behaviour. Their studies of local economic development networks in Wales and the West of England found that the growth of networks was partial, often limited to achieving short-term goals, and subject to external influences:

*while local economic development networks can indeed make a difference, especially when they have invested in social capital, their scope remains heavily circumscribed by non-local factors, so much so that the 'governing without government' thesis is a fatal conceit (Morgan et al. 1999, p.196)*

Cameron and Danson (2000, p.18) describe how the character of local networks, their leadership and elites, are fundamentally determined by the economic structure and layout of their economies, which in turn depends on the relation of the local economy to the national and global economic system. In many cases, European or national levels of government have created strong incentives for regional actors to enter into various forms of partnership. The motives and interests for each partner's involvement will be dependent on the status of organisations (whether public or private) and the tiers of government that affect them (Cameron *et al.* 2000, p.268). Danson and Gilmore (2000, p.228) suggest that Scotland has a long track record for introducing and encouraging partnerships, particularly as models of economic development strategies that predate devolution and represent a capacity in institutions and individuals to an extent not yet achieved in the rest of Britain.

Hay and Richards (2000) acknowledge that the Labour Government brought a general change in the consultative process for Ministers and civil servants and that, furthermore:

*the establishment of numerous task forces covering a wide panoply of policy areas has the potential to present a considerable challenge to the authority of some of the more traditional and well-established policy networks*

a point to which we shall return in Chapter 6 when examining the activities of the Pharmaceutical Industry Competitiveness Taskforce and the Bioscience Innovation and Growth Team.

No one theory or model is adequate to explain the complexity of policy activity in the modern state (Parsons 1995, p.73) and Parsons urges policy analysts to accept the pluralistic nature of their inquiry, both in terms of the interdisciplinary nature of the research and the need for a "hermeneutic tolerance of diversity", given that policy



analysis is made up of “multiple constructions of the policy process”. The strength of the network approach is that it provides a metaphor for this complexity which fits with the technological and sociological changes of modern society (Parsons 1995, p.185) and it recognises that “government” is not an undifferentiated whole: it is a department or a section of a department that is involved in a policy network, not the entire government (Rhodes and Marsh 1992). Against these strengths is the weakness that the metaphor is highly diverse in its use and interpretation (Parsons 1995, p.185).

Nevertheless, Atkinson and Coleman (1992) urge that these ambiguities should not be allowed to overshadow the fact that the concept of a policy network has assisted public policy studies by shifting attention from policy-making in national institutions to policy-making in sub-systems and sectors and in the process “institutionally imposed boundaries...have been broken down and replaced by a more fluid and less restricted view of the policy process”.

## **2.5 Policy learning**

Network studies have provided useful snapshots of the policy process at a particular point in time but they typically devote less attention to changes in policy processes and outcomes. Policy analysis has traditionally been dominated by the linear, “stages model” whereby policy-making is seen as a sequential process involving some or all of the following steps: identification of a policy problem, policy initiation and formulation, legislation, implementation, evaluation, and iteration (John 1998, pp.22-37). This approach adopts a legalistic, top-down focus that may be inapplicable when policy stems from a multitude of overlapping directives and actors (Jenkins-Smith and Sabatier 1994) and fails to recognise that policy evolution usually involves multiple, interacting cycles initiated by actors at different levels of government (Jenkins-Smith and Sabatier 1994).

In considering the impact of environmental changes on policy networks, Atkinson and Coleman (1992) argue that “networks may delay and even channel the direction

of policy change” and that the concept of policy networks needs to be reviewed if they are to be used to study policy innovation and change:

*Greater attention must be paid to the cognitive frameworks of all members of the policy community, to the relative strength of coalitions of community members supporting alternative sets of ideas, and to the potential for policy learning (emphasis added) (Atkinson and Coleman 1992)*

The advocacy coalition framework (ACF) (Sabatier and Jenkins-Smith 1993; Jenkins-Smith and Sabatier 1994; Sabatier and Jenkins-Smith 1999) deals with situations where there is policy change, often over long time periods of a decade or more, and considers the role of policy-oriented learning during the period. It describes the concept of a policy-making process operating across various institutions of government and a range of actors and seeks to understand the process of policy change and the role of learning by incorporating actors across all levels of government, not just the national level. An advocacy coalition therefore consists of actors from a variety of governmental and private organisations at different levels of government who share a set of policy beliefs and seek to realise them by influencing the behaviour of multiple government institutions over time (Sabatier and Jenkins-Smith 1993, p.212).

A further refinement of the research design could therefore have been to explore the extent to which an advocacy coalition existed in Scotland. However, this presents some methodological problems. From an ACF perspective, policy change takes place over time (10 years or more) and the current research is essentially studying a four-year time frame over the life of the first session of the Scottish Parliament. The approach, itself, may be less applicable to a UK context where there is less openness and contact between actors and a less pluralistic decision-making process than in the American political system (Parsons 1995, p.200). Finally, the ACF concept has most frequently been applied to environmental or social policy fields where, as Sabatier and Jenkins-Smith (1993, p.213) note, “advocacy coalitions...take time to develop and may well do so only in the presence of sustained policy conflict”. It is doubtful, therefore, whether the ACF would be particularly applicable to the arena of STI

policy in Scotland which has not been subject to this type of conflict over core belief systems.

However, there is no question that the issue of policy learning lies at the crux of this research. The evidence-based policy approach adopted by the current UK government with its philosophy of “what matters is what works” (Solesbury 2001), its emphasis on the need for collaboration (to identify what matters), and the role of “evidence” (to discover what works) (Nutley and Webb 2000) is meaningless unless policy-makers learn from the process and improve its outputs. Indeed, the government’s own policy-making guidelines note that, to be effective, policy-making must be a learning process (Cabinet Office Strategic Policy Making Team 1999, para 10.1). In particular, policy-makers need to move away from a “use and dispose” attitude to policy learning where knowledge is brought in to serve a specific purpose and then disregarded rather than becoming systematised and embedded<sup>4</sup>: this mode of copying and emulation does not lead to learning (Common 2004). Furthermore, Common (2004) warns that the public sector’s capacity to learn has been damaged by increasing organisational fragmentation and is ultimately compromised by political agendas.

Mytelka and Smith (2002) stress the changing nature of policy structures which, although they can exhibit inertia, can also be dynamic. They argue that this dynamism often results from learning which can arise from improved understanding of, and interactions with, the actors that are the objects of policy. They consider the drivers and mechanisms for such learning and conclude that innovative learning and policy learning cannot be fully separated from one another, such that:

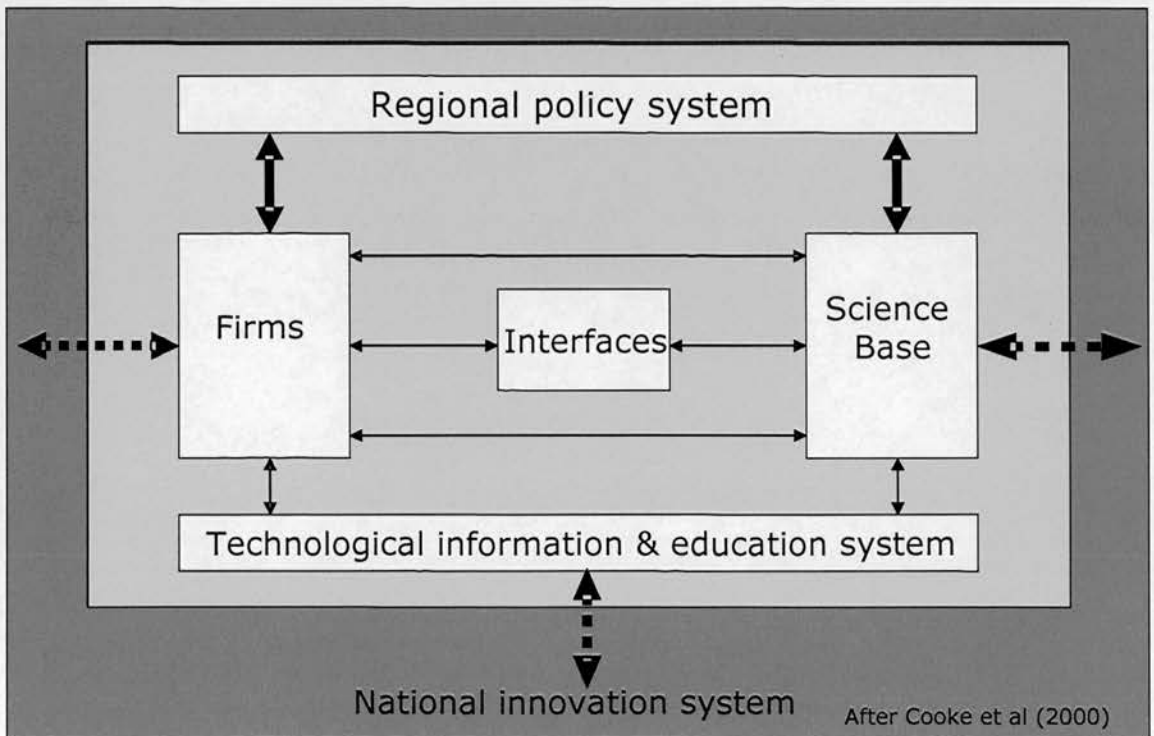
*a central component of understanding the dynamics of innovation as a whole should therefore include the nature and effects of learning within policy systems (Mytelka and Smith 2002)*

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<sup>4</sup> Contribution to PRIME Doctoral Conference, University of Sussex, 19-20 May 2004 by Kasper Munk, Copenhagen Business School.

While much of the traditional systems of innovation literature discussed in Section 2.2.1 focuses on the interactions that lead to learning between firms, it often neglects the interactions between the system actors (firms/science base/intermediaries) and the policy regime. Thus, these models can sometimes be rather divorced from politics, viewing the policy routines in which the system of innovation is embedded as a benign black box. This can be especially problematic when the system itself is being re-worked, as is the case in Scotland following devolution, where the rather permeable state-region boundaries that exist between Scotland and the rest of the UK are being re-negotiated and both existing and new actors are trying to work out where they fit into this new system. This current study therefore shifts the emphasis from the process of learning between firms (depicted by the thin arrows in Figure 2.1 in a simplified model of a regional innovation system after Cooke *et al.* (2000)) on to

**Figure 2.1 Simplified model of RSI depicting policy-learning interactions between actors from firms, the science base and the wider national system, with the regional policy actors**



the interactions between government and other actors within the Scottish level of governance (depicted by the broad arrows in Figure 2.1) and, to a lesser extent, the interactions across governance levels (depicted by the dashed arrows) that might help to inform the policy learning process.

## **2.6 New modes of governance**

Recent work on both innovation networks and policy networks across a range of knowledge domains shows a convergence in approach and a recognition that closer integration of the insights from innovation studies with those from organisation and policy studies might bear fruit (Steward 2001; de la Mothe 2001b). This elision lends support for a form of associative governance that has grown partly as a result of its perceived benefits to regional systems of innovation and partly as a result of the failure of top-down forms of policy-making and implementation (Wolfe 1997).

The appeal of the associative model of governance derives from the insights it can provide into the policy-making process where the exclusive role of public policy-makers is supplanted by a mix of public and private inputs and where the role of learning is paramount (Wolfe 1997).

Although the associative model as a way of thinking about state-society relations is relatively pervasive in the European literature, British authors tend to regard the policy network paradigm as a form of “interest group intermediation” (a generic term for all types of relationships between interest groups and the state) whereas German and Dutch scholars view policy networks as a new form of governance, as a mechanism for mobilising political resources in situations where these resources are widely dispersed between public and private actors, and as a specific form of public-private interaction based on non-hierarchical interaction (Marsh 1998b; Borzel 1998).

Edler *et al.* (2002) adopt this latter stance. They draw attention to the discrepancies between the increasing perception of innovation as a systemic, horizontal phenomenon caused by and influencing a broad spectrum of factors while the related policy institutions continue to work in a departmentalised and fragmented manner,

maintaining a narrow, vertical, thematic focus. Building on work done by Smits and Kuhlmann (2002), Edler *et al.* (2002) report that the governance of innovation in most OECD countries is characterised by failing attempts at restructuring responsibilities in government, the dominance of the linear model of innovation and innovation policy run in very specific, narrow fields. They find that this situation is exacerbated by the emerging multi-level governance of innovation in a European context which makes the development of a systemic policy approach even more difficult. The workshop on which these authors report (Edler *et al.* 2002) discussed the need for a new policy design where the state acts as a moderator and enabler within a network-oriented approach rather than a hierarchical interventionist approach. This requires a “new mode of governance” with, on the one hand, more elaborate forms of institutionalised co-ordination between the European level and national and regional levels, and on the other hand, a continuous reflection on appropriate principles of governance with respect to both strong leadership and participatory approaches. These authors conclude that this will require a re-organisation of administrations in a way that enables flexible, horizontal co-ordination and exchange.

An interactive innovation policy is therefore “one where the boundaries between science and technology development, SME support, education and training, and industrial policy have faded away” (Cooke *et al.* 2000, p.142) although as these authors note, public policy in general (not just at the regional level) is not used to tackling problems in such an integrated manner:

*[on]the contrary, these policy domains are usually compartmentalised in different departments and agencies competing for power rather than co-operating to tackle the policy issues (Cooke et al. 2000, p.142)*

Such transparency and horizontal co-ordination within the regional innovation system requires decision-making powers to be devolved as well as some level of consensus about the region’s goals for economic development and STI policies. This “is likely to fail if it is pursued as a top-down policy by a dominant policy actor” (Cooke *et al.* 2000, p.142) and instead requires a true commitment to user

involvement that goes beyond just offering the opportunity to “participate in participation” (de la Mothe 2001a, p.8).

Shapira *et al.* (2001) call for policy and institutional modernisation to reorient innovation systems to match current and emerging socio-economic and political developments, noting that, in most industrialised countries, innovation policy-makers are indeed trying to reform traditional policy approaches. They point to a shift in the institutional locus of innovation policy and the pursuit of new models for innovation that are “typically iterative, catalytic and networked and which accelerate the growth and pace of innovation among multiple participants”. However, they warn that such policy changes need to be accompanied by “considered assessment, reflection and learning” in order to ensure success (Shapira *et al.* 2001).

Cooke *et al.*'s (2000, p.134) study of European RSIs demonstrated that innovation policy is generally fragmented and haphazard and does not fit the needs of its users (see also Nauwelaers and Wintjes (2002), Section 2.2.3 above). They find that the discrepancies that exist between innovation support provision and its uptake by SMEs, indicate that innovation policies are not attuned to the real problems of firms and that top-down innovation policies, developed without consulting its users and stakeholders, lead to inefficient innovation support strategies that either do not match the needs of regional industry or only reflect the wishes of those firms that are the best at articulating their needs (Cooke *et al.* 2000, p.142) (see also Section 4.5.2 on the “star” system). Improvements will only come when regional governments develop policies “that have the consensus of regional stakeholders and address the needs of regional firms” (Cooke *et al.* 2000, p.134).

Likewise, Mytelka and Smith (2002) caution that policy-makers have found it difficult to deal with the complex reality represented by the systems of innovation approach and, although national governments would be expected to tailor new policy instruments to the needs of actors whose behaviour the policy is designed to influence:

*[O]nly where stakeholders at the regional level have been able to shape policies directly through participatory processes are there small signs of movement in this direction (Mytelka and Smith 2002)*

## **2.7 Reprise**

This review has demonstrated how early thinking on innovation policy has responded to the influences of “new regionalism” by developing the concept of a regional system of innovation which in turn reflects the political shift from government to governance and the concomitant ascendancy of the policy network paradigm. This advance towards more associative forms of governance for STI policy exemplifies a convergence between the academic domains inhabited by the interdisciplinary field of science and innovation studies and those of public policy and political studies.

While scholars argue over points of detail, most authors acknowledge this shift towards networks as a new form of governance and agree that policy networks do affect policy outcomes while recognising that they may only be part of the explanation and accepting that hierarchy, in terms of the role of government or public authorities within networks, is still important (Marsh 1998b).

Marsh (1998a) describes policy networks as a meso-level approach where the macro level deals with the broader political context and processes of government within which any policy network operates and the micro level deals with individual actions and decisions of actors within the network. The meso level therefore concentrates on questions concerning the structure of networks and patterns of interaction within them.

In adopting this meso-level approach, this thesis will investigate the impact of environmental change (in the form of devolution) on policy networks in Scotland and try to assess how these networks are influencing STI policy development. In particular, this study will consider how sectoral networks affect the pattern of policy outcomes for science and innovation in the life sciences in Scotland and how the sub-national, national and supra-national political institutions condition these policy networks.



The literature suggests that, in order to reap the economic benefits of their STI-based resources, regions such as Scotland should be promoting the formation of regional policy networks. In so doing, they should learn from past experiences, improve policy integration (both within the region as a whole and more specifically within and between government departments and agencies), and attempt to develop a policy consensus on future STI strategies across a broad range of stakeholders. This should be done, not by reinventing the policy wheel, nor by adopting policy solutions developed in other countries in a wholesale fashion, but through iteration and policy learning to ensure that STI policies respond to changing policy conditions and evolving policy goals.

This research therefore uses the policy network approach as a tool to investigate the complex relationships that exist in areas related to STI policy in Scotland post devolution; it tries to understand policy outcomes by exploring who participates and who wields power in these networks; and it considers whether these networks fit the popular typologies of policy communities or issue networks. Authors such as Cooke *et al.* (2000 p.120) discuss how the direct and indirect impacts of public policy shape a regional system of innovation. By focusing on policy learning, the current research examines the converse: the extent to which actors within the RSI actually shape the policy domain (see Figure 2.1).

The term “multi-level governance” was originally developed to give due recognition to the roles played by various actors at supra-national, national, *and* sub-national levels in a European policy context (Sloat 2002a, p.35). The current research adopts this model of governance to examine the interactions amongst a complex assemblage of actors operating within the broad purview of STI policy *within* and *between* the multiple levels of governance now in place in the UK. Rather than the popular metaphor of the “conceptual lens”, a more appropriate optical analogy for this espousal of the governance model might therefore be that of a prism, refracting light into a spectrum of multi-tiered, societal actors and dispersed policy resources in order to illuminate the process of policy-making for STI in Scotland.

## **Chapter 3 The Scottish System of Innovation**

### **3.1 Introduction**

This chapter makes the case for the existence of a Scottish system of innovation (SSI). It discusses the constraints on the system in terms of the external drivers that influence STI policy and explores the multi-level nature of policy-making in Scotland and the need for greater policy integration at the regional level. This chapter continues the policy network metaphor, introduced in the previous chapter, to draw further attention to the way in which policy is the product of a complex interplay of people and organisations, thereby providing a picture of how “real” politics takes place in contrast to the traditional, institutional approach to policy-making (Parsons 1995, p.185). The character of such policy networks is determined by many factors, including local economic structures (Cameron and Danson 2000, p.18), so in order to begin to understand their role in the Scottish system of innovation, this chapter starts by introducing the key policy actors, discussing their role in the policy-making process and reviewing some of the recent policy and strategy documents relevant to STI in Scotland. Next it attempts to map the SSI, discussing the general policy framework and its linkages both within the system and with external actors in order to explore some of the constraints that might impact on the regional governance of STI in Scotland. This leads on to a discussion of the need for a more integrated approach to government intervention *within* the SSI and *between* the different levels of governance. This chapter concludes by reflecting on some of the changes that devolution has wrought as regards participation in the policy system, a theme that is then explored in detail in Chapter 4.

### **3.2 The devolution process**

Following the election of the Labour Government in the UK in May 1997, a White Paper on devolution was published setting out key proposals for the re-establishment of a Parliament in Scotland. A referendum took place in Scotland in September 1979 and the Scotland Bill, paving the way for Scottish devolution, received Royal Assent

in November 1998. A Consultative Steering Group was established which reported in December 1998 (Consultative Steering Group 1998), setting out detailed recommendations for the day-to-day running of the Scottish Parliament. The first elections for the Scottish Parliament were held on 6 May 1999. The first day of business in the Parliament was 12 May 1999, with the official opening taking place on 1 July 1999. The election for the second session of the Parliament took place in May 2003. Both of these elections returned Labour as the largest single party, but with no overall majority.

The Scottish Parliament consists of 129 elected representatives known as Members of the Scottish Parliament (MSPs) and the Scottish Executive comprising: the First Minister, the Lord Advocate and the Solicitor General (also known as the Law Officers) and 18 other Ministers and Deputy Ministers appointed by the First Minister. Until May 2003 there was also a Secretary of State for Scotland who was a member of the UK Cabinet. As anticipated (Brown *et al.* 1998, p.121), on 12 June 2003 the Prime Minister announced a number of changes to the government which led to the Scotland Office becoming part of the Department for Constitutional Affairs with the position of Secretary of State for Scotland now held by the Secretary of State for Transport who is responsible for Scottish affairs, advised by the Scotland Office. The role of the Secretary of State and the Scotland Office is to promote the devolution settlement, to represent Scottish interests within the UK government and to advise the UK government as regards Scots law, although it appears that this can often be a case of trying to promote co-operation and compromise (Eames 2001). A Memorandum of Understanding (Cabinet Office 1999a) sets out the principles that will underlie relations between the UK government and the devolved administrations while a series of Devolution Guidance Notes (Cabinet Office 1999b) give departments advice on the routine practicalities of working with the devolved administrations. However, as these notes make clear (ODPM nd), effective relations between the devolved administrations cannot be sustained by memoranda and concordats alone and ultimately rely on effective communication between civil servants at the various levels of government. As we shall see, this must be the case *within* levels of governance just as much as it is *between* the different tiers.

### **3.3 Devolved and reserved powers**

The freedom of action of the Scottish Parliament, as of any regional government anywhere in the world, is limited and the integration of the Scottish economy into the British, European and world economies means that distant economic events over which no Scottish actor has any control may have much greater effects on the Scottish economy than any actions of Scottish Parliament (Newlands 1999a, p.21).

The Parliament does have the power to pass legislation but does not have powers over monetary policy and only very limited powers over fiscal policy<sup>1</sup> so that Scottish businesses are still more heavily affected by UK legislation on financial and economic matters than by devolved powers (Sloat 2000a). However, while the Scotland Act 1998 makes it clear that overall macroeconomic policy is reserved to the UK Parliament, the Scottish Parliament does have the authority to develop a distinctive “micro-economic” agenda (Burnside and Wakefield 2003) using policy tools related to education and training, support for businesses, promoting Scottish exports, developing tourism, and providing roads, local transport and other infrastructure.

Key areas of devolved responsibility include:

- Health
- Transport
- Local government
- Economic development
- Environment
- Education
- Housing
- Training
- Agriculture

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<sup>1</sup> The Scottish Parliament also has the power to raise or lower the basic rate of income tax by up to 3 pence in the pound but has not so far acted upon this.

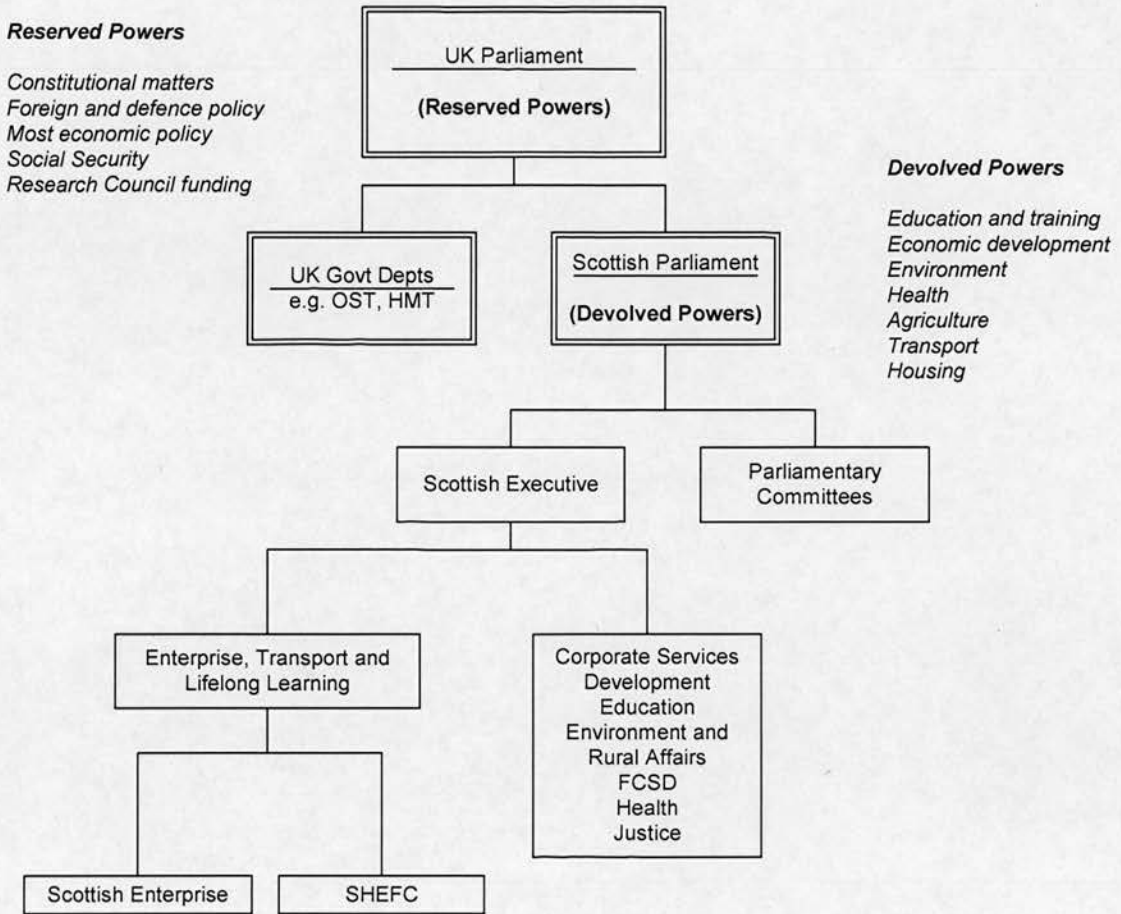
Those policy areas still covered by the UK Government in Westminster (known as reserved powers) are:

- Constitutional matters
- Foreign and defence policy
- Most economic policy
- Social security
- Medical ethics
- Relations with the EU

Many aspects of technology and innovation policy are covered by Scottish economic development policy; and some aspects of science policy, related to education, public understanding of science, universities and other higher education institutes may be covered by education policy. Science itself is a “concurrent power”, meaning that responsibility is shared between the Scottish and UK Parliaments.

The split between devolved and reserved powers illustrates the highly complex situation of STI policy, with many of the key policy-makers remaining at the UK level (see Figure 3.1). Policy links between the UK and EU levels are well defined and have been smoothed by long familiarity and regular use. Links between the UK and Scottish levels are still in their formative stages. It would seem that government should have a particularly important co-ordination role in the Scottish system of innovation given this multi-level nature of governance with policy emanating from local, national and supra-national levels where many of the key drivers for science and innovation are external to the Scottish system. This multi-level dimension of the Scottish system of innovation presents a considerable co-ordination and communication challenge. Devolution may thus be unintentionally reinforcing traditional tendencies to develop policy in separate compartments or “policy silos”, rather than a more integrated approach. This leads to important questions about where Scottish policy actors have influence and control, given that many of the drivers for UK science are powers reserved either to the UK Parliament in Westminster or to the European Commission.

**Figure 3.1 Key policy actors in the Scottish System of Innovation**



(OST = Office of Science & Technology; HMT = Treasury; FCSD = Finance & Central Services Department)

### 3.4 Key policy actors and instruments

#### 3.4.1 STI policy instruments

In terms of published strategies that might elucidate the Scottish government's thinking on STI, the *Framework for Economic Development in Scotland* (Scottish Executive 2000a) and *A Smart, Successful Scotland* (Scottish Executive 2001b), discussed below, have provided the basis for action on the economy, and hence enterprise and innovation to date. The key science policy document, *A Science Strategy for Scotland* (Scottish Executive 2001a), set out a framework for the development of the Scottish Executive's policy in terms of maintaining a strong

science base; increasing the exploitation of scientific research; ensuring the supply of scientific talent; promoting awareness and understanding of science in society; and ensuring the effective use of scientific evidence in policy formulation and resource allocation by government. This is discussed in detail in Chapter 5 in terms of the role of users in the policy development process and the impact the strategy has had on the co-ordination of STI policy in Scotland.

Published in June 2000, the *Framework for Economic Development in Scotland* (FEDS) provides an over-arching policy statement on economic development. It headlines two aspects germane to this study of the policy-making process, namely “partnership” where it states that economic development is ultimately driven by the private sector, therefore FEDS seeks to enable and encourage that development, and “evidence-based policy” whereby “policy-making needs to be underpinned by evidence and rigorous analysis, not by anecdotal and ad hoc assessment” (Scottish Executive 2000a, p.xi), noting that “the evidence that underpins the thinking on economic development remains patchy in several areas” (Scottish Executive 2000a, p. xiv) and requires enhanced knowledge and understanding of the key elements that drive progress. Innovation is described as a key feature of entrepreneurial dynamism and an important driver of the increased productivity which in turn drives the overall competitiveness of the Scottish economy (Scottish Executive 2000a, p.60). The FEDS document underlines the research strengths of Scotland’s universities and focuses on the need to achieve a step change in the quantity and quality of commercialisation activity in Scotland’s science and research base. Although FEDS raises the questions of how to encourage industry “pull” to match the academic “push” and how to bring about more effective interaction between government, academia and industry, it is grounded in the “treasure trove model” (SUPRA 2000) where universities are exclusively seen as the source of innovation. We shall return to this issue in Section 3.6 and again in Chapter 5.

### 3.4.2 Scottish policy actors

#### Scottish Parliament

The Scottish Parliament controls 60% of the public funding for research and development in Scotland (Miller 2000). UK Research Councils and UK charities provide the remaining 40%. Significantly, science funding via the UK Research Councils<sup>2</sup> remains a reserved power, something that the Scottish universities and their representative bodies campaigned hard to retain in order to avoid the fragmentation of the science base, arguing that there is a minimum efficient scale of scientific community and of resourcing below which it is difficult to sustain an internationally competitive research capability (Royal Society of Edinburgh and Royal Society of London 1999; Boulton 1999).

Much of the work of the Scottish Parliament takes place in committee and it is through these committees that the Scottish Executive is held to account and where proposed legislation is examined. The Enterprise and Lifelong Learning Committee (now the Enterprise and Culture Committee<sup>3</sup>) noted in its legacy paper at the end of the first session (Enterprise and Lifelong Learning Committee 2003) that, unlike some other committees, it had not had a high volume of legislation or petitions referred to it and its focus had therefore been on self-generated inquiry work. The committee indicated that its main objective was, by the end of the first parliamentary session, “to have had an impact on the governance of Scotland” although when reviewing the outputs from this committee during Session 1 (Table 3.1) it is evident

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<sup>2</sup> Scotland benefits disproportionately from Research Council funding. Figures from 1998-99 quoted by Miller (2000) show that – with a population of only 9% of the UK population – NERC spends 13% of its budget in Scotland, ESRC 6%, EPSRC 13% and MRC 12%.

<sup>3</sup> At the start of the second session of the Scottish Parliament the Enterprise and Lifelong Learning Committee was replaced by the Enterprise and Culture Committee. The remit of this committee is to consider and report on matters relating to the Scottish economy, business and industry, energy, training, further and higher education, lifelong learning and such other matters as fall within the responsibility of the Minister for Enterprise and Lifelong Learning. It also covers matters relating to tourism, culture and sport, and all other matters covered by the Minister for Tourism, Culture and Sport.



**Table 3.1 Enterprise and Lifelong Learning Committee activity during the first session**

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Inquiries

- local economic development services
- the governance of the SQA
- the impact of the new economy
- fuel prices in remoter rural areas
- SHEFC reviews of teaching and research funding
- lifelong learning
- tourism

Primary legislation

- Education and Training (Scotland) bill
  - Education (Graduate Endowment and Student Support) (Scotland) bill
  - University of St. Andrews (Postgraduate Medical Degrees) bill
  - Secondary committee on the following legislation
  - Transport (Scotland) bill
  - Tobacco Advertising and Promotion (Scotland) bill
-

that issues relating to the governance of STI may have been overshadowed by more populist policy areas.

Economic theory predicts that the powers of regional governments largely concern service provision and economic development policy (Newlands 1999a) although it could be argued that decentralisation of economic development powers to Scotland existed for many years prior to the advent of an elected Scottish Parliament as virtually all of the key policy actors in Scotland (with the obvious exception of the Parliament itself) pre-date devolution. The Scottish Office, pre-cursor to the Scottish Executive, was founded in the 19<sup>th</sup> century with the Scottish Development Department and Scottish Industry Department established in the 1960s. Scottish Enterprise and Highlands and Islands Enterprise<sup>4</sup> were established in 1991 following a merger with the Scottish arm of the Training Agency, which gave the Scottish Office greater responsibility for training policy in Scotland. Around the same time oversight of higher education policy in Scotland passed to the Scottish Office with the creation of the Scottish Higher Education Funding Council (SHEFC). While there may not have been legislative devolution to Scotland, there was therefore very considerable administrative devolution in policy areas related to STI (McCarthy and Newlands 1999) although commentators note that the capacity to be creative was greater in some areas of Scottish policy than in others. For example, during the last three decades there has generally been more Scottish innovation in education, child law, housing and social work, than in training, industry, and health (Brown *et al.* 1998, p.102). Even now, some critics doubt that the Scottish Parliament can significantly enhance economic activity. While the Scottish Parliament may influence business decision-making, the Parliament's powers may be largely confined to the public services since many of the key aspects of government action that impact on business and the economy are reserved powers (Kerley 1999).

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<sup>4</sup> Preceded by the Scottish Development Agency (founded 1975) and Highlands and Islands Development Board (founded 1965) respectively.

## Scottish Executive

Within the Scottish Executive, STI policy is primarily the responsibility of the Enterprise, Transport and Lifelong Learning Department<sup>5</sup> and the remit of the Enterprise and Lifelong Learning Minister includes:

*economy, business and industry, including Scottish Enterprise, Highlands and Islands Enterprise, European Structural Funds, trade and inward investment, energy (including renewable energy), further and higher education, lifelong learning, training and science (Scottish Executive 2003)*

Within the Enterprise, Transport and Lifelong Learning Department there are two divisions responsible for STI policy: the Enterprise and Industrial Affairs Group and the Lifelong Learning Group. The latter has lead policy responsibility for issues affecting higher education in Scotland. Within this division the Science and Higher Education Branch (formerly the Science Policy Unit) has policy responsibility for cross-cutting science issues within the Executive, for the implementation of the Science Strategy and for policy relating to the funding and management of research in Higher Education.

Within the Enterprise and Industrial Affairs Group, the Innovation Policy Unit (IPU) has policy responsibility for innovation “in its broadest sense from an economic development perspective”<sup>6</sup>. IPU’s remit includes promotion of the knowledge-based economy; higher education institution (HEI) /industry links; commercialisation of the science-base; technology transfer; and sponsorship of specific hi-tech sectors including supporting the implementation of the Biotechnology Framework for Action. Other departments such as Health and Environment and Rural Affairs also have policy responsibilities within the broad remit of STI.

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<sup>5</sup> Until the 2003 election known as the Enterprise and Lifelong Learning Department and generally referred to as such in this thesis.

<sup>6</sup> Quoted from [www.scotland.gov.uk/who/elld/ipu.asp](http://www.scotland.gov.uk/who/elld/ipu.asp) but webpage no longer available when last accessed (28/10/04).

## Scottish Enterprise

The Scottish Enterprise Network is the key delivery mechanism for the Executive's economic development policy including many aspects related to science and innovation. Scottish Enterprise covers the southern part of the country (covering 93% of the Scottish population). Its headquarters are in Glasgow and there are 12 local offices, known as local enterprise companies (LECs)<sup>7</sup>.

Scottish Enterprise has had a strategy in place since 1996 to increase the contribution that Scotland's science and technology base makes to the economic wealth of Scotland through commercialisation (Scottish Enterprise and Royal Society of Edinburgh 1996) and in January 2000 the second phase of this strategy was launched as Technology Ventures Scotland which aimed to encourage investment in technology research and development in Scotland and to accelerate the commercialisation of Scotland's science and technology. In the specific area of biotechnology, Scottish Enterprise launched a four-year *Framework for Action* in 1999, a £40 million strategy to grow the biotechnology cluster in Scotland. This Framework, which has been updated annually, sets out a number of targets to grow the sector again with a focus on new firm formation and the commercialisation of the science base (Scottish Enterprise 2002). Scottish Enterprise is widely regarded as a leading exponent of the clusters approach in Europe (Sainsbury 1999). However, clusters policy is an inherently political issue. Some would say that Scottish Enterprise adopted the clusters approach in the 1990s as a way of differentiating itself from English economic development policy. Scottish Enterprise is now recognising that clusters policy is just one element of effective innovation support and should not be promoted in isolation but as part of a larger policy picture and the clusters initiative now seems to have been largely overshadowed by Scottish

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<sup>7</sup> The Enterprise and New Towns (Scotland) Act 1990 set out the legal basis for the establishment of Scottish Enterprise and Highlands and Islands Enterprise. Both bodies are charged with enhancing skills and environmental improvements, but Scottish Enterprise's functions also included safeguarding employment, industrial efficiency and competitiveness while Highlands and Islands Enterprise's (HIE) remit included broad measures for the social and economic development of their area (Burnside and Wakefield 2003). The role of HIE is of less relevance to this study and is not discussed further.

Enterprise's new flagship initiative, the £450 million Intermediary Technology Institutes (ITIs), which aim to encourage and support pre-competitive research in the areas of Energy, Life Sciences and Techmedia (Communications Technology and Digital Media).

By the mid 1990s, some years prior to devolution, Scottish Enterprise had established itself as an effective regional body and used the latitude in its relationship with the Scottish Office to begin to pursue a number of quite distinct agendas promoting both clusters and regional entrepreneurship several years before they were to appear on the English agenda (Gillespie and Benneworth 2002). However, although Scottish Enterprise and its predecessors have existed for much longer than their English counterparts, their initial aim had been to attract inward investment and they have had less experience of stimulating home-grown enterprise (Gillespie and Benneworth 2002). In line with other development agencies in the UK, Scottish Enterprise has now moved away from this historical focus on foreign direct investment towards a greater emphasis on the "soft" infrastructure of business support services, technology transfer, and skills development (Morgan 1997) and, more recently, there has been a further shift from a focus on increasing Scotland's business birth rate (particularly in the biotechnology sector) towards the sustainability and growth of existing firms.

The creation of LECs was seen by some as taking decentralisation too far, with the loss of a central strategic overview of the problems of the Scottish economy and a multiplication of the problems of co-ordination both within the Enterprise Networks and between the Networks and other economic development actors (Newlands 1999a, p.22). A review of the Enterprise Networks was launched in December 1999 by Henry McLeish, the then Minister for Enterprise and Lifelong Learning. A Review Issues Paper was published in February 2000 and circulated to a range of interest groups and organisations, seeking input from Scottish business, academics, local authorities and the Enterprise Networks themselves. One of the main outcomes of the review was the publication of *A Smart, Successful Scotland: Ambitions for the Enterprise Networks* (Scottish Executive 2001b), a strategy for enterprise that detailed the Executive's expectations for the Enterprise Networks and aimed to

clarify relationships between the two institutions. *Smart, Successful Scotland* set out three priority themes: Growing Businesses, Global Connections, and Skills and Learning. It signalled a shift in priorities, suggesting that the Enterprise Networks should withdraw from areas where market failure was no longer evident, less focus on the direct provision of traditional business development services and a greater focus on issues related to skills and learning, digital connectivity and positioning Scotland on the world stage. The document is written in the language of facilitation/co-ordination/joint venture and sets out a vision of “new relationships between the Networks, their customers, stakeholders and the Executive”. It hinted at poor past performance (“The Enterprise Networks must be better at responding to their customers”) and a less than amicable past relationship when it spoke of the Executive building “relationships of trust that give the specialist expertise and insight of the Networks Boards and staff better leverage to enhance the prosperity of Scotland” (Scottish Executive 2001b, p.7). While future enterprise strategy was to be set jointly by the boards of Scottish Enterprise, HIE and the Scottish Executive, direction was to be essentially the responsibility of the Scottish Executive while delivery was the responsibility of the Enterprise Networks (Scottish Enterprise, HIE and the LECs) (SPICE 2001).

Further steps were also taken to improve co-ordination within and between the networks in an attempt to bring about a more cohesive, streamlined and customer-driven Network including a change in the status of LECs to make them wholly owned subsidiaries of either Scottish Enterprise or HIE. However, despite these changes, critics “struck by document fatigue” were still calling for fewer promises and more action (Murden 2001) and noting that Scottish Enterprise’s performance indicators still set too much store by numerical targets rather than assessing the value of activities.

### **SHEFC**

The other key government agency in Scotland with policy links to STI is the Scottish Higher Education Funding Council (SHEFC). Established in June 1992 as a non-departmental public body responsible to the Scottish Executive, SHEFC provides financial support for teaching, research and associated activities in Scottish higher

education institutions. Although this study is not about higher education policy *per se*, SHEFC is a relevant policy actor as it has increasingly, in recent years, participated in the economic development agenda by playing its part in knowledge transfer. SHEFC was a key partner in the Technology Ventures initiative and more recently established a Task Group on Knowledge Transfer jointly with Scottish Enterprise (SHEFC/Scottish Enterprise 2002) to develop a blueprint for collaboration between industry, academic and the public sector to capture the economic benefits of Scotland's research base.

### **Linkages with UK level of governance**

At the UK level, the Office of Science and Technology (OST) retains responsibility for the science budget and the task of co-ordinating STI policy across government, while the Department of Trade and Industry (DTI) is responsible both for UK science policy (through OST), and for promoting the development and use of technology by industry. Although OST oversees R&D spending, it does not have executive authority over other departments that also have STI policy roles such as the Department for Environment, Food and Rural Affairs or, indeed, the Scottish Executive.

Formal and informal links exist between policy-makers and stakeholders but few consensus-making bodies. The Council for Science and Technology is the government's top-level advisory body on major science and technology issues of strategic importance to the UK and advises Ministers on the balance and direction of UK STI. The House of Commons and House of Lords Select Committees on Science and Technology both have remits to review science and technology policies but have no direct equivalent in the Scottish Parliament. Although committees of the Scottish Parliament may examine any matters that fall within their remit, conduct inquiries and consider and report on the policy and the administration of the Scottish government as well as initiate legislation, their full timetables have not so far

allowed them to undertake the detailed scrutiny of STI policy issues carried out by the UK Parliamentary Committees<sup>8</sup>.

Of the various actors involved in economic development policy, Newlands (1999b) suggests that the Scottish experience implies that regional development agencies are the crucial component. Furthermore, the construction of devolved economic development policies is both a long-term and a two-way process. Building up effective economic development policies adds to the credibility and legitimacy of devolved institutions and provides an argument for the further devolution of powers (Newlands 1999b). Scotland clearly, therefore, had a long track record in certain aspects of the governance of STI prior to devolution. Having identified the key policy actors and introduced some of the complexities brought about by the nature of the Scottish devolution settlement, the following section attempts to map the Scottish system of innovation and explore some of the constraints that might impact on the regional governance of STI in Scotland.

### **3.5 Mapping the Scottish System of Innovation**

As we have seen in the previous chapter, the national systems of innovation approach (NSI) provides a useful conceptual framework, first to define and describe the nature and determinants of the (sometimes intangible) investments made by countries in activities to promote and manage technical change and secondly, to analyse the differences between countries in the levels and patterns of these investments (McKelvey 1991).

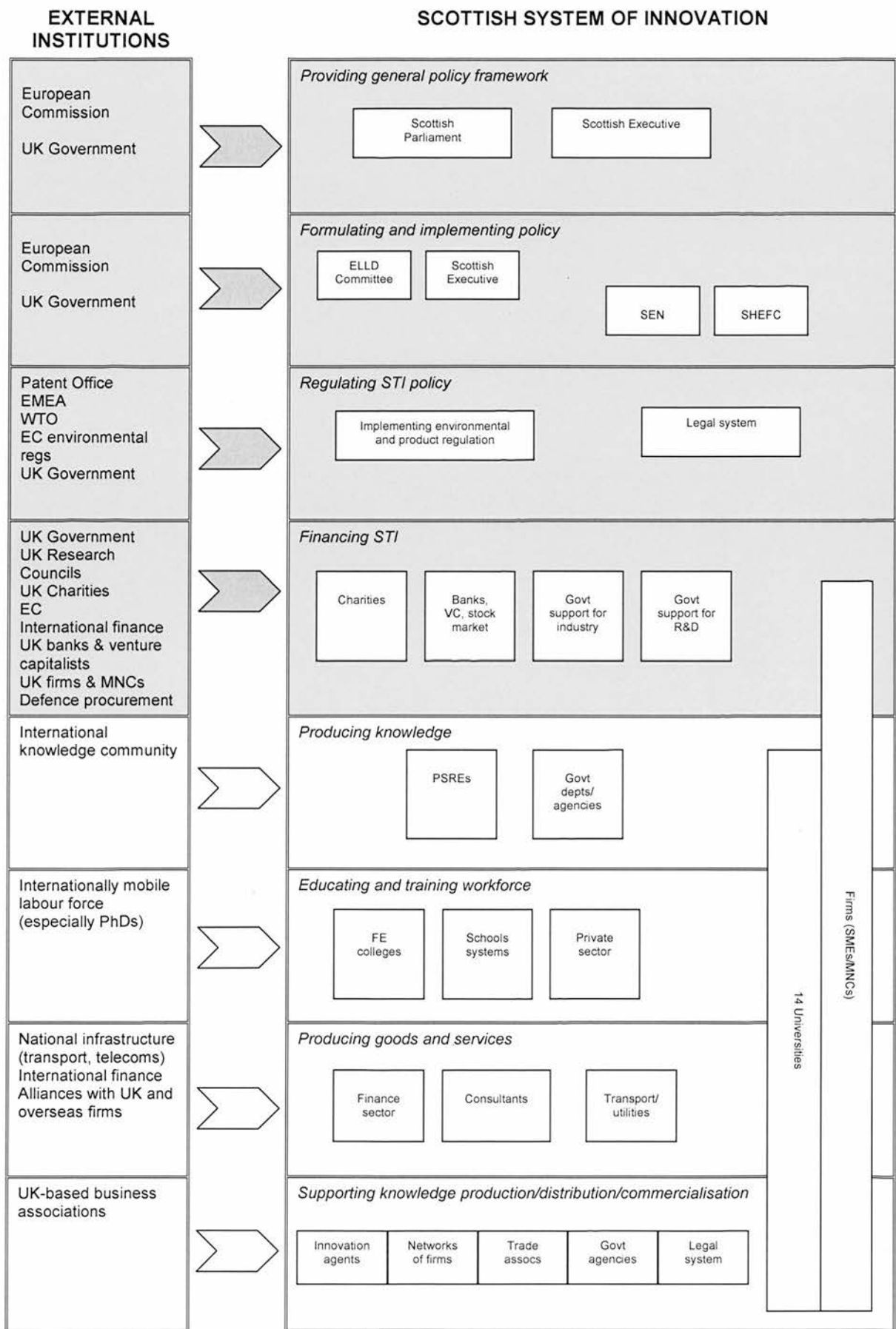
The key interdependent elements of any NSI are the R&D system, the role of the public sector, relationships between firms, the financial system, and education and training (Senker *et al.* 1999). Figure 3.2 attempts to identify the key factors that constitute the system of innovation in Scotland, taking a fairly broad definition of the NSI approach by encompassing all institutions and cultural factors that affect innovation in a national economy rather than the narrower definition which

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<sup>8</sup> A notable exception to this is the Enterprise and Lifelong Learning Committee's inquiry into local economic development services, published May 2000.



**Figure 3.2 The Scottish System of Innovation**



concentrates on institutional actors producing and diffusing knowledge (Senker *et al.* 1999). The role of government policy in NSI is not just about those policies directly targeted at technological advance but includes policies for educating the workforce and those aimed at shaping the macro-economic climate, regulation (*e.g.* environmental, patent protection), and public procurement.

The role of government is particularly important in the Scottish system of innovation (SSI) as policy emanates from multiple levels of governance: regional, national and supra-national. The right hand side of Figure 3.2 identifies eight functional/policy levels within the SSI. The top half of the diagram (darker shading) includes those policy areas that are the key drivers for science, technology and innovation, *e.g.* finance, regulation and the overall policy framework (*i.e.* the system drivers). The bottom half of the diagram (no shading) describes the operation and outcomes of the STI system, *e.g.* knowledge, a trained workforce, goods and services. Thus, the “system” is intended to represent Scotland as a discrete regional and political entity, but the boundaries of this system are somewhat permeable. Indeed, Cooke *et al.* (2003) describe a RSI as an open system “in constant interaction with its national, other regional and innovation nodes and networks”. The left hand side of Figure 3.2 therefore identifies institutions that are external to Scotland but nevertheless have an impact on these policy levels. It is also worth reflecting momentarily on the attitudes of system “insiders” and “outsiders”, a point to which we shall return in Chapters 4 and 8. Those external to the SSI often regard Scotland as a well-functioning, joined up, policy community (*e.g.* Interview with European policy-maker, P240902<sup>9</sup>) and are envious at how cohesive the system is (Interview with service provider, I160702), whereas those who view the system from the inside perhaps inevitably tend to focus on its imperfections (Interviews with policy targets, *passim*).

The intention in this section is to use the SSI described in Figure 3.2 as a starting point to identify the constituent elements, to analyse the relationships between these

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<sup>9</sup> Respondents were offered anonymity and are therefore classified by their role (academic, policy-maker, industrialist, *etc.*) and identified by a code number based on the date of interview. See Appendix for further details.

elements (particularly those that are mediated by public policy), to identify the source of those policies (Scotland, UK or Europe), and to consider the opportunities for policy targets to influence those policies.

### **3.5.1 Providing general policy framework**

At the top of the diagram is the general policy framework. This would include policies for the macro-economy, fiscal policy, trade and anti-trust laws, infrastructure development, regional development and public procurement. Although the Scottish Parliament does have the authority to vary the tax rate and is responsible for the infrastructure in Scotland, the macro-economy, defence (a significant driver for public procurement) and international trade law are all reserved powers. Regional development would fall within the Scottish Parliament's remit but is regulated (and financed) by the European Commission to a significant degree.

### **3.5.2 Formulating and implementing STI policy**

The Scottish Parliament and the Scottish Executive do have more scope for formulating and implementing STI policy although again this has to be done within the frameworks set out by the UK government and the EC. For example, Foresight is a national initiative and the clusters approach to innovation, although possibly given a different emphasis in Scotland, is a central tenet of UK innovation and competitiveness policy.

### **3.5.3 Regulating STI policy**

Scotland's distinctive legal system pre-dates devolution but the regulation of STI in the form of, for example, environmental standards, patent protection, and product licensing is still controlled by the UK, the EC and international law giving the Scottish Parliament little scope for high level policy interventions and leaving it essentially with an implementation and monitoring role and responsibility for local environmental issues such as planning.

### **3.5.4 Financing STI**

Although, as noted above, the Scottish Parliament controls 60% of the public funding for research and development in Scotland (Miller 2000), the remainder comes from

UK-wide bodies in the form of the UK Research Councils and UK charities. Funding for research (both in the public and private sector) also comes in the form of European Framework funds and much of the private sector funding from banks, venture capital firms and multinational companies is also external to the Scottish system. However, with only 9% of the UK population, Scotland does well out of UK public sector funding winning 12% of total UK funding council resources for research; 13% of the research councils' resources for research; 13% of government research departments' resources for research and 12% of EU research resources spent in the UK. The *per capita* income from research grants and contracts in Scotland is £39 compared with £28 for England (data from Technology Ventures Scotland 2003). However, as noted below (Section 3.5.5), Scottish industry's contribution to financing STI is minimal.

Scotland has developed some distinctive policies in this area such as the highly regarded Proof of Concept fund which aims to bridge the gap between early research and the first stage of commercial funding, the RSE Enterprise Fellowships to support young entrepreneurs, and Scottish Enterprise's £20 million venture capital fund to plug the equity gap for companies looking for up to £500,000 to grow their business. However, little direct financial assistance is given to companies beyond small-scale competitive SPUR and SMART awards which can often be seen as more of a bureaucratic hindrance than a real benefit to a company (Interview with biotechnology CEO, I090603).

### **3.5.5 Producing knowledge**

Scotland has 14 universities and Scotland's academics produce 1% of all research publications in the world-ranking Scotland third in the world for the number of research publications published per head of population<sup>10</sup>. In the public sector there are several research establishments including the six Scottish Agricultural and Biological Research Institutes (SABRIs), all of which could be said to contribute to the production of knowledge, a range of non-departmental public bodies (NDPBs)

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<sup>10</sup> Universities Scotland website, [www.universities-scotland.ac.uk](http://www.universities-scotland.ac.uk) (last accessed 28/10/04).

including Scottish Natural Heritage, the Scottish Agricultural College, and the Royal Botanic Garden, and a number of executive agencies such as the Scottish Agricultural Science Agency, which has an advisory and regulatory role. However, Scottish industry's contribution to knowledge production is meager, investing a dismal 0.5 per cent of national GDP on R&D, half the level of the UK as a whole and a third of the OECD average (data from Technology Ventures Scotland 2003)

### **3.5.6 Educating and training workforce**

Countries that are sustaining competitive and innovative firms are characterised by good education and training systems, not just supporting universities but ensuring that universities and other education and training institutions provide graduates that meet industry's needs. In addition to its universities, Scotland also has two art schools, one conservatoire, one college of higher education, one university college, a teacher training college and 47 further education colleges. Forty-seven per cent of Scots now go into higher education in comparison with the UK average of 35%<sup>10</sup> and around 400,000 students per year enrol in further education courses<sup>11</sup>. Authors such as Maskell (1998) argue that localised learning can give small countries a competitive advantage and Andersen and Lundvall (1998) suggest that one of the main reasons for the relative success of small European countries might be the fact that most of them developed mass education systems at an early stage.

### **3.5.7 Producing goods and services**

Within the SSI the tier that actually produces goods and services is much broader than just the manufacturing sector. Scottish Enterprise includes over 360 organisations in Scotland's life sciences community many of whom provide services to the dedicated biotechnology firms in the Scottish cluster which comprise 20% of the UK's life sciences companies<sup>12</sup>. This tier includes intermediate and final markets, supply chains and the infrastructure and utilities needed to produce goods. Significant external actors include the alliances and collaborations that Scottish firms

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<sup>11</sup> Scottish Further Education Unit website, [www.sfeu.org.uk](http://www.sfeu.org.uk) (last accessed 28/10/04).

<sup>12</sup> Scottish Enterprise website [www.scottish-enterprise.com/sedotcom\\_home/sig/sig-biotechnology/biotechnology-key-facts-and-figures.htm?siblingtoggle=1](http://www.scottish-enterprise.com/sedotcom_home/sig/sig-biotechnology/biotechnology-key-facts-and-figures.htm?siblingtoggle=1) (last accessed 28/10/04)

have with UK and international companies. Crucially, strengthening the competitiveness of a small country such as Scotland through policies that only support the first steps in the chain of innovation might prove to be counterproductive as the end users are an important part of the innovation system and may currently be external to the system.

### **3.5.8 Supporting knowledge production/distribution/commercialisation**

As noted in Section 3.5.4 above, UK government support for innovation relies less on direct financing and more on providing support mechanisms for technology transfer, developing organisational learning, and promoting networking. In Scotland there is a plethora of business support organisations from the public sector Scottish Enterprise Network to private sector law firms. Although the industry trade associations still tend to be UK-, and often London-based, many such as the BioIndustry Association (BIA) and the Association of the British Pharmaceutical Industry (ABPI) are developing a greater Scottish presence post devolution in addition to local biotechnology support organisations such as Edinburgh Bio-Alliance and more general technology business development networks such as Connect Scotland.

### **3.5.9 Linkages within the SSI**

Although theoretical work on NSI tends to stress economic aspects, technological innovation includes many complex factors, such as key industrial sectors, the national environment, cultural interactions, and producer-user interactions. In the context of regional development, success is determined not only by technological and political considerations but also by institutional path dependencies (Braczyk and Heidenreich 1998).

A national system of innovation represents more than just the sum of its individual components and it is the interdependent relationships between these components that give it its unique character. Within the system there will be flows of knowledge and information, flows of money and flows of authority. There will be formalised contractual relationships at both the domestic and international levels (for example domestic and international consortia and firm alliances, domestic university/industry

collaborations and international university collaborations) as well as informal arrangements such as networks, clubs, and business fora.

The concept of NSI encompasses an idea of systematic interactions that cannot be reduced simply to the actions of specific firms, or to the existing R&D system or to competition among firms or institutions (McKelvey 1991). The component institutions regulate the manner in which the technological knowledge available within a nation or region is generated, developed and harnessed economically. Success depends on the synergy between these institutions. Within any system of innovation, co-ordinated co-operation between governmental, scientific and political actors is needed to achieve international competitiveness. The multi-level dimension of the Scottish system of innovation provides even greater challenges of co-ordination.

As previously noted, the freedom of action of the Scottish Parliament as of any regional government is limited. The lower half of Figure 3.2 (no shading) illustrates areas of relative autonomy within the SSI where there are fewer strong policy links with external institutions. However, the key drivers for STI – finance, policy environment, regulation – are in the top half of the diagram (dark shading) where there are many external policy influences residing at different levels of governance. Current Scottish STI policy seems to be concentrating on the linkages between elements depicted in the bottom half of Figure 3.2, which are of course important in the light of all the literature discussed in Chapter 2 on developing learning networks to encourage innovation, *etc.*, but this raises concerns about what is happening in the “top half” of the system to ensure both the adequate co-ordination with external policy actors and the engagement of policy targets in the policy-making process.

Scotland, therefore, faces a constrained policy environment for STI with many key actors external to the SSI. Critics note that, while the Scottish Parliament has the authority to effect significant impact on industrial and economic development (by introducing and customising policies in areas such as training, provision of venture capital, and new firm formation), this also requires greater attention to be paid to the

linkages within the system in order to maximise the value added to the Scottish economy (Danson 1999, p.96).

Others offer a more positive view of the SSI. Cooke and co-authors (*e.g.* Cooke *et al.* 1997; Cooke *et al.* 2000; Cooke 2001a) have discussed the criteria for identifying a RSI including autonomy to spend from a block grant; taxation authority (present but not so far implemented in Scotland); and freedom to develop infrastructure (both “hard” *e.g.* transport and “soft” *e.g.* knowledge). Scotland would probably come into the category of a “region with a high capacity for developing regional innovation systems”, being a region with high infrastructure and policy organisation capacity with a developed organisational infrastructure of mediating organisations for technology and vocational training and a presence of public research and educational organisations (Cooke *et al.* 2000, pp.98-119). Cooke *et al.* (*ibid.*) conclude, among other things, that:

- in an MLG system, the ability to interact at all appropriate levels, upwards and downwards, is a distinct advantage
- support from EU policies for regional innovation systems is needed, in preference to existing piecemeal policies
- regional innovation requires a package of measures covering finance, management, training, marketing and competitiveness advice, as well as more conventional technology transfer
- different regions have different innovation and MLG models and this may take time to change
- each regional innovation system must have at its core a strong university-industry innovation and networking system (Cooke *et al.* 2000, pp.98-119)

Taking this one step further, Cooke (2001a) proposes various measures to assess the degree of “embeddedness” of a region with respect to the organisation of governance, suggesting that an embedded region (one with higher RSI potential) will



display “inclusivity, monitoring, consultation, delegation and networking propensities among its policymakers” while the disembedded region (one with lower RSI potential) will have policy organisations that “tend to be exclusive, reactive, authoritarian and hierarchical”. While the evidence presented here and in Chapter 4 will indicate that the Scottish system of innovation displays some of the characteristics of the former category, the discussion in Chapter 7 (and in particular Section 7.4) will indicate a worrying tendency towards exclusivity and hierarchy amongst some government actors.

Turning to the biotechnology sector in particular, Peters and Hood (2002) believe that Scotland has led the way in the UK in the development and application of cluster thinking to exploit the development potential of biotechnology. While recognising that Scotland has important assets on which to build in terms of the excellence of its life sciences research, these authors do, however, warn that the Scottish biotechnology cluster still has some way to go before it achieves critical mass and a high level of integration both locally and internationally. Peters and Hood (*ibid.*) describe the core of the cluster (drug discovery and development) as relatively dynamic and innovative but caution that the core is small relative to the ring (*i.e.* services and support including medical devices). Furthermore, both are geographically dispersed and local linkages are still only developing. These authors conclude that the core and the ring are activity rich but have yet to develop the scale density and depth associated with fully developed Porterian clusters (Porter 1990). They note the continuing challenge of consolidating significant numbers of spin out and start up companies into “meaningful and well-founded companies” and express concerns that the Scottish biotechnology cluster is currently too fragmented and lacking in flagship companies to make Scotland a credible world force in the global biotechnology industry.

Again, factors external to the SSI are significant in the success of the biotechnology cluster. While the Scottish science base is an important driver for new firm formation, Peters and Hood (2002) stress that many of the main engines of business growth lie beyond the cluster’s local boundaries such that it is not possible for Scotland to influence many of the forces shaping the global biotechnology industry.

The Scottish Enterprise Cluster Action Plan 1999-2004 (Scottish Executive 1999) aimed to increase the number of participating organisations, improve the performance of existing companies and increase the number and nature of linkages within the cluster and was seen as a motor to drive forward the knowledge economy, creating wealth and high quality jobs (Scottish Executive 2000b). While some say that the Edinburgh biotechnology cluster may be set to rival those in Cambridge (UK) and Boston, they believe that its emergence has come about as much by chance as planning (Nicholson 2002).

In reviewing Scottish Enterprise's related vision for the electronics cluster, Molina and Kinder (2001) conclude that it has not been informed by a holistic, proactive constituency building perspective so that the clustering process has not been as "deep" as it could have been (*e.g.* networking between firms has been rather superficial rather than sustainable knowledge networking). One of the reasons the authors give for this is that Scottish Enterprise is not a single unified body in charge of practical policies for the different Scottish regions because the LECs had considerable autonomy which led to fragmentation of effort and a lack of a common goal. They identify a number of "governance elements" as problematic including:

- short-term rather than long-term thinking
- simple cause/effect thinking rather than holistic/systemic thinking

and conclude:

*...it is clear that there are deep rooted cultural, structural and institutional policy factors and practices which require substantial changes if the most conducive environment for clustering is to be created. These governance issues must be faced squarely if policy efforts are either to engage in the long-term pursuit of more sustainable dynamics than the present situation, or, remain consciously inside the modest confines allowed by the present governance (Molina and Kinder 2001)*

Since this paper was published in 2001, Scottish Enterprise has undergone a number of organisational changes leading to greater integration of the Enterprise Network and a change of policy focus away from foreign direct investment and clusters

policy. Nevertheless, Molina and Kinder offer some important insights here for the regional governance of STI in terms of holistic approaches and closer integration of both government policies and of the various government agencies involved, and it is to these issues that we now turn.

### ***3.6 Government intervention in the Scottish System of Innovation – The need for an integrated approach***

The foundations for today's STI policy were laid in 1993 with the publication of the first UK White Paper on science and technology for over 20 years (OST 1993). The White Paper's failure to co-ordinate STI policy sufficiently (Lyll 1993) should be seen in the context of Ronayne's analysis that intra-departmental rather than overall co-ordination would seem to be the preferred policy mechanism in the UK, where individual agencies are allowed self-determination while trying to avoid undue duplication of effort or pursuit of conflicting goals in different parts of government (Ronayne 1984, p.41). In practice, co-ordination in Britain still tends to mean cross-membership of committees: an "insider's world" where a relatively small group of senior civil servants, elite scientists, and influential industrialists move from committee to committee (Ince 1986, p.12).

In the 1990s, governments began to focus on their countries' specific strengths via the NSI model and the clusters approach to innovation, discussed above, became increasingly influential on policy. Thus, policy directed towards industry was designed to be delivered at the local level and a clear trend, even before the devolution agenda, has been towards giving greater responsibility to agencies closer to the target audience. Decentralisation should encourage heterogeneity in national and regional technological capabilities and create opportunities for closer contact with firms but it can bring with it a loss of control and potential loss of learning as feedback to the centre may be lost (Dodgson and Bessant 1996, p.174).

Keating (2002) reminds us that policy-making is typically an incremental process in which the weight of existing commitments limits the scope for innovation. Before devolution, the Scottish Office was tied to the Whitehall policy machine through a dense network of ministerial and official contacts and committees but, while the

Whitehall departments generally took the lead in joint policy-making there was no formal hierarchy. Keating (2002) argues that the devolution settlement builds on this administrative heritage with the effect that, over large areas of public policy, there is now no “centre” at all.

Charles and Benneworth (2001) highlight the limitations of a governance system in which central departments are reluctant to cede powers to regions, as in the UK. They describe how the current UK system was established by the White Paper (OST 1993) whose “central rationale...was to create a system of scientific governance which generated excellence in UK science to boost the competitiveness of UK business”. However, these authors point out that a House of Commons inquiry (House of Commons Science and Technology Committee 2000) found that there was little coherence of research activity between government departments and they find that the problem with the system of scientific governance in the UK is that changes in science and technology policy do not fit well with other changes in the policy environment. Their claim that “...a top down scientific governance system weakens UK economic performance if it cannot direct scientific policy to create capacity for growth and development throughout its constituent regions” finds particular resonance in the context of devolution, in a situation where science policy is dominated by the DTI and the top down approach to science policy can have negative regional impacts leading to a concentration of STI activity in SE England (Charles and Benneworth 2001).

As noted in Chapter 1, there are limits to what a region-state can achieve when it seeks to use STI policy to foster regional economic growth. Maskell and Tornquist (1999, p.50) have described regional development policy as mainly a process of “making do” and indeed the Scottish Executive has been criticised by some for failing to do anything more substantive in terms of regional policy than re-badging old policies and departments (Gillespie and Benneworth 2002) and those institutions that have had the greatest impact in the short period of devolved government are those that were already operational, such as Scottish Enterprise.

As Latouche (1998) demonstrates with the example of Quebec, politics can both enhance innovation and governance at the regional level but can also constrain it in the Quebecois situation where a major obstacle to the formulation of STI policy has been finding a proper framework to integrate the myriad of federal and provincial initiatives. Regional states are limited in their legislative and policy aspirations: although they often claim to be in a better position to intervene in many areas, certain responsibilities are outwith their remit, having been assigned to another level of government, as the discussion of the SSI in Section 3.5 has attempted to demonstrate in the case of Scotland.

Industry is affected by many facets of government policy including a vast array of laws, regulations and voluntary agreements such as tax law, employment law, and anti-discrimination legislation, only a few of which are the result of specific policies aimed at influencing the growth of industry (Coombs *et al.* 1987, p.199). Jacobs (1998) identifies four government roles in innovation policy:

- providing material and knowledge infrastructures
- organising the necessary processes in order to define and achieve certain concrete policy objectives
- providing the intellectual framework to enhance understanding of the knowledge-based economy
- setting the overarching vision and ambition of the nation

but, as Porter (1990, p.626) notes, the agenda of nearly every government agency touches national competitiveness in some way but is the principal agenda of few bodies and in most governments the issue cuts across traditional ways of organising the social and economic policy agenda. He suggests (*ibid.*, p.618) that what is needed is a different and more varied role for government where even parts of government that appear far removed from economic policy are engaged in a consistent, wide-ranging programme that recognises the interdependence of seemingly discrete policies.

### **3.6.1 Vertical integration**

Policy integration across levels of governance, for example from EU to UK to Scotland, depends mainly on the ability to communicate effectively across system boundaries and the institutional structures determined by government policy-making at the highest levels has a major influence on the effectiveness of such communications (Lyall and Tait 2004). For example, integration and communication across the EU/UK boundary are relatively effective and well practised, while the situation across the UK/Scotland boundary appears less satisfactory and the comments above from Charles and Benneworth (2001) also emphasise this point.

Vertical integration is thus mainly a function of the institutional structures determined by policy-making at senior government levels and its most important constituent is effectiveness of communications across levels of government. Ideally, vertical communication across these boundaries should be a two-way process, but effective vertical integration often implies top-down control. In the context of STI policy, this raises questions about how successfully stakeholders at the regional level can engage in the policy-making process: the danger is that the focus rests on the public sector and does not include private business and other interested parties, a point that will be explored further in Chapter 4. Peters (1998) argues that, although the typical conceptualisation of policy co-ordination is a top-down hierarchy dependent on central agencies, the continuing devolution of policy to lower levels of governance makes the issue of policy coherence and co-ordination more difficult: governments can now no longer depend upon the formal structure of the public sector to provide co-ordination so that, as more open conceptions of governance become the norm, then networked versions of co-ordination involving interest groups also become more common (Peters 1998).

### **3.6.2 Horizontal integration**

Horizontal integration takes place across departmental boundaries, for example the ideal, but so far patchy, integration between science and technology policy and social and environmental policies in the UK in the development of new approaches to governance. There have been various examples of amalgamation of government

departments, with integration as one of the main aims, where the staff involved have continued to operate within their pre-existing boundaries and it would seem that, in these cases, integration poses similar challenges to that of interdisciplinary research in academic organisations (Tait *et al.* 2002; Bruce *et al.* 2004). As with interdisciplinary research in academia, each policy area has its own specialist language and this leads to difficulties in effective communication across boundaries (Tait and Lyall 2001). Likewise, career structures for public servants reward those who specialise and it is difficult to make a career by “trespassing” across traditional boundaries. Most important, the impact of effective horizontal integration is a *loosening* of control and the introduction of greater complexity into policy implementation processes. Thus, horizontal policy integration cuts across the career structures of public servants, raises communication difficulties and lessens the ability of individual departments to exercise control in their own spheres (Tait and Lyall 2001).

Prior to devolution, commentators from the scientific community (*e.g.* Royal Society of Edinburgh and Royal Society of London 1999) were emphasising the necessity of co-ordinating the roles of STI policy actors in order to make best use of Scottish resources. Boulton (1999) noted that this would require the roles of these actors to be defined and structures or policies put in place which would facilitate “more extensive, more innovative and more productive interactions”. Similarly, an analysis of responses from Scottish business to the Consultative Steering Group (Brown and McCrone 1999) showed that most respondents emphasised the necessity of a cross-cutting approach to the Scottish Parliament’s committee work, although many did not want to abandon departmental divisions. The Executive’s own analysis (Hogg 2000) of how best to ensure the right conditions for translating cross-cutting policy into joined up service delivery found that the Executive’s policy development processes and policy management structures were not all fit for purpose to deliver cross-cutting policy objectives. Significantly, the focus of Hogg’s study was on policy implementation and one of his key recommendations was listening to delivery agencies in order to ensure effective delivery of policy objectives rather than involving a broader group of policy targets/stakeholders in the actual process of

developing policy which, as we shall see in Chapter 4, remains the prevailing model of “participative” policy-making.

### **3.6.3 Integrating research and innovation policy**

More than ever, government policies for science, technology and innovation need to be presented as an integrated package of measures as the following quote from Neal Lane, former Director of the US National Science Foundation (NSF), illustrates<sup>13</sup>:

*the question is not, where the dividing lines are between science and technology, or between basic and applied research, but rather how do we take better advantage of the interrelationships in order for the nation to reap the full benefits of its integrated investment in science and technology*

So rather than drawing distinctions between government support for the science base and technology-based SMEs, what is needed is an integrated research and innovation policy to create scientific and technical knowledge and provide the incentives for innovation (Branscomb 1999, p.5). Such a policy to stimulate innovation must also include policies toward competition, regulation, *etc.* (Porter 1990, p.631) and should focus on long-term investments in knowledge-based infrastructure and foster an economic climate that encourages private investment in R&D and the effective and innovative use and absorption of technology by firms and organisations. Substantial direct investments in basic research in science and technology will continue to be needed because private firms tend to under invest in both long-range research and research for the public good. Helping firms to acquire technical knowledge and skill means providing access to all available technology, not just the most recent knowledge. It also means developing a trained workforce at all levels (not just graduates), supporting institutions whose function is the diffusion of science and technology and encouraging regional initiatives to bring together firms, universities and research institutions (Pavitt and Sharp 1993).

Government policy must recognise that a “one size fits all” approach is unlikely to work. Every industry is different and government agencies must use a range of

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<sup>13</sup> Quoted in Branscomb and Keller (1999, p.122).



policy tools – direct (R&D funding) and indirect (tax and economic policy, regulations, standards, export promotion, procurement) – to encourage R&D co-operation, access to capital and enhanced innovation. A mix of policy tools should be adapted across regions and industries to address local needs. Policy interventions should address information promotion and diffusion and include networking and the decentralisation of policy design and implementation (Dodgson and Bessant 1996, p.170). Innovation based development strategies, particularly those that are regional in nature, should seek to integrate innovation programmes with training and education (Branscomb and Keller 1999, p.483). Commentators note, however, that when it comes to government intervention in STI policy, “many political programmes have intentionally only a symbolic effect on firm behaviour”, “a political rather than an economic purpose” and “political action and engagement are often required to symbolise governmental rigour” (Maskell 1998).

In the UK, the *cri de coeur* of the current Labour Government is for “joined up” policy. The *Modernising Government* initiative (HM Government 1999) has as its goal a more integrated approach to policy-making and a series of Cabinet Office publications (*e.g.* Cabinet Office Performance Innovation Unit 2000; Cabinet Office Strategic Policy-making Team 1999) have been issued with the aim of improving policy formulation and implementation in areas that cut across the policy boundaries of traditional government departments but the generally fragmented nature of government policies to promote innovation presents businesses with a “bewildering array” of support mechanisms and runs the danger that “the government itself will lose focus in the administration of a plethora of unconnected initiatives” (Anon 2001a).

The shift of OST from the Cabinet Office to DTI following the publication of the 1993 Science and Technology White Paper (OST 1993) was seen as an attempt to tie STI policy more closely to the competitiveness agenda and has resulted in a trend to direct spending towards exploitation of technology and technology transfer. This led to concerns that priorities in the science budget allocation are shifting from long-term, basic research to more applied work on shorter timescales (Diederer *et al.* 1999, p.32). But on the other hand, the UK appears to emphasise more explicitly the

competitiveness issue when targeting government support than other European countries and Diederer *et al.* (*ibid.*, p.51) claim that this focus on competitiveness has created a more integrated approach across sectors.

However, the main message of a recent House of Lords report (House of Lords Select Committee on Science and Technology 2003), which examined the role of the Regional Development Agencies in the exploitation of science and technology, is still the need for rationalisation of all the activity (at regional, national and European levels) that encourages the exploitation of science, engineering and technology (SET) for economic gain. According to the Select Committee, the primary need is for a clear sense of national direction and purpose to create the conditions in which stakeholders can optimise their contributions and the Committee called for coherence, longer-term perspectives and reduced bureaucracy in this policy field, concluding that the key to success is “coherence, connectivity, co-ordination, communication and co-operation”. While they comment on the utility of a single department in the Scottish Executive covering enterprise and higher education, the report noted that there was “a long way to go before there was an integrated strategy” in Scotland (House of Lords Select Committee on Science and Technology 2003, p.59).

It would appear that at EU, UK and Scottish levels, there is so far a general lack of integration between the modern approaches to governance being developed in the social policy arena and policies for science, technology and innovation which still seem to be driven by an old-fashioned, linear conception of innovation systems (Tait and Williams 1999). As later chapters will show, even within the area covered by science, technology and innovation policies, as demonstrated by Scotland’s Science Strategy, these linear assumptions seem likely to discourage the flexible approach needed for effective, participative policy-making.

### **3.7 Participation in the policy-making process**

Devolution was intended not only to transfer powers downwards territorially but to foster a new type of politics with more participation on the part of backbenchers and civil society more generally (Keating 2002) that would lead to stronger

Parliamentary committees, and power sharing between the Executive, Parliament and the civil service<sup>14</sup>. It was also anticipated that proportional representation would lead to coalition and result in a policy process operating more by consensus than the Westminster parliamentary process (Brown *et al.* 1998, p.120). However, existing systems of policy-making have shaped the policies to which the Scottish Parliament succeeded, including significant elements of STI policy that predate the Parliament. This can lead to policy inertia and inherited styles of policy-making (Brown *et al.* 1998, p.97).

Examples of policy communities or networks of the type discussed in Chapter 2 existed pre-devolution in some areas of autonomous policy such as education, housing and health, reinforced by distinctive Scottish institutions such as the legal and education systems and led by Scottish elites in the form of politicians, business men, civil servants, lawyers and academics (Brown *et al.* 1998, p.109). While acknowledging that Scotland has long had its own interest groups and policy communities, Keating (2002) notes that there has been an important change in style and operation since devolution. These groups now have to confront each other in an open political system, vying for attention and resources and, according to Keating, many groups have found the transition from lobbyist to participant in the policy-making process difficult: in the past they could simply raise issues whereas now they are asked how they would improve the situation. While there has been a growth in think tanks, Keating points to a remaining shortage of policy-making capacity in civil society.

It was intended that the Scottish Parliament's committees would play a significant role and draw in many more actors to the policy process, leading to more open government and proper democratic oversight of government quangos. Committees are where individual petitions are considered, and where individuals and civic

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<sup>14</sup> *Does the Scottish Parliament Matter?* Mark Shephard, University of Strathclyde. University of Edinburgh, Social Policy Seminar, 5 December 2003.

organisations may be called to give written or oral evidence to help Committees reach their views (Scottish Civic Forum 2003). Committees are encouraged to engage with civic society; to increase their visibility to the public, and help the Parliament meet its commitment to being open and accessible. Funds are available to committees for such activities, and they are encouraged to try different methods, locations and formats in doing this. The Scottish Civic Forum (*ibid.*) cites as an example of this the work of the Procedures Committee, which recently published a report on how the Parliament was performing in terms of sharing power, accountability, accessibility and equal opportunities. The report was informed by three public meetings (Hawick, Paisley and Ullapool), by oral evidence from 100 witnesses, and by the written submissions of 230 groups and individuals.

Of greater relevance to STI policy, the Enterprise and Lifelong Learning Committee experimented with various methods of evidence gathering and engaging with the public and stakeholders beyond formal committee meetings (Enterprise and Lifelong Learning Committee 2003). These included Case Study Visits where small cross-party groups of committee members examined aspects of the inquiry subject at a local level, allowing members to talk direct to businesses, students, employees, *etc.* rather than hearing solely from their representative organisations.

The Enterprise and Lifelong Learning Committee also held Conventions of Stakeholders such as the Business in the Chamber event in October 2000 where around 100 invited businesses debated the Interim Report on Local Economic Development Services and voted on its interim conclusions. The event led to some changes in the Committee's recommendations, particularly on business advisers. Stakeholders also participated in pre-report debate workshops. Prior to the Parliamentary debate on the Committee's New Economy Report the Committee arranged a small workshop with participants from the new technology and financial services sectors which sought the views of the industries so that they could be taken into account and introduced into the debate.

The Committee reports (Enterprise and Lifelong Learning Committee 2003) that such events have resulted in significant changes in their thinking on some important

issues, and have helped to generate a consensus within the relevant sector, noting that:

*This is more likely to create confidence in the committee's recommendations within the Scottish Executive and beyond and increase the likelihood of their implementation* (Enterprise and Lifelong Learning Committee 2003)

One of the fears voiced by critics was that the open committee system might simply give unprecedented opportunities for pressure groups to lobby rather than genuinely opening up the policy process to groups that have never previously been involved (Brown *et al.* 1998, p.122) and indeed many groups have sought to strengthen their policy capacity by hiring researchers, policy consultants and parliamentary liaison officers. They have also sought to reorient their lobbying and networks to take account of the new three level politics (Keating 2002) and many national (UK) level representative bodies have now opened Scottish offices or Scottish branches.

Turning from the Scottish Parliament to the Scottish Executive, the *Framework for Economic Development in Scotland* (FEDS) (Scottish Executive 2000a), described in Section 3.4.1 above, is couched in terms of working in partnership with the agencies of the Executive, the local authorities, the various business and academic groups, and individual enterprises and talks of formulating policy “in close collaboration and after a detailed dialogue with all other key interested bodies” (Scottish Executive 2000a, p.76). These interested bodies include:

*those who already have implementation responsibilities in the field of economic development, those who seek to increase our knowledge from the academic standpoint, those who are customers and active in business, and others with key insights to contribute* (Scottish Executive 2000a, p.76)

FEDS also acknowledges (*ibid.*, p.29) that the public sector may have a role to play in facilitating the development of institutional networks that are not always self-generated within the private sector, noting that such networks can promote the flow of information, knowledge and collaboration that contributes to the lowering of the costs of doing business and opens up opportunities for further advances in productivity.

However, the language and tone of the document suggest that it is still the Executive's view which is to be imposed:

*What is important in any partnership is a clear delineation of the problem and the respective responsibilities of those involved and this is what the Framework must stimulate. It must also define the priorities that should shape detailed thinking and action. It is because of the importance of partnership and collaboration throughout all areas of economic activity that achieving a common understanding of the way forward and of the Economic Framework is so important (Scottish Executive 2000a, p.3).*

FEDS describes how the Executive must seek to influence the contributions of other bodies whose activities have an important impact on progress towards the Executive's vision and objectives, but which rest outwith the direct control of the Executive stating that:

*The Framework seeks to embrace all the channels through which these objectives might be addressed by moving towards a systematic, well-directed and coherent approach to its influencing activities (Scottish Executive 2000a, p.74)*

in particular in the private sector where:

*...the Government may feel it has no direct policy or expenditure role but, nonetheless, wishes to exhort and catalyse private sector decision-makers into pursuing particular objectives within their enterprises (Scottish Executive 2000a, p.74)*

FEDS identifies four target groupings for such influencing: other public sector agencies within Scotland with an interest in economic development; the Scottish private sector; Whitehall Departments with responsibilities and powers that bear on Scottish objectives (particularly with respect to UK macroeconomic, employment and tax/benefit policy); and the EU. But the implication is that these groupings are to be influenced by government policy rather than government policy being influenced by these groups. Each grouping is "playing a key role in the achievement of the Executive's objectives" (emphasis added) (Scottish Executive 2000a, p.74) rather than a true sense of working together to identify jointly the objectives in the first instance.

Finally, FEDS talks about how to raise the quality of policy-making and of spending decisions through enhanced monitoring, evaluation and feedback (Scottish Executive 2000a, p.80) but does not appear to consider the benefits to policy-making of involving users in the initial stages. While the Parliament does actually seem to be “walking the talk” in terms of wider participation in the policy-making process, albeit in policy areas other than STI, the Scottish Executive still seems to be entrenched in the rhetoric of partnership without actually yet demonstrating real commitment to the engagement of policy targets in setting the policy agenda.

Interviews with business leaders (Brown and McCrone 1999) showed that the division of powers between the Scottish Parliament and Westminster may have a differential effect on business in Scotland depending on size, sector of business and other factors. Large firms based in Scotland that are generally owned and regulated at the UK and EU levels and trade in UK and global markets thus tend to focus the attention of their representative groups at UK level but do need to pay more attention to the Scottish level than in the past (Keating 2002). Small firms tend to be locally owned, trade locally and are more dependent on local enterprise support services. They also tend to be less well integrated into UK-wide networks of influence hence are more focused on the Scottish level of governance, although this may not hold true for the more globally-oriented biotechnology SMEs that are the focus of the empirical part of this study.

Business groups are fairly unanimous in opposing anything that could be seen as erecting economic barriers within the UK, which makes them a force for policy convergence (Keating 2002). At the same time, in small countries like Scotland, informal contacts and personal networks are likely to be important due to the overlap of elites, as is the growing emphasis on microeconomic rather than macroeconomic factors such as creating partnership between government and business to facilitate local economic development (Brown and McCrone 1999). Brown and McCrone (*ibid.*) note that modern government is multi-layered and business has to address issues at different levels local/Scottish/UK/Europe as well as global. In this context it is simply not an option for business in Scotland to “do nothing”.

Prior to devolution, commentators suggested that the borrowing of ideas for policy from elsewhere would gradually become more acceptable so that sources of policy would become more diverse, both because of new ways in which civil society would be able to influence it and because Scottish policy-makers would be more relaxed about seeking inspiration from other places (Brown *et al.* 1998, p.123). Chapter 4 will test whether this suggestion is borne out by the experience of policy targets since devolution.

### **3.8 Reprise**

STI policy today is no longer just a matter of resource allocation for research as it was in the early days of UK science policy. It is now a complex process involving multi-level governance at the national, sub-national and supra-national levels, which requires careful co-ordination to ensure effective policy integration. While discussions of competitiveness policy preoccupy national government, as much or more attention is necessary at the regional level in areas such as university education, infrastructure, and local research initiatives. Some argue that today the role of regional government is potentially as great or greater than the role of national government in ensuring competitive advantage (Porter 1990, p.622). This chapter has introduced the key institutional actors and has discussed their role in the Scottish system of innovation. It has demonstrated that, as a newly devolved region, Scotland faces a tough challenge to co-ordinate strategies for science, technology and innovation within this system across the multiple tiers of Scottish, UK and European policy and has posited that its scope for success may be limited by the constraints of the devolution settlement.

However, it has also demonstrated that the new system of governance provides an added impetus for developing new ways of working, with coalition government encouraging more consensual working practices. There are stated commitments to partnership and evidence-based policy at both UK and Scottish levels and, in Scotland, the Parliament has already demonstrated that it is capable of innovative forms of policy engagement with stakeholders although not, as yet, in areas related to STI policy.



Scotland is a small country with a population of under five million concentrated within the central belt which facilitates linkages within this regional system of innovation and affords multiple opportunities for networking and interactions between policy-makers and policy targets. In terms of existing institutions, there are several government agencies in Scotland working towards the exploitation of knowledge for economic benefit that are apparently committed to working with each other and with stakeholders and have a track record in attempting to “join up” STI policy through, for example, the Technology Ventures Scotland initiative. Devolution has further encouraged the emergence of new network builders in the form of industry representative bodies that are seeking to expand their policy role.

Having explored the nature of the Scottish system of innovation, Chapter 4 will now seek to establish whether these factors provide the right conditions for actors within the SSI to coalesce into an effective policy-making network for STI policy in Scotland.

## **Chapter 4 Scottish Policy Networks: Extant, Extinct or Emergent?**

### **4.1 Introduction**

Chapter 3 has described how regional boundaries and distinct institutions and policy agendas confer on Scotland a characteristic regional system of innovation which affords multiple opportunities for networking and interactions between policy-makers and policy targets. Coupled with the coalition nature of Scottish government and the concurrent character of many aspects of science and innovation policy, one might infer that Scotland should offer a set of circumstances congenial to the operation of policy networks as outlined in Chapter 2 and that such networks would facilitate policy integration within the Scottish system of innovation.

As previously discussed, Scotland has a long-established and well resourced regional development agency, unparalleled in the rest of the UK, combined with the intellectual property and know-how of a world-class research base. Optimists believe that devolution has spurred activity and describe a sea change in relationships between the relevant STI actors from the academic, industrial and financial sectors where senior people across a range of sectoral boundaries are seeing the benefit of a well-devised and reasonably integrated strategy. The pessimists, on the other hand, still see a yawning chasm of understanding between these actors.

Policy targets stress the need for consistency and transparency of government policy and the avoidance of a multiplicity of different innovation support schemes. Although the government is seen as much more pro-science than previously, an attitude that is filtering down to intervention and support at a local level, there is still a tendency amongst policy-makers to favour policy initiation over policy delivery.

Nor is the Scottish biotechnology sector a homogeneous group. Many of these small companies do not yet understand how the wider world impacts on them and do not have significant policy concerns; those in the middle of their development phase are more concerned with business opportunities and perhaps local incentives and cultural

barriers for entrepreneurs; while mature companies are concerned about financial initiatives and international regulatory environments. This presents a challenge for the trade bodies trying to impart a joint view to policy-makers (Interview with industry representative, I030702).

Although formal and informal links exist between policy-makers and stakeholders, there is historically less of a consensus-seeking tradition in UK politics than in some other European countries such as Germany as we shall see in Chapter 6. But is this now changing in Scotland with its coalition government and are Scottish policy institutions embracing the opportunities for change offered by devolution? Policy-makers publicly concede to giving the “impression if not reality that we are involved with the community” and “facilitating network rhetoric”<sup>1</sup> and one could question whether the explosion of intermediary organisations in Scotland actually facilitates or hinders effective, direct interaction between these players.

As outlined in Chapter 1, Chapter 4 is the main empirical chapter and presents the findings from the survey of policy-makers and policy targets which set out to investigate whether self-organising policy networks for STI policy exist or are emerging in Scotland post-devolution. This survey took the form of a series of semi-structured, qualitative interviews steered by a topic guide (see Appendix), which aimed to explore, through a series of relatively open-ended questions, whose voices are heard by policy-makers, whether a coherent policy network exists and what processes are used to influence the policy agenda within the multi-level governance context. By seeking answers from the interview data to the questions outlined in Table 4.1, this chapter examines the status of policy networks in Scotland and attempts to gauge whether the impact of Scottish devolution on the government to governance shift is borne out in reality. (The research method and analytical techniques are discussed in more depth in Chapter 1 and further illustrations of the data analysis approach are given in the Appendix.)

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<sup>1</sup> Public remarks from Scottish Enterprise representative at Scottish Enterprise/Scottish Development International Seminar, Stirling, 16 January 2003.

**Table 4.1 Analytical framework**

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- Who participates in policy-making at the regional level in Scotland and through what mechanisms are policy targets engaging in the policy process in Scotland?
  - Has participation in the policy-making process been facilitated by the establishment of the Scottish Parliament?
  - Is there evidence that this engagement is leading to the formation of a distinct Scottish policy network for STI?
  - Is there any evidence of changes in practice or outcomes (“policy learning”) as a result of this dialogue between policy-makers and policy targets?
- 

## **4.2 Policy participants and mechanisms**

### **4.2.1 Ad hoc consultation**

In the UK, interaction with stakeholders has traditionally been seen as consulting in an *ad hoc* way on each particular issue rather than an ongoing interaction with users: in Britain politicians will ask for your opinion when they want it and have traditionally not had mechanisms for dealing with uninvited information (Interview with European policy-maker, P240902). This seems to be the opposite side of the coin from the “small country neurosis which makes [Scottish] businesses instinctively recoil from too close an association with political players” (Baur 2002).

Although the theory of participative policy-making has been discussed for a long time, this way of making policy remains relatively untested and there is still a tendency for all government levels to equate “consultation” with “engagement”. However, in many cases, consultation is at least a step forward (Interview with European policy-maker, P240902) even if respondents describe participation in the policy-making process through consultation as “surprisingly minimal and poor”

(Interview with biotechnology CEO, I090603). Policy consultation is frequently still seen in terms of inviting people to an event:

*we ran a seminar and attracted...40, 50 people to come along to hear a few people speaking and then we split down into working groups and as a result a report was produced about actions that might be useful*  
(Interview with policy-maker, P180203)

and stakeholder engagement is often only apparent at the end of the policy process in the context of mandatory policy evaluation (Interview with policy-maker, P170403). The advantage of stakeholder consultation from the policy-makers' point of view seemed to be as a way of ensuring an easy ride:

*we knew there might be sensitivities and we thought, we will go to town on this, we'll not try and push this through without the involvement and the backing of the research community. And as a result, it's all, so far, touch wood, it's all gone through very smoothly* (Interview with policy-maker, P180203)

So although these types of activities appear to be involving the right stakeholders, this type of engagement, where events are at the policy-makers' behest, seems to fall short of a policy network because it is primarily government actors who set the agenda.

While there is recognition by government that there needs to be more dialogue with stakeholders, this type of *ad hoc* consultation activity can, in fact, produce negative consequences and exasperation with the "endless rounds of discussion papers on which one is asked to comment" (Interview with academic, A220403) and the constant reviews that do not appear to produce any results (Interview with service provider, I150702).

Despite this apparent avalanche of consultation, it is recognised within the Scottish Executive that other countries in the EU are traditionally more consultative (for example, prior to the implementation of regulation) and are better at involving coalitions and social partnerships, such that the policies that emerge reflect consensus (Interview with policy-maker, P280202). The UK, even after devolution, is still more centralised and the top-down approach persists where policy targets are

simply told what the Scottish Executive intends to do (Interviews with service provider, I020503; biotechnology CEO, I280802; and policy-maker, P280202).

This consultation process is, itself, often seen as flawed, as one respondent described:

*[the consultation] was only open for two weeks...in the middle of August – you know, the peak holiday time...If you were cynical, one might say they were doing that at a time where they wouldn't get too much interference and we have yet to have any response to our submission to that* (Interview with service provider, I020503)

#### **4.2.2 Bilateral relationships**

*Ad hoc* consultation is therefore a one-way process that allows policy targets to participate in policy-making, however imperfectly. The next level appears to be the development of bilateral relationships either with individual firms or universities or, more usually, their representative bodies. Here some organisations have achieved a more formal and recurring contact with policy-makers at various levels within the Scottish Executive, either with civil servants or Ministers, where discussions are of an ongoing nature and the representative body is able to flag up forthcoming issues (Interview with university representative, A110303)<sup>2</sup>.

While some might criticise “how little effort many Scottish companies are making to learn about – let alone engage directly in – Scotland’s government” (Baur 2002), some of the larger Scottish players do have more formalised dealings with the Scottish Executive and Scottish Enterprise but these still tend to be demand driven, *i.e.* at the request of the policy target (Interviews with university representative, A311002 and policy-maker, P240303). However, such formalised interactions did not appear to be the norm and were most usual where there was a funding relationship between the Scottish Executive and the policy target. Interactions with civil servants were often just seen as “teeing up Ministerial involvement in some way” with little interaction at a policy level (Interview with service provider,

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<sup>2</sup> In particular, some stakeholder groups on the more social or general business side (for example, STUC and COSLA) have formalised their relationship with the Executive in the form of a Memorandum of Understanding which provides a formal structure for relationships and discussions with the Executive and for them to influence policy.

I160702). Thus, engagement with policy targets most often revolves around briefing a Minister for a forthcoming event or company visit and, although civil servants see this as engaging with users (Interview with policy-maker, P180203), it is not a very overt way of involving policy targets in the development of policy. Furthermore, access to the relevant Minister was seen as increasingly problematic since the early days of devolution (Interview with service provider, I150702). Although generally attributed to the large Enterprise and Lifelong Learning (ELL) portfolio, there was also a hint that civil servants are sometimes obstructive:

*I would like to see more interaction there but again, to get access to the Minister, you're stalled by your civil servants and I know that his diary is very full and it can be very difficult* (Interview with policy adviser, P280203)

Officials report “no shortage of contact” in the form of bilateral meetings with bodies such as CBI and the universities but recognise that a networked, multilateral type of interaction might be desirable:

*one of the things that...I think we've been recognising within the Executive is that there's probably much more that we could do – not so much in terms of bilateral relationships with individual organisations...but on a more multilateral, joined up sort of way – you know, when we talk to the CBI, do we talk to others at the same time as part of a similar group and are there ways of improving multilateral relationships rather than bilateral?* (Interview with policy-maker, P020403)

#### **4.2.3 Active engagement?**

Navigating the labyrinthine civil service seems to be problematic even for the professional lobby groups (Interview with industry representative, I260602) although relations with civil servants are most usually described as cordial and open (Interviews with industry representative, I260602; biotechnology CEO, I090603; and service provider, I020503). Successful interactions with Ministers are seen as being dependent on that individual's personality and interests (Interview with directors of research institutes, R290702 and R210203). Many respondents commented on the time required to build up a relationship with Ministers and expressed irritation at the lack of continuity and consistency of support where Ministers, and to a lesser extent,

civil servants, do not stay in post long enough to develop a good working relationship. Such a turnover of staff results in institutional memory being lost with inevitable, negative consequences for policy learning. In this context respondents also highlighted the importance of long-term relationships that lead to trust (Interviews with biotechnology CEOs I090603, I280802 and I120203; and with service providers I020503 and I150702), a point that is further discussed in the contrasting case of German STI policy (Chapter 6):

*somebody is given a job to do something and because there is such a turnover of people then they're almost at a starting from first principles I suppose all the time* (Interview with service provider, I020503)

*I know who I'm dealing with [at the DTI] [but] with Scottish Enterprise it's different names every time, looking after different things, not quite sure who. A lot of movement in terms of people and functionality which I have to say I don't really understand* (Interview with biotechnology CEO, I280802)

*I'm on my second Chief Medical Officer and my second Chief Scientist and I think the third Minister for Health and the second for Enterprise and Lifelong Learning* (Interview with academic, A220403)

Another respondent emphasised the importance of regular and sustained contact with policy-makers otherwise “you lose touch very, very quickly, you know, once you're out of that swim for three to six months” (Interview with university representative, A311002).

Industry very clearly sees the advantage of developing a long-term dialogue with policy-makers. Their representative bodies regard this type of two-way dialogue as a way of avoiding potential crises in their industry and in essence describe their aspirations for a fully functioning policy network (Interview with industry representative, I040702) which, as we shall see in Chapter 6, appears to work better in some industries and at some levels of governance than others.

At the same time, policy-makers in parts of the Scottish Executive do express a sense of obligation to at least listen to users' views:



*There's a general sense of, you know, we should really meet anybody that seeks a meeting with us in a completely open way...if they think they want to talk to us, well, let's hear what they've got to say (Interview with policy-maker, P140403)*

But the question still remains as to the extent to which the Scottish Executive *actively* seeks to engage in an *ongoing* dialogue with its user community. One respondent, who reported virtually no engagement with government departments or agencies and no dealings with MSPs, typifies the attitudes of the sector when he said that, if invited, he would be happy to advise government or to take part in a working party but that he had never been approached by government to do so:

*I will help Scotland when asked. But I just don't have the time to go knocking on doors saying how can we help because it's hard enough in the current economic climate running this company (Interview with biotechnology CEO, I280802)*

There is undoubtedly more dialogue with 22 Scottish Ministers in comparison with the much smaller number prior to devolution so there are many more opportunities for interaction but, in reality, the number of Ministers who have a direct involvement in policy-making as it affects business are few in number and the social agenda has tended to dominate much more of the Executive's policy agenda in the first session of the Parliament (Interview with policy-maker, P240303). Policy-makers express the view that there is much more interaction between business and government than ever before and opportunities for a much wider range of businesses to meet Ministers in Scotland now than was the case prior to devolution. These Ministers are seen as being "much closer to the grass roots of what's happening in Scotland" than previously and "have an opportunity to take account of the views much more than they had before" (Interview with policy-maker, P240303).

Respondents described interactions with the various departments of the Scottish Executive, the Scottish Enterprise network and also at the UK level with DEFRA, Department of Health, Home Office and DTI. Where these were largely resource dependent and not overtly policy relationships these were seen to be entirely satisfactory and complementary:

*I mean, we do have a very close and good working relationship with Scottish Enterprise Edinburgh and Lothian...The resource input...it's been a partnership and they've got back from us, in terms of spin-out companies and so on, I think what they wanted (Interview with director of research institute, R210203)*

There was a perception that the Scottish Executive is more willing to engage than Scottish Enterprise:

*With the Scottish Executive...you have a constructive dialogue. It's positive and it is as open as it can be. With Scottish Enterprise, there's always a challenge to establish dialogue in the first place. There's always a challenge to find out who you should actually be establishing a dialogue with – and there's always a challenge to actually get them to listen to you, to actually engage (Interview with service provider, I020503)*

Some firms seemed to find it more productive to go directly to the Ministerial level (Interview with biotechnology CEO, I090603) although others found that such direct links were not good (Interview with biotechnology CEO, I291002) which perhaps demonstrates the privileged access that some firms, and some individuals, have over others as discussed below (see Section 4.5.2).

During the course of these interviews with policy-makers and policy targets, multiple avenues for approaching government, either unilaterally or through a representative body, were mentioned including:

- MSP visits and placements with industry
- Proactive briefings and one-to-one meetings with MSPs and party workers
- Government – industry interaction through the administration of grant aid schemes or assistance such as RSA, SMART, SPUR
- Private dinner meetings with the Minister involving university research directors, people from industry, and Scottish Enterprise
- Indirect routes to influencing, for example, the Treasury via interactions with venture capitalists

Evidence presented by the Scottish Civic Forum<sup>3</sup> suggests that the majority of people who have contact with the Scottish Parliament are happy with the experience but that the workings of the civil service are often incomprehensible and officials are seen to act as gate-keepers, a point to which we shall return in Section 7.4. While people apparently do feel engaged in the democratic process, they want an *ongoing* relationship with policy-makers and urge them to get participation right at an earlier stage. If anything, people tend to feel over-consulted but not consulted at an early enough stage so that the impression is often that the consultation document is in its final form. The Scottish Civic Forum (*ibid.*) points out that information sharing is not consultation and, furthermore, consultation is not the same as participation. There is a clear need for effective feedback so that those consulted can understand how their input is analysed in order to demonstrate how external contributions influence policy. Significantly, a key theme of the Scottish Civic Forum's research deals with engagement with committees and cross-party groups but few policy targets interviewed for this current study had had any contact with individual MSPs other than Ministers and although the committee work was seen as much quicker and more accessible in Holyrood than in Westminster, there was no reported contact between policy targets and these Parliamentary committees, presumably because the majority of policy affecting this industry is not the responsibility of the Scottish Parliament.

However, scepticism remains about the outcome of all of these types of interactions and their ultimate impact on policy:

*We do have a lot of discussion; we do have a lot of contact. I'm not sure it goes anywhere* (Interview with biotechnology CEO, I120203)

while others criticise the one-way nature of the interaction:

*I was invited to a Lifelong Learning and Enterprise meeting at the end of last year in the Grand Hall at the Castle and I stood there along with a crowd of others for some considerable time, sipping white wine, eating*

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<sup>3</sup> Scottish Civic Forum Event, Scottish Parliament, 25 November 2003.

*canapés and then the Minister...came in, gave a rousing speech and then left. I don't think I'll be going to another one. I'm more than happy to hear about what's happening but, you know, I'm not interested in the rarra, to be honest (Interview with biotechnology CEO, I280802)*

For the biotechnology industry, in particular, there are issues about company maturity: small firms do not have the time or the personnel available to take part in lengthy policy interactions. While the larger companies have dedicated staff tasked with government liaison who understand the multi-level nature of science and innovation policy, smaller firms admit that they do not understand the intricacies of the policy process and rely on bodies such as the BIA to represent their views (Interview with biotechnology CEO, I291002). The biotechnology sector is fragmented and in an earlier stage of evolution than the pharmaceutical industry which is more homogeneous and can act in a more concerted manner. Although there was seen to be the intellectual capacity in biotechnology to develop an organised approach, this was felt to be hampered by the heterogeneous leadership of companies “a mishmash of scientists through to development people through to commercial” (Interview with biotechnology CEO, I280802). More seriously, despite the fact that a lot of policy is being made in the name of these small technology-based companies, policy-makers do not always seem to see the necessity to engage them in the process:

*biotech SMEs are still too small to influence, I would think, or be at that stage where they need to influence seriously perhaps (Interview with policy-maker, P280303)*

This means that smaller companies do not have a voice if the DTI engages primarily with the BIA which is regarded as representing only the larger, well-established firms (Interview with industry representative, I040603). Within the companies themselves there can be a fatalistic tendency to believe that, however loud they shout, they cannot change the situation and that it is better to focus their energies on developing their business and just accept the policy environment as it is (Interview with service provider, I160702). Even those companies who understand the political scene and have multiple interactions with MSPs and Scottish Ministers do not feel

that they have a great deal of influence on policy matters that really affect their business (Interview with biotechnology CEO, I120203).

Universities are also viewed by some as disadvantaged in the process of influencing policy:

*there's no doubt at all in my mind that there is a very clear route of contact through OST, DTI for industry to lobby and it is quite clear that they know the avenues and use their own corporate position...But I would argue that perhaps the universities aren't given the same kind of hearing, yet they are a major contributor to education, wealth and employment* (Interview with academic, A220403)

These interviews demonstrate that interactions between policy-makers and policy targets do take place in Scotland and that there are various mechanisms for doing so:

*I think if I really wanted to, you could be heard. No question of that* (Interview with biotechnology CEO, I291002)

However, the tendency to use consultation as a substitute for ongoing, collaborative engagement prevails. Lobbying can have an impact but sometimes this can be to correct policy disasters that have come about because of lack of prior consultation:

*instead of having open dialogue to help form the delivery of a policy, they [Scottish Enterprise] almost decide on delivery in a vacuum or in isolation, or making unilateral decisions about how policy should be delivered ...Instead of [consulting us at] an informative stage, we have to lobby at Ministerial, senior Scottish Enterprise board level and it's only by lobbying those levels to get literally the Scottish Enterprise board to question Scottish Enterprise's executive – why are you delivering this stuff when there's no market failure – are we actually getting any results* (Interview with service provider, I020503)

### **4.3 The impact of devolution**

So far there is the feeling that the Parliament has left the Scottish biotechnology sector well alone. Devolution may, in fact, be less relevant to the biotechnology sector because most significant policy is still reserved to Westminster and scope for major change may have been limited by pre-existing institutions such as the regional development agency (Interviews with academic, A220403; researcher from NHS

facility, R021002; industry representative, I040603; and biotechnology CEO, I090603). Many see the Parliament as quite irrelevant, the tiers of government either above or below being the ones that matter:

*As far as the Scottish Parliament's concerned, I'm honestly not sure what influence it has on anything...the area that concerns me most, both positively and negatively I think, are the [local] Councils...planning, infrastructure, transport (Interview with biotechnology CEO, I120203)*

Some partially credit devolution with invigorating Scottish Enterprise by exposing it to greater Ministerial scrutiny and enabling greater interaction between the RDA and policy-makers and Ministers (Interview with biotechnology CEO, I291002). Others are more emphatic:

*I'm sure it's given the Scotland players a greater sense of purpose, a greater sense of self-determination and strengthened...it's given Ministerial backing to what they do, given a greater flexibility (Interview with industry representative, I030702)*

Devolution has certainly given greater flexibility to both the Scottish Executive and bodies such as SHEFC and Scottish Enterprise, particularly in terms of funding, where ELLD is credited with kick-starting a number of initiatives that would possibly not have occurred pre-devolution (Interviews with service provider, I150702 and university representative, A311002).

Devolution has therefore brought new opportunities, but potentially also a new threat as far as the biotechnology industry is concerned by introducing new layers of governance that may be increasingly problematic as companies get nearer to market and worry that the Scottish health system might present an extra, unhelpful layer of bureaucracy. In this respect, dealings with policy-makers have become more complex because companies now have to negotiate these multiple levels of governance:

*if [the Scottish] Parliament started to meddle, then it would very rapidly increase the complexity of life without many offsetting benefits (Interview with biotechnology CEO, I090603)*

Officials, on the other hand, see devolution as simplifying the situation: in many respects Scottish government was always a rather opaque, two-tier system and devolution has actually clarified policy roles and remits for both policy-makers and the wider world and had a positive impact on science because it has raised its profile and taken a more strategic view (Interview with policy-maker, P180203). Thus, devolution has enabled the Scottish Executive to debate and promote science and innovation in a way that would not have been possible before because there was not the interest from Ministers who were fewer in number and more focused on activities in Whitehall (Interview with policy-maker, P180203).

But as far as the DTI is concerned, devolution has had little impact as most major strategic policy issues are UK-led and firms favour engagement with central government over the devolved administrations (Interview with policy-maker, P280303). Moreover, most biotechnology businesses are probably more concerned by the constraints of corporate “red tape” on a day-to-day basis than on issues specific to the biotechnology industry and these policy areas remain, by and large, reserved to Westminster (Interview with service provider, I160702).

Others complain that devolution has merely brought a lot of displacement activity (Interview with university representative, A200203). While the support systems for biotechnology have increased with many institutions organising themselves on a Scottish level (Interview with European policy-maker, P240902), the real issue remains the lack of understanding by politicians of the key issues affecting the biotechnology industry because politicians generally take a short-term view and therefore focus on “inappropriate metrics”, such as numbers of jobs and numbers of companies (Interview with university representative, A200203).

In many respects, Scotland is striving to get the best of both worlds from devolution. On the one hand, in terms of research funding, the universities want to remain part of the UK science base (Interview with policy-maker, P170403). On the other hand, Scotland is trying to innovate with initiatives, such as the Proof of Concept fund, in order to capture value from Scotland’s research excellence and address the imbalance between research excellence and a business base that under-invests in R&D

(Interview with policy-maker, P070302). Scotland therefore seeks to use whatever approach is more advantageous – to wave the Saltire where appropriate or to be a small part of a big country, when that is more beneficial (Interview with European policy-maker, P240902). Businesses “want consistency in areas where it doesn’t bring them any competitive advantage. If they believe there’s a competitive advantage and difference then that’s fine” (Interview with policy-maker, P070302). Above all, biotechnology is a global industry that recognises the dangers in being isolationist if too much reliance is placed on the Scottish agenda (Interview with industry representative, I030702).

Many of the differences do seem to work to Scotland’s advantage and users in the higher education sector, for example, have seen the benefits that devolution can bring with the Cubie settlement<sup>4</sup>, increases in research funding, Proof of Concept funding, Scottish Enterprise/RSE Fellowships, and the support provided by the LECs. These additional funding mechanisms are the envy of research institutes in England and Wales and have increased support for divergence among the research sector (Interviews with director of research institute, R290702, and university representative, A110303)<sup>5</sup>.

#### **4.3.1 Increased consensus?**

The voting process for the Scottish Parliament sets the tone for a more consensual way of working (Interview with university representative, A110303) and some civil servants do see the Parliament as an agent for inclusivity in policy-making and a key part of the policy development process (Interview with policy-maker, P020403). This difference was attributed by one observer as being the result of consensus politics:

*The committees are more powerful. They’re also more balanced in terms of numbers and if the committees are going to achieve anything in Scotland, they have to do some consensus building...Therefore they all*

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<sup>4</sup> Regarding the Scottish Parliament’s decisions about student fees.

<sup>5</sup> However, the debate about university top-up fees is a current cause for concern amongst Scottish HEIs.



*have to do the same kind of give and take and...the outcome...is that when a committee says something...the Minister does have to listen way, way more than they have to listen to the Select Committee in England. So...when the Enterprise and Lifelong Learning Committee take an interest in commercialisation, the Minister can't just shrug it off. It forces the Minister to do things that they otherwise wouldn't have. Now, those structures have meant that the Parliament has done things it wouldn't – that no government would have done. So that's the first aspect in which devolution has made a difference* (Interview with university representative, A110303)

Officials would like to believe that Scottish government has always been more consultative, criticising Whitehall departments for devising policies without consultation. Partly, this is ascribed to geography where it is possible in Scotland to consult with all the key people in one room: “we've always been more consensual because you can get people in and talk it round with them and, you know, avoid some of the depth charges” (Interviews with policy-makers, P140303 and P260203). Although access to government agencies is seen as being significantly easier in Scotland than it is in the rest of the UK (Interview with biotechnology CEO, I120203) this may simply be a factor of size and is not necessarily a result of devolution.

The scale factor undoubtedly makes a difference in the way that policies can be developed and implemented in Scotland (Interview with policy-maker, P070302): the “inertia of government” may be less because there are fewer people to bring on board (Interview with industry representative, I030702), there is a greater possibility for ongoing dialogue (Interview with academic, A220403) and more scope for multi-agency partnerships, for example between funding bodies (Interview with policy-maker, P130503):

*The small is beautiful – potential to innovate rapidly because we're small – is definitely there* (Interview with academic, A220403)

This fact can be exploited by brokering organisations such as the Royal Society of Edinburgh which are also seen as being unique to Scotland (Interview with policy-maker, P260203).

The weakness of this model is, as discussed later in Section 4.5.2, that there is a limited pool of people on whom to call and a danger of losing depth and diversity (Interviews with academic, A220403 and policy-maker, P140303). There is also the danger of adopting a parochial outlook:

*Research is an internationally competitive endeavour and to play the little Scotlander card is fundamentally to be missing the point on science policy. So that we've always viewed that side of it with a degree of anxiety* (Interview with policy-maker, P140403)

### **4.3.2 The role of Ministers**

Devolution has increased the interactions between officials in the Scottish Executive and Scottish Enterprise and between civil servants and MSPs<sup>6</sup> and it has brought more direct Ministerial contact with government agencies and their user communities. Hence simply in terms of osmosis, the fact that Ministers are exposed to the biotechnology industry on a fairly regular basis and civil servants work more frequently with Ministers, there should be greater opportunities for policy targets to influence policy (Interviews with policy-maker, P260203 and director of research institute, R290702).

Potentially, Scottish companies are at an advantage in that they have more immediate access to Ministers but there is a danger of raising expectations:

*[Ministers must] work to maintain that because that...is one of the huge advantages and if you can get accessibility, you at least believe that you have a greater chance of changing policy* (Interview with service provider, I150702)

If users engage in the policy-making process and do see that it can have a positive impact, they will be more willing to take part in the future (Interview with university representative, A110303) but the question remains as to whether this interaction with Ministers truly does have an impact or is it the case that "if you're in tricky job, you

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<sup>6</sup> In particular, list MSPs who do not necessarily have constituency concerns to deal with and are more likely to take an interest in other issues.

want to talk to people whose views are consonant with yours” (Interview with biotechnology CEO, I140802)?

Devolution has brought with it policy legitimacy. In terms of science and innovation policy, Scotland is coming out from under the wing of the DTI and allowing the Executive to control the agenda rather than hanging on to the DTI’s coat-tails and “tartanising” policies developed at the UK level (Interviews with policy-makers P140303 and P170403). Under the Scottish Parliament, the Scottish Executive has conducted a series of reviews, notably the review of the Enterprise networks and the publication of *Smart Successful Scotland* (Scottish Executive 2001b), discussed in Chapter 3, which created the framework for economic development in Scotland and set out the broad policy guidance to the Enterprise network at a level that had never been provided before by the Scottish Office (Interview with policy-maker, P170403).

Whereas the Scottish Office was a federal organisation with departments reporting directly to the Secretary of State, the departments within the Scottish Executive report to a Cabinet Minister and there is (at least in theory) parallel machinery through the First Minister and the Cabinet as a whole to liaise with departments and co-ordinate activities (Interview with policy-maker, P020403). But the biggest change is seen to be the way Ministers have thought about their role differently and strategically and want to be inclusive both with stakeholders and users of public services (Interview with policy-maker, P020403):

*I think it’s devolution that’s made a big impact and it’s devolution more than the Parliament that’s had the impact* (Interview with policy-maker, P020403)

*while there’s personality differences between the Ministers and there’s been policy differences, if there’s a theme, it’s that they want to be participatory and they want to prove the worth of the Parliament – of the devolution changes and to do that, they have to be seen to be doing things* (Interview with policy-maker, P020403)

Many of the drivers for change could be attributed to the change of UK government from Conservative to Labour (Interviews with policy-makers, P170403, P020403 and P140303) but although the Ministers have changed, is it the case that the civil service

is carrying on as before, held back by the institutional inertia of a public sector bureaucracy? The Scottish civil service is, by and large, staffed by the same people that worked under the previous regime and while they might embrace the idea of devolution, many may be continuing in a “business as usual mindset”. Some respondents question whether enough attention was paid in pre-devolution discussions to learning a new, participative working method that developed the outward-looking, public side of policy-making that Ministers profess to espouse when many civil servants have their whole work experience in a pre-devolution civil service environment and may feel that their work is essentially unchanged (Interview with European policy-maker, P240902).

Many have criticised the calibre of politics and politicians in Scotland and MSPs have been described as inexperienced in policy matters, more susceptible to special pleading and less able to see the bigger picture (Interviews with policy-maker, P140403 and director of research institute, R290702). Officials see the dangers of Ministers who are *too* responsive to public opinion and the need for the civil service to exercise control over them:

*there is a very real sense that the micro politics within which we operate now has become...an order of magnitude more pronounced with devolution...and this sort of micro politics is much the most significant impact now of devolution and much the most significant undercurrent in terms of policy development, simply because you've now got Ministers being either mischievously misinformed or innocently misinformed by a whole raft of people that you can't possibly predict or forestall (Interview with policy-maker, P140403)*

but for others this is the genuine power of devolution:

*policy-making is now much more, you know, one person might call populist but the other side of the coin of that is it's much more in touch with what Scottish people want, which is exactly what devolution is all about (Interview with policy-maker, P020403)*

#### **4.3.3 The challenges of multi-level policy-making**

While multi-level governance may have doubled the opportunity for influencing policy-makers (Interview with industry representative, I260602) and afford the

advantage that policy targets can now choose which level is most appropriate for their particular needs (Interview with European policy-maker, P240902), there is an upside and a downside to multi-level governance. Respondents question the degree to which Scotland is able to take a policy lead, whether the Scottish science system is the real agenda setter and point to the tendency to look to England for endorsement (Interviews with academic, A220403 and policy-maker, P070302).

Local control of programmes can make government more responsive to customer needs but at the same time increases the complexity of the policy systems that users are trying to influence (Written communication with US biotechnology strategy consultant, March 2002). The more tiers of governance, the more opportunity there is for political influence and this can have a negative impact on, say, funding regimes where the smaller the area that is distributing the money, the greater the degree of political influence that can be brought to bear (Interview with university representative, A311002). Ultimately, doing it differently is not an option for Scottish businesses who want consistency and do not want to cope with different sets of rules and working practices at different levels of governance<sup>7</sup>.

Some believe that businesses and their representative bodies are sophisticated and able to cope with the multi-level nature of science and innovation policy (Interview with policy-maker, P240303) but others are more doubtful:

*it's unclear to me, to be honest, where policy starts and stops in terms of regulations because...you'll get Ministers who are just looking for a vote who will jump up and down on their hobby horse about GMOs or something like that and they may in fact have no power whatsoever over them. So it's not always clear to them where their power starts and stops* (Interview with biotechnology CEO, I291002)

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<sup>7</sup> As an example of this, one respondent expressed concerns that the creation of the Health Technology Board for Scotland (the Scottish equivalent of NICE) had introduced an unnecessary, extra regulatory tier (Interview with biotechnology CEO, I090603).

Most of the major companies recognise that the drivers for policy derive from an EU or international framework and they do not operate on a regional or national basis (Interview with policy-maker, P280303). Many firms reiterate that real policy, particularly in terms of the regulatory and fiscal regimes that affect business, is made at higher levels of governance (Interviews with industry representative, I260602 and service provider, I160702):

*In terms of high level policy, I'm not sure – well, it's not evident to me what influence the Scottish Executive actually has...I think the Parliament and the Scottish Executive is almost struggling to find a role – all the important stuff still tends to be done in London, at least at major policy level* (Interview with biotechnology CEO, I120203)

although overstated prospects of devolution (a view possibly fostered by politicians) has left the Scottish government having to manage expectations where Scottish businesses overestimate how much policy is actually devolved (Interview with policy-maker, P280202). The Executive perhaps was not prepared for the fact that people would identify with the Scottish level of governance to such an extent (Interview with European policy-maker, P240902). This could also be symptomatic of a lack of engagement with business in policy-making process: greater participation might lead to increased appreciation of where policy responsibilities lie.

Devolution appears to have simplified some policy interactions and complicated others (Interview with policy-maker, P260203). It has undoubtedly brought added communication difficulties and, with London-based civil servants complaining about the “newness, just unfamiliarity, not forgetting to consult with colleagues...Not being sure who to talk to” (Interview with policy-maker, P270303), how much harder must it be for those outside the political system to negotiate the labyrinth?

Much of the split of responsibilities at devolution was done on a pragmatic rather than necessarily a logical basis:

*I suppose that had a certain amount of logic and also a certain amount of political fudge at the time and...as things evolve and as new things come up, then I think...how they fit in is...it's done pragmatically* (Interview with policy-maker, P270303)

Each department of the Scottish Executive has a Memorandum of Understanding with the other UK departments which prescribes how they will work under the devolution settlement and when problems do occur they tend to be errors of omission exacerbated by staff changes (Interview with policy-makers, P240303 and P280202). Attempts at co-ordination between the Scottish Executive and Whitehall are improving but could still be better:

*I think I would be exaggerating if I was saying that the links were brilliant and they all worked very smoothly but I think it's fair to say that there's a willingness to make these links and the links are being made and I think they will work* (Interview with policy-maker, P270303)

However, a number of funding issues have fallen between the tiers. The obvious one cited by several respondents was the Genetics Knowledge Parks initiative which matched DTI funding with UK Department of Health funding from which Scotland was excluded (Interviews with academic, A220403, policy-maker, P140303 and policy adviser, P280203) but there have been other similar mismatches in veterinary and cancer research where Scotland was initially excluded from national funding initiatives. Although not insurmountable, these errors have been annoying for those involved (Interview with policy adviser, P280203).

Following a difficult birth, when central government was suspicious about the coalition nature of the new Scottish government and cautious about sharing policy information with the Scottish Executive, the situation is reported to be settling down again (Interview with policy-maker, P140403). But some things never change:

*the Office of Science and Technology was always an arrogant organisation that really seeks nobody's opinion but their own – tends to send something up to the devolved administration saying, could we have your replies by Friday...So that side of it – that hasn't changed with devolution* (Interview with policy-maker, P140403)

There is still some question of the status of devolved administrations in Whitehall where they are often no longer equal partners in the official Whitehall community (Interview with policy-maker, P020403). Nevertheless, there is a belief that devolution has shifted the balance of power and that the UK government now has to

take notice of the Scottish level of governance. While the legal powers of the Scottish Executive are effectively the same as under the Scottish Office, there is the sense among some Scottish civil servants that relationships have changed and are now less of a hierarchical and more of a two-way process so that interactions with Whitehall are now much more a “meeting of equals” (Interview with policy-maker, P020403).

Some officials did not see any problems arising from the concurrent nature of science, arguing that everyone is clear that science and innovation policy is concurrent and, because of the potential for errors, people handle these issues with care (Interview with policy-maker, P240303). Others are less sanguine:

*the UK has a dedicated science Minister, who very much sees Scotland as part of his remit. The DTI run initiatives on a UK basis...Except when they don't...I mean, in principle, they run things on a UK basis. It's just that...the UK generally finishes round about Luton* (Interview with policy-maker, P260203)

*there was always an element in DTI of forgetting that Scotland existed and it's still there and in some senses exacerbated with some people thinking –Scotland, oh that's alright, they do their own thing now, it's OK, we don't have to think about them. And not realising that in quite a few of these areas of concurrent powers, they are meant to cover the UK as a whole and it's not devolved* (Interview with policy-maker, P140303)

*there is a discontinuity at the border and there are DTI initiatives that are poorly understood up here and Scottish initiatives that are poorly understood, if at all, down south. And therefore that can engender some sort of – maybe resentment is too strong but lack of understanding of each other which doesn't help* (Interview with service provider, I160702)

Even if there is no difference in policy approaches, Scottish policy-makers feel the need to keep a watching brief:

*I think that it's difficult for Whitehall to grapple with all the implications of devolution and they'd rather not bother if they could. So we have to keep battling away...Reminding them it's different in Scotland and when you're talking about the UK and England, it's two different things* (Interview with policy-maker, P180203)



but the difference in scale is a challenge with much smaller numbers of Scottish civil servants trying to keep abreast of UK issues (Interview with policy-maker, P180203)<sup>8</sup>.

While Scotland is seen to be more innovative in comparison with many of the English regions (Interview with policy-maker, P070302), it is harder to decipher the degree to which Scotland is a leader or a follower, to disentangle the degree to which the influence of UK-level policy for science and innovation is setting the agenda for Scotland and whether Scotland is really optimising the freedom that devolution offers (Interview with policy-maker, P070302). But there is a general feeling that devolution has increased motivation both within the Scottish government and amongst Scottish businesses and has boosted self-confidence, so that devolution's biggest impact has perhaps been internal and psychological (Interview with service provider, I160702). Devolution has forced the Scottish Executive to demonstrate that it is developing policies within the scope of its powers that are best fitted for the purpose rather than simply adapting something that has been developed by the UK government (Interview with policy-maker, P070302). Devolution has given Scotland the ability to focus more on what policy-makers consider to be the priorities of which one is clearly biotechnology (Interview with service provider, I160702).

But while the benefits of devolution should be that stakeholders are closer to policy-makers and have greater opportunities for interaction, this does not necessarily seem to be happening from the companies' point of view (Interview with biotechnology CEO, I280802). On the downside there is the danger that policy-makers become too parochial and isolated as a small country rather than as part of a bigger nation. So in many ways the impact of the Scottish Parliament on the policy-making process presents something of a mixed picture with few actual changes. At the same time there is the potential for some disadvantage where we forget to communicate across

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<sup>8</sup> This is not simply a problem for policy-makers as UK representative bodies are also accused of neglecting Scottish policy input (Interview with university representative, A110303).

the borders. While there is undoubtedly the capability to do things differently, the more layers, the more interventions, the more tiers of governance are introduced, the more opportunity there is for political influence that is not necessarily to policy targets' benefit.

#### **4.4 Engagement in policy networks**

Officials describe using a range of opportunities to engage with their user community including formal surveys, workshops, one-to-one meetings and major consultation exercises, and recognise the value of user engagement:

*anything we do has to be realistic and meaningful in relation to the user community and, without consultation, that's not possible. You can't expect to get the best outcome* (Interview with policy-maker, P170403)

Although, as we shall see below, there are examples of where Scottish Enterprise has set out to engage more systematically with key people from the private sector with a view to attaining more regular input to inform the decision-making process (Interview with policy-maker, P170403), the tenor of this exchange still implies that it is the policy-makers who are impressing their ideas on policy targets rather than listening to what users actually need. Despite, or perhaps because of the fact, that it is a small country, Scotland still tends towards "jostling and competition", rather than a natural propensity to co-ordinate (Interview with policy-maker, P170403). There are too many links in the chain and too many actors and government innovation schemes (Interview with academic, A260603) a point clearly recognised by the SSAC (Wojtas 2004) as we shall see in Chapter 5.

There are certainly ample opportunities to network:

*you could, in Scotland, go to an event almost every night of the week...and see the same people there* (Interview with biotechnology CEO, I291002)

but participants complain that networking is over-rated, its utility difficult to measure and its key proponents mainly consultants and advisors. Networking for a purpose is seen as useful if there is a targeted project where people are brought together to

achieve a specific goal but the type of networking promoted by Scottish Enterprise is criticised by the biotechnology sector:

*anyone who thinks they have anything to do with biotechnology can turn up, you know, and by meeting each other it will create an industry. It just doesn't happen* (Interview with biotechnology CEO, I090603)

Individual companies often have narrow horizons (Interview with industry representative, I030702) and from a practical standpoint find it difficult to respond to invitations at short notice (Interview with biotechnology CEO, I291002). How then do we encourage industry to participate in, for example, informal dinners with policy-makers where much of the key discussion and influence takes place, and prevent these events being populated by academics, government officials, service providers and “dead beat” companies (Interviews with biotechnology CEOs, I291002 and I090603).

Thus, while networking undoubtedly happens, it is regarded as being of arguable benefit and appears to do little to inform policy. The new generation of Scottish biotechnology firms are led by management teams with international experience who regard the Scottish Executive as unfamiliar and perhaps uneasy when dealing with senior industry representatives who are confident, knowledgeable and politically experienced (Interview with biotechnology CEO, I090603). Although trade bodies play an important role on companies' behalf, the Scottish biotechnology industry consists of a diverse and not necessarily cohesive group of companies so it often falls to individual firms to state their own case to policy-makers (Interview with biotechnology CEO, I291002): not easy when the Executive's tendency is not to deal with individual companies (Interview with policy-maker, P140303).

In the past, it was “not the done thing” for academics to interact with government but attitudes in the scientific community are changing (Interviews with director of research institute, R290702 and academic, A220403). Nevertheless, scientists are still criticised by one of their own for their inability to share their views and think strategically (Interview with policy adviser, P280203). Although policy-makers may find it easier to engage with universities than with industry (partly because they are

fewer in number and their publicly funded status fosters a closer relationship with government) (Interview with policy-maker, P270303), they are criticised for failing to exploit the policy expertise of universities sufficiently and urged to change their attitude to seeking information, placing less emphasis on the short-term, low-cost, one-off consultancy culture and more on long-term, ongoing dialogue based on properly funded research (Interview with university representative, A110303).

Business people recognise what a policy network is and have seen them operating in the pharmaceutical industry in the UK and overseas but are not aware of the same processes operating in Scotland (Interview with biotechnology CEO, I280802). They contrast the situation with the US where policy-making is seen as more proactive and interactive and often much more driven by elected representatives and their agendas as opposed to intermediate government agencies. Although more politicised, the US system is also seen as more accessible than the UK policy process:

*you can get to see your Congressman or Senator remarkably easily in the States compared to the palaver you have to go through here* (Interview with biotechnology CEO, I090603)

In some senses, Europe is seen by respondents as a model for participative policy-making: although it takes a long time, it is seen as a very inclusive process that operates on a network basis and encourages a common agenda at national levels where industry and government are all trying to influence a large pool of others (Interviews with university representative, A200203 and industry representative, I030702). Certainly, respondents were as likely to mention interactions with MEPs as they were with MSPs (Interview with biotechnology CEO, I090603) and were also developing links through Scotland Europa's bio-regions network (Interviews with industry representative, I260602 and policy-makers P240902 and P070302).

Closer to home, SHEFC describes a very interactive relationship with stakeholders and clearly articulates the benefits of involving others in policy development (Interview with policy-maker, P130503). The smaller size of the Scottish HE sector in comparison with its English equivalent is obviously a factor here but there is,

nevertheless, an institutional mindset that is geared to working with their user community and this is seen as aiding the funding council's credibility with its stakeholders (Interview with policy-maker, P130503). Again the small country factor means that cross membership of committees (such as, for example SHEFC Council and SSAC) can be helpful although one observer was very critical of this situation:

*there is a deep feeling that I have that committees are constituted of like-minded yes men...I think it's true in general but I've been shocked at the extent of it in Scotland* (Interview with biotechnology CEO, I140802)

Officials acknowledge that many of the most successful policy developments post-devolution have actually come through advisory committee or independent committee processes and recognise that allowing stakeholders to set the agenda, so that Ministers are then in a position of deciding whether or not to accept policy recommendations, rather than "dreaming it up from the first principles", is actually a very effective way of getting buy-in and bringing authority and legitimacy to the policy process (Interview with policy-maker, P020403).

The policy community claims that it wants to hear from real businesses and believes "it's far easier to lobby government because there's a process for doing it, either through the Parliament or directly with the Executive" although admits the process may be more complicated because of the relative roles of the Parliament, the Executive, Scottish Enterprise (Interview with policy-maker, P020403), a point which will be explored further in Chapter 7. But ultimately the following quotes illustrate that the aspirations of this policy-maker are not realised in the experience of at least one leading biotech CEO:

*If someone in a biotechnology firm has got something to say, if they say it clearly to one or more of them, people will listen...there's a very, very receptive audience out there* (Interview with policy-maker, P020403)

*we keep participating with Scottish Enterprise to try and bang the drum for Scotland but that's it. As I say, we're wheeled out with a hat and cane saying isn't this wonderful, it's an example of what Scotland can do. But we do our act and then we go back and that's it. So I'm not sure*

*how deep or how robust the process is, if at all indeed it exists* (Interview with biotechnology CEO, I280802)

#### **4.4.1 Networks, fora and steering groups**

During the course of interviews respondents alluded to fora that might be considered to be policy networks. For example, the Bioindustry Steering Group which was set up during the development of the Scottish Enterprise biotechnology clusters strategy around 1998 when the first *Framework for Action* was launched. Although Scottish Enterprise staff still speak about the Group in the present tense, others described it as essentially moribund and there are obvious questions about its survival with the advent of the ITI Life Sciences<sup>9</sup> and other more recent developments described in Chapter 8. During the development of their clusters strategy Scottish Enterprise recognised (or were persuaded) that it would be useful to have a means by which industry fed in its views on a long-term basis, not just to producing the initial clusters strategy document but also to its implementation and future development. The Group considered issues such as globalisation, skills, access to finance, reducing entry barriers for venture capital, and gave feedback on research reports. The Group was deliberately devised so that it covered a cross section of the industry and started with a core group of six members although relatively few members had a policy background (Interview with policy-maker, P140403)<sup>10</sup>.

Described as a “structured discussion forum” (Interview with policy-maker, P140403), the Group met approximately three times per year, primarily, in the early days, to provide feedback to Scottish Enterprise on their *Framework for Action* (Interviews with policy-maker, P260203 and university representative, A200203) and to act as a “sounding board” for Scottish Enterprise (Interview with university

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<sup>9</sup> Launched by Scottish Enterprise in 2003 with £450 million funding over 10 years, the Intermediary Technology Institutes (ITI) in Life Sciences, Energy and Techmedia aim to facilitate co-operative R&D and commercialisation, and encourage local and foreign investment to ensure that new and existing high growth, technology-based companies foster economic growth (see [www.itilifesciences.com](http://www.itilifesciences.com)) (last accessed 28/10/04).

<sup>10</sup> The Group eventually increased in size up to a dozen core members with a wider group of participants drawn from the Enterprise Network who did not attend each meeting.

representative, A311002). The impression from members was that the Group was set up by Scottish Enterprise rather than as a policy response to user demand. Although Scottish Enterprise set the agenda for meetings, they seem to have steered it with a fairly light touch:

*we have a reasonably clear idea of what we want to get out of the meeting. Though the Group don't always see it that way...if they want to go in a different direction, that's fine...if they think that something is important and they want to discuss it and they want to tell us it's important, that's fine because that's what it's for* (Interview with policy-maker, P260203)

The interaction within the Group was described as “hugely helpful” (Interview with policy-maker, P140403) but essentially the success of the Group lay, according to its members, in its role as a successful networking vehicle:

*I mean, as much as anything else, for the people you met as the topics you actually came to discuss* (Interview with policy-maker, P140403)

*it was a good networking opportunity but it went more than that because you were actually working together and we had very specific focus groups with topics that we were trying to do, to identify what the key constraints were and it led to reports which, of course, went into the Scottish Enterprise system* (Interview with university representative, A311002)

*given that they didn't precisely set themselves anything other than a target of having a really good informal mechanism for listening, in that, I think it's probably been outstandingly successful* (Interview with policy-maker, P140403)

but it was less clear to members (both from industry and the policy-making community) whether it has informed public policy (Interview with biotechnology CEO, I120203):

*More generally – how far has it informed our policy? – specifically not really. It's much more a general sense of – there's only so many ideas under the sun at the time and it's always hard to say quite how you arrived at them* (Interview with policy-maker, P140403)

Significantly, the feedback process was not transparent to members, for example how information supplied by the Group informed Scottish Enterprise and the Scottish

Executive's policy process, and there was a strong sense that Scottish Enterprise was something of a "black hole":

*I'm not quite sure exactly what the impact the steering group had because unfortunately I think the communications with Scottish Enterprise are not the best. Information is gathered by Scottish Enterprise largely through the use of consultants but occasionally through those fora [i.e. the Bioindustry Steering Group] and the reports are then lost or certainly are not distributed outwith Scottish Enterprise...if you're in my sort of position, what happens is that...we participate frequently in a lot of surveys for consultants paid for by Scottish Enterprise and it's always the same survey again every 12 months (Interview with university representative, A311002)*

Another example of an existing Scottish discussion forum is the Pharmaceutical Liaison Group. Set up by the Scottish Executive Health Department, it consists of representatives of all the main pharmaceutical companies and meets approximately twice per year. The group was created with devolution in mind so that Scotland was not sidelined because it had none of the key pharmaceutical companies' headquarters or major facilities. This group was established to discuss issues of common interest so that the Executive could use it as a sounding board about issues relevant to members' businesses (e.g. clinical trials, ethics) and seek their views on strategy (Interview with policy-maker, P140403). Although this sounds good in theory, in reality other commentators observe that the Health Department is actually much less likely to interact with policy targets from industry than ELLD (Interviews with industry representative I260602 and service provider I160702).

Others might argue that the Scottish Foresight Forum which includes representatives from universities, SHEFC, Scottish Enterprise, CBI Scotland and small business organisations, represented a policy network as it contributed to OST's policy discussions (Interview with policy-maker, P140303) but in reality this group's task is primarily cascading information and practical policy implementation.

SHEFC has also set up a task force on knowledge transfer (SHEFC/Scottish Enterprise 2002) to develop national priorities and strategies in knowledge transfer from the perspective of the Scottish higher education sector. Its membership is



drawn entirely from the public sector (Scottish Executive, Scottish Enterprise, Universities Scotland, HEIs) and, although there is much to be applauded in its aims, it has been criticised for lack of industry input (Interview with director of research institute, R290702) and there appear to be obvious overlaps with the remit of the SSAC (see Chapter 5).

The fieldwork also tried to identify whether there had been any policy issues that had brought policy targets together to influence government collectively, but stakeholders still appear to coalesce more at the UK level where the bioindustry's trade bodies have certainly worked together to influence government policy on R&D tax credits, the availability of venture capital funding and the regulation of the use of animals in research (Interviews with industry representatives I260602 and I030702; and biotechnology CEO, I291002). Although many point to the uniqueness of the Scottish Proof of Concept fund (Interviews with industry representative, I040702; university representative, A110303; policy adviser, P280203; and policy-maker, P260203), it is questionable how much this initiative was a response to grass roots lobbying and how much it was political expediency at a time when Scottish Enterprise's inward investment projects were drying up, there was "money in the wrong place" and it was in various peoples' interests for this funding initiative to be launched (Interview with policy-maker, P260203):

*It's distinctly Scottish and the Proof of Concept is a good concept but, again, it was an initiative that was launched by Scottish Enterprise at the behest of the Minister at the time saying we needed this to go through, so there's a political statement that this should be done (Interview with university representative, A311002)*

While it is undoubtedly possible to lobby government and to influence policy in Scotland, it remains a difficult process. There is a slow recognition that there is a need for more concerted action, integrating or interacting with policy-makers and an acknowledgement that we have not yet got the process right (Interview with service provider, I150702), but it still takes time and substantial effort from all parties to establish a dialogue that will generate sufficient momentum to influence policy (Interview with academic, A220403). The impetus for such dialogue generally

seems to come from the policy targets and the prevailing model is still one of *ad hoc* consultation where interaction takes place on an isolated, one-off basis (Interview with policy-maker, P170403).

There is certainly no shortage of contact and indeed some nascent networks of which the SSAC, described in more detail in Chapter 5, is one example. In the UK, initiatives such as Foresight have, to a certain extent, encouraged government-industry interaction (Interview with industry representative, I040702). But policy-makers do not necessarily make it easy. Certain people's voices are listened to and bodies such as Scottish Enterprise can be a help or a hindrance, depending on the personalities involved and on how driven they are by the Executive. Such interactions are often cyclical with policy targets complaining that they have "been here before" (Interviews with biotechnology CEO, I291002; and university representative, A311002). Authors such as Diederer *et al.* (1999, p.42) are probably right to say that the voice of industry and the voice of academia are heard quite often and quite loudly in the corridors of power and that policy does react to these voices but, while networking certainly takes place in Scotland, it is doubtful that it goes any further:

*to describe these things as a policy network in the sense of having channels of information flow and information exchange...if they exist – they're partial and accidental. People do network, they do bump into each other, they do exchange information but the extent to which that has a substantive influence on the Executive, SHEFC, [Scottish Enterprise], institutional policy in individual universities – I would say is highly questionable (Interview with policy-maker, P170403)*

#### **4.5 Policy learning**

Some commentators (Parry 2000) have suggested a "policy-making deficit" in the Scottish Civil Service and have noted that, while officials are "masters of the technicalities of the game", they do not "get to grips with the way that policy outputs are to be achieved and real differences made". Some respondents from the policy-making community are much more optimistic about the impact that devolution has had on the quality of Scottish government policy and claim a positive correlation with policy-oriented learning:

*the decision-making process is faster so there are policies which can be put through in Holyrood which would never have made their way onto statute in Westminster just because of lack of time. But there are some fairly obvious, fairly high-profile examples of how business thinking has fed into Executive policy-making and I think transport is one of them (Interview with policy-maker, P240303)*

Other policy-makers recognise that devolution provides an opportunity for different parts of the UK to try different things and learn from each other (Interview with policy-maker, P270303), but other respondents stress the potential disadvantages and the need for everyone to work harder to ensure proper co-ordination while acknowledging that this, in itself, may not necessarily always be a problem:

*one of the benefits of working harder is that then you gain a more detailed learning. If somebody is a special case you then, in order to understand what you have to do, you have to dig in deeper and that's not a bad thing (Interview with industry representative, I030702)*

While some believe that all industry can really do is raise issues and then hope that policy-makers will eventually take notice (Interview with biotechnology CEO, I030603), other policy targets consider that policy-makers do appear to learn as a result of dialogue with industry, but are, nevertheless, critical of the quality of policy emanating from the Scottish Parliament:

*I think the normal knock about in the Parliament is meaningless and the policy, when it tends to emerge through the various committee structures, tends to be sort of bland (Interview with biotechnology CEO, I120203)*

and complain that Ministers never stay long enough in a position to have an impact (Interview with biotechnology CEO, I120203).

It is often difficult to discern what influence stakeholders might have had on policy because of poor (or often non-existent) feedback from policy-makers (Interview with university representative, A311002) and several respondents criticised Scottish Enterprise's approach to policy in particular (for example, interviews with university representative, A311002 and service provider, I020503) as still being very "top down" rather than "bottom up":

*there are times I feel we're sometimes playing catch up, that, you know, decisions have been made...what we're trying to do now is to slightly modify the decisions so the consequences won't be quite as bad* (Interview with university representative, A311002)

However, some policy targets are quite optimistic about communication channels to policy-makers and the feedback mechanisms through the Enterprise network to ELLD although this view is perhaps coloured by the fact that this respondent was often able to provide the Executive with “good news stories”:

*I'm sure it gets back [from Scottish Enterprise to ELLD], yes. I mean, they use us as a sort of shining example of how an institute like X can feed the economy of the area. I mean, you can see it even in the documents coming from Scottish Enterprise that they utilise us as examples* (Interview with director of research institute, R210203)

Other respondents were able to recount direct experience of how it is possible to influence policy:

*[that involvement with the House of Commons select committee] made me aware of how it was in fact possible to have direct influence and that it was possible for substantial changes to be made in terms of how policy mechanisms [get established]* (Interview with academic, A220403)

But effecting policy changes is a long-term and resource-intensive process and this respondent from the university sector emphasised that, although it is possible to influence the policy agenda at both UK and Scottish levels, it is not necessarily an easy process. Although no one was placing specific impediments in his way, it nevertheless takes considerable commitment of time and money, particularly difficult if those trying to influence the process are grant funded (Interview with academic, A220403).

However, simply listening to views is not the whole process: it is what policy-makers do with the information and this is the black art practised by civil servants who complain that MSPs do not have the necessary experience to do this well:

*The need to distinguish self-interest and public interest and the underlying impression that the Parliamentary committees have difficulty in weighing up the evidence of an authoritative spokesperson of a*

*particular industry who will have huge influence. The Parliamentary committees just haven't had the experience... They're bewildered by all of this information that's thrown at them – how you influence this black box of government (Interview with policy-maker, P020403)*

#### **4.5.1 Lobbying or dialogue?**

This then brings us to the question of whether these interactions between policy targets and policy-makers are simply lobbying or whether they reflect a genuine two-way dialogue and consequently policy learning.

Interestingly, the working groups that resulted from the Pharmaceutical Industry Competitiveness Task Force (PICTF), discussed in more detail in Chapter 6, were considered by policy-makers to have actually reduced lobbying:

*R1: They do raise the level of debate and they do provide genuine debate. It may not always be totally unacrimonious...*

*Q: And does it influence the policy that results?*

*R1: Oh yes. I mean, they are proper working bodies. They are a proper network. It's a proper dialogue between industry...*

*R2: in a sense, it actually reduces the lobbying*

*R1: Yeah*

*R2: Because – because you had the framework, you didn't have the ad hoc lobbying (Interview with policy-maker, P280303)*

a notion which is supported by MacIntyre-Kemp's (2003) approach to policy networking which seeks to eradicate the lobbyists' "them and us" attitudes:

*In a communitarian approach there is no separation of people and state – just an entire community agreeing a shared way forward so there is no need to lobby anyone (MacIntyre-Kemp 2003)*

At the Scottish level, Scottish Enterprise present their interactions with stakeholders as a two-way dialogue (although interestingly they see interaction with firms as being more straightforward than interaction with universities) (Interview with policy-maker, P260203) but many other respondents refute this; as illustrated by the earlier

comments about Scottish Enterprise being a “black hole” (Interview with university representative, A311002) or remarks about the need to lobby the higher echelons of Scottish Enterprise to correct policy mistakes (Interview with service provider, I020503).

“Lobbying” is often regarded as a pejorative term:

*it's very difficult a lot of the time to make a distinction between lobbying, which lots of people still see as just nasty, and shouldn't be done, and policy influencing* (Interview with European policy-maker, P240902)

and policy-makers point to the need to distinguish self-interest from public interest:

*I think sometimes we listen too much and sometimes the challenge is making a distinction between what might be seen as sort of self-interested lobbying by a particular company as opposed to a more public interested view about what is good for the biotechnology sector* (Interview with policy-maker, P020403)

As a consequence, trade associations are trying to educate member companies to see interaction with policy-makers as a long-term, ongoing relationship, rather than lobbying on specific issues:

*I think this comes back to having an embryonic company base...they don't quite understand why you have to continue your engagement with policy-makers and I think this is where we got the problem with lobbying because sometimes...well, lobbying is only mentioned when... “I have a problem therefore I'm going to moan or take issue with my Member of Parliament”, and what we want to do is move away from that. We're not coming with issues. We're coming with awareness and trying to raise it before there is a problem, maintaining an ongoing dialogue with policy-makers and not just going to them when you've got an issue but this is only just starting to happen in Scotland* (Interview with industry representative, I260602)

Others in government take a rather disparaging view of the role of trade associations:

*it is possible to have a dialogue with industry on broader matters but...they tend to be operating on shorter time horizons than the time horizons for policy* (Interview with policy-maker, P170403)

While there is genuine interaction in some cases, there is not yet an established policy network in Scotland that is bringing government and other actors together:

*I think we've got to keep working at it. I think the problem is to be honest there are too many agendas round the table. And at the end of the day, it's Scotland/UK and we have to put personal agendas aside* (Interview with industry representative, I260602)

The private sector is starting to be more vocal about their concerns and how they want to be involved in the policy process but the regular dialogue is still seen as being between the Executive and Scottish Enterprise rather than between the Executive and the private sector (Interview with service provider, I160702). Some pin their hopes on the development of the BIA in Scotland to become the driving force, taking over some of the devolved activities of Scottish Enterprise and coalescing with some of the more locally organised biotechnology groups in order to add power and value (Interview with service provider, I160702), but there is clearly still a perception that the public sector, in general, and parts of Scottish Enterprise, in particular, is “a bit of closed door” (Interview with industry representative, I260602). Likewise, others report, using the same terminology, that while lobbying is possible in certain areas, in others it is a “closed door for industry” (Interview with biotechnology CEO, I291002). Some are quite emphatic that nothing has changed:

*we haven't actually moved beyond the lobbying process towards a two-way dialogue* (Interview with academic, A220403)

At the UK level, the DTI sponsor division for biotechnology takes the lead on making strategic policy for the bioscience industry sector within the UK: it mediates between companies and regulators and describes an ongoing relationship with individual companies to help inform the government's productivity and competitiveness agenda (Interview with policy-maker, P280303). This relationship is described as a “coalition” between the industry, the research sector and government departments:

*in a sense kind of sitting in the middle and trying to influence or direct if you like in some measure, a framework where...the regulation is elsewhere, ...the research councils are elsewhere, so you're there in the*

*middle influencing or trying to but from a position of no direct power, if you like...trying to sort of induce a harmony of relationships (Interview with policy-maker, P280303)*

But in reality it sounds as if little has changed since this researcher performed this role herself ten years ago in the precursor DTI division. Respondents still talk in terms of *starting* the process of dialogue rather than describing a *mature* policy network:

*my colleagues at the moment are starting to go out and actually meet with biotech companies in the sector and find out their views of what's happening in industry and what they think should be done in trying to feed those views sort of into the department and see what can be done about that (Interview with policy-maker, P280303)*

Industry's representatives are much more positive about their interactions with the UK level of government:

*Oh, genuine dialogue and for example, we gave evidence to the Trade and Industry Select Committee yesterday afternoon and they were asking us for ideas. Civil Servants ask us for ideas saying it's time for us to put up our bids to the Treasury. So there's definitely a desire from government...and also, of course, all governments struggle with their own internal problems of not being able to join up people and departments. So anything that we can do which cuts across boundaries, that sheds a wider perspective helps to give them ammunition to do something they want to do (Interview with industry representative, I030702)*

*[Policy-makers] need to learn what the industry's doing so if we could help them take different perspectives, they will also of course raise questions and seeing those questions, help inform us where their thinking's going. So it's very much a two-way process...Secondly, we can actually assist them. We can see where their thinking is going and where their funding squeezes, what their pressures are. [Q: So they need you as well as you need them?] Yeah, absolutely. It works both ways (Interview with industry representative, I040702)*

However, there seems to be some variation between Whitehall departments. While relationships with the Department of Health and parts of the DTI seem genuinely interactive, OST appears to take a more controlling approach to dialogue, making sure that it is conducted on their own terms:



*what we try and do is make that a two-way process by consulting on specific things. When we're in a position to...there are times when we're sort of involved in an internal debate on things so you can't be particularly open* (Interview with policy-maker, P270303)

In general, there would appear to be greater dialogue between policy-makers and other public sector bodies, for example, the PSREs and the health trusts where there is a funding relationship (Interviews with director of research institute, R210203; and policy-maker, P140403) than between policy-makers and the private sector where policy-makers clearly like to be “in the driving seat” (Interview with policy-maker, P140403). Perhaps dialogue can be achieved between government and these public bodies simply because they are all civil servants, bound by the same (albeit diminishing) public service ethos that facilitates trust and the sharing of information. This can make life difficult for those not inside the public sector fold who are, nevertheless, tasked with engaging constructively with government:

*it does come down to individuals and some are more than happy and others – and I think it is, you know, the more traditional the person is, the more traditional civil servant values they hold, the less likely they really are to come to us or to share information with us* (Interview with policy adviser, P280203)

#### **4.5.2 The “star” system**

Furthermore, the government’s interaction is piecemeal and often very individualised, involving the “usual suspects”, *i.e.* a limited number of key stakeholders whom one might term “stars”, be they academics or, more usually, entrepreneurs with a high-profile reputation, rather than a more comprehensive form of policy interaction or policy network:

*I think the kind of people who tend to be consulted and involved are generally pretty well known, so when some consultation or enquiry is happening on a particular subject, it's pretty well known who could and should be invited to it, whether from industry or from academia. So that's an advantage of having a relatively compact geography* (Interview with policy-maker, P170403)

*You get successful people who've made it and the government will literally seek them out* (Interview with biotechnology CEO, I291002)

*So we have one or two pet people in companies: [A at Company B] for instance is very good value for money and, you know, we tend to wheel him out if we possibly can (Interview with policy-maker, P140303)*

*we set up a meeting with [C of Company D] – he’s another one of the key individuals that we kind of wheel out at times (Interview with policy-maker, P140303)*

*they will listen to a group – a number of experts who will talk on certain things...it tends to be that they will interact with this one, that one, this one...So you’ve got maybe one or two academics who they’ll draw on now and again (Interview with university representative, A110303)*

While the small size of Scotland can be an advantage if it facilitates regular interactions between policy-makers and policy targets it can also exacerbate the “star” system, meaning that some companies get over-exposed, and limiting the scope for policy learning if policy-makers are only consulting a small number of key players and perhaps excluding other views:

*The weakness of that model, of course, is that you’re asking the same people, you’re calling on a limited number of individuals and you might lose depth (Interview with academic, A220403)*

A further issue which militates against constructive policy learning is the perceived lack of feedback from policy-makers in response to policy consultation:

*I genuinely have no concerns that they will ask us the questions, whether they will act upon the answers we give them...is more variable...So Scottish Executive can phone up and ask us any question – we will always answer and we can ask them some questions and they may not necessarily answer. So when we have some lobby campaign initiatives, we will get a two-line response but none of the ideas will be taken up or progressed (Interview with university representative, A110303)*

Others bemoan the fact that once the dinners and lunches with business representatives are finished there is no follow up (Alex Neil MSP)<sup>11</sup> or warn about

the dangers of raising expectations about public engagement without subsequent feedback (SCVO representative)<sup>11</sup>.

### 4.5.3 Failure to learn

Finally, although the Intermediary Technology Institutes (ITIs) (see footnote 9) were not a particular focus of the fieldwork for this research when the data were analysed there seemed to be such unanimity of responses, from policy targets and policy-makers alike, to this £450 million policy initiative that it perhaps serves as a valuable example of how the “policy learning” approach can fail. As the following quotes so graphically illustrate, the ITIs provoked an unprompted and heated reaction from respondents:

*It's a flawed model...they [Scottish Enterprise] think or like to think that they've consulted the industry in the development of the ITIs and I have to say I think that's token and they haven't. And I don't know any of the more experienced CEOs in Scotland who think the ITIs...are going to work (Interview with biotechnology CEO, I090603)*

*they [universities] haven't been properly consulted about really how these things will work and the problems of actually getting intellectual property out of the universities. There's a feeling out there that they just haven't been adequately involved in the whole process (Interview with policy-maker, P180203)*

*it wasn't very clear in the beginning that this was an idea that essentially had already been decided to do and that the consultation was token on something that was at an advanced stage and we're all extremely busy people. We have to prioritise our time and I don't think there was a – I think there was a – what's the right word? A faked or sort of phoney attempt at consultation where it wasn't clear why people like myself should have given up time at the time it was offered to pay attention to it (Interview with biotechnology CEO, I090603)*

*I think one of the major problems is the lack of consultation and the fact that you can get some very mixed messages from different people in Scottish Enterprise as to what these are about, how they are going to work...They've done it in isolation (Interview with policy adviser, P280203)*

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<sup>11</sup> Contributions to Centre for Scottish Public Policy conference “The Scottish Parliament, Politics and the People”, 30 August 2003.

*If you look at the ITI project, there is no industry demand, there is no industry support and there is no engagement with Scotland (Interview with university representative, A200203)*

*these were people from industry saying, here's why these won't work. And instead of learning from that or instead of saying, this is what we want to achieve, how do we go about it – I mean, they are creating an opportunity to fund research. We don't need any more research (Interview with university representative, A200203)*

*the Intermediate (sic) Technology Institutes are a classic example. Major programme, major impact on the research community, the financial community, the technology community...The amount of consultation was virtually zero (Interview with service provider, I020503)*

*using ITIs as an example, that was one of the patchier ones I think where we did involve them early on but I don't think Scottish Enterprise involved – I don't think they recognised early enough quite how vital getting the academic sector on board was...whilst they have very good relationships with ourselves...I don't think they took on board just how important it was (Interview with policy-maker, P140303)*

*Scottish Enterprise do things in a way that nobody can quite understand...Zero consultation. Nothing...Consultation as Scottish Enterprise describes it...If anyone in Scottish Enterprise tries to tell you that there has been consultation, I would say it depends what you mean by consultation...But, as of the time – as of now, as far as I'm aware, we've yet to see something on paper which explains how these will work. We've seen a couple of presentations and a bit of chat but...we're not even clear what we're consulting [on] (Interview with university representative, A110303)*

Middle-ranking policy-makers within Scottish Enterprise appeared, even some time after the public announcement of the ITIs, reluctant to discuss the initiative:

*I can't really talk about the ITIs because it's something that's under development and people are currently being recruited at the moment. So I can't give you detailed information or views about the ITI process (Interview with policy-maker, P170403)<sup>12</sup>*

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<sup>12</sup> The research design had not been devised to incorporate any element of iteration of information between sources although, in this particular case, such a procedure may have been informative. This quotation is, however, extracted from an interview which took place some weeks after those cited

From these reactions, the ITI initiative appears to have been a top down policy with no apparent willingness on the part of Scottish Enterprise to learn from the experiences of stakeholders. This was evidently not a policy response to market demand and this failure to learn necessitated an extensive *post hoc* PR exercise to sell the ITIs to the market.

#### **4.6 Reprise**

When asked about the impacts of devolution, policy-makers tended to focus on the increase in ministerial involvement. For officials, this has meant more opportunity to influence Ministers and a higher profile for Scottish STI where Ministers can now act more autonomously. On the downside, this much readier access to politicians has led to micro politics and far greater opportunities for Ministers to be swayed by interest groups. The representative bodies interviewed certainly tended to agree that the Scottish Parliament has opened up opportunities for dialogue with government and this group of respondents generally recognised that there were some advantages in having easier access to politicians. This group also acknowledged that devolution had given Scottish government actors greater flexibility, the ability to focus more on Scottish priorities (of which one is clearly biotechnology), and perhaps a greater sense of purpose. But many policy targets, particularly the SMEs, saw little real change as a result of devolution and instead highlighted the dangers of becoming too insular and isolated as a small country and expressed concerns about the potential added complexities that another layer of government bureaucracy might bring to their businesses.

Multi-level governance issues were generally recognised by policy-makers as presenting both an advantage and a complication for STI policy. While some policy-makers inevitably tried to portray the impact of devolution on relationships with Whitehall as entirely positive, many owned up to communication difficulties between the different levels of governance, partly because of nervousness on the part

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earlier in this section and would have permitted Scottish Enterprise some right of reply had they wished to avail themselves of this opportunity.

of the UK Labour Government regarding the coalition nature of Scottish government but, more generally, simply the fact that departments such as the DTI tend to forget that many aspects of STI policy require them to perform a dual function with a remit that, in some respects, covers the whole of the UK and, in others, only England. Policy targets, especially the SMEs, and to a much lesser extent the representative bodies, tended to emphasise a similar lack of clarity about levels of policy responsibility and the potential for some disadvantage where we forget to communicate across the borders.

Policy-makers did tend to promulgate the rhetoric that devolution is an opportunity for different parts of the UK to try different policy approaches and then learn from each other and see what works but there was little evidence of this happening in practice. Some policy-makers did maintain that policy-making in Scotland is now closer to the grass roots in some respects but others accentuated the challenge of distinguishing between self-interest and public-interest industry lobbying, identifying that the key issue was not the amount of lobbying but whether such viewpoints actually had any impact on policy outcomes. This was echoed by policy targets where the general sense from all types of respondents (SMEs, universities and representative bodies) was that, while there is undeniably quite a lot of engagement with policy-makers in Scotland, there was a distinct lack of feedback on the outcomes from this interaction and no evidence of policy-oriented learning as a result of this interaction.

So while policy-makers recognise that networking does take place, some question the extent to which this has a substantive influence on the Scottish Executive, SHEFC, Scottish Enterprise, *etc.* There is generally, although not universally, a view expressed among policy-makers that engagement with policy targets tends to be via one-off isolated consultations, and a growing recognition that there is more that they could do to foster a greater degree of co-ordination within the Scottish system of innovation by improving multilateral, network-based relationships rather than the current focus on bilateral relationships with individual organisations. At the moment, those policy-makers who are reflexive about the policy process do

recognise the desirability of a policy network approach as a way of fostering information flow and information exchange but acknowledge that, if they exist at all in Scotland at the moment, they are partial and accidental. Similarly, policy targets generally acknowledge that networking happens in Scotland but question its utility. Some recognise that it is possible to lobby government and to influence policy but stress that it is a difficult process that requires substantial effort to establish an ongoing channel of communication: policy-makers are not proactively seeking input from users and the onus is on the policy targets, be they representative groups, universities or individual firms, to establish this dialogue.

In his pre-devolution study, Macleod (1996) took a rather optimistic view of the “networked regional village” that brought together bodies such as the Scottish Office, STUC, CBI Scotland, COSLA, SCDI and the regional development bodies to provide “the interactive synergy for a relatively informal order for governing economic development”. However, one of his respondents did, nevertheless, draw distinctions between Scottish competences in *social* and *business* networking:

*We are quite good at social networking, but what we do not seem to do is the business networking that appears to happen almost as a matter of routine in the United States* (Scottish Enterprise official speaking in 1995, quoted in Macleod 1996)

This present study takes this theme one stage further. Whilst the interviews reported in this chapter demonstrate that business networking undoubtedly does take place, in part perhaps as a result of the regional development initiatives reported by Macleod (*ibid.*), this networking does not necessarily, or overtly, inform policy and there is little evidence to suggest that policy networks of the type described in Chapter 2 exist within the Scottish system of innovation post-devolution.

In Scotland, interactions between policy-makers and policy targets are still conducted by and large via the tried and tested method of policy consultation but the effectiveness of these exercises is frequently criticised and they reinforce the “top-down” style of government rather than the more inclusive, associative governance approach. While the government is clearly prepared to make use of leading

companies to showcase Scottish biotechnology, there is a general feeling amongst respondents from the sector that they have little real impact on government policy. The situation is further exacerbated by the “star system” whereby policy-makers rely on inputs from a select group of industry advisers.

Routes to influencing the Westminster Parliament are well-established, whereas there is still clearly a learning curve to be surmounted in terms of effective engagement with Holyrood. Although access to the Scottish Parliament, the Scottish Executive and civil servants is in some respects relatively easy, at least for civic society, access does not equate with influence and there is a perceived hierarchy of evidence and the sense that traditional, establishment views prevail. While representative bodies such as the BIA are developing their role in Scotland, much of their policy interests lie outwith the Scottish level of governance and it is doubtful that such professional fora are yet in a position to promote policy learning (Sabatier and Jenkins-Smith 1993, p.232). Understandably, given the timescales involved, policy-makers at the UK level of governance have a more mature relationship with trade associations (as we shall see in Chapter 6 when discussing the activities of various joint industry-government task forces) whereas relations between Scottish policy-makers and trade associations are nascent, with Scottish Enterprise historically taking on many roles that one might expect the private sector to fulfil (for example, in terms of networking or training activities).

This fieldwork has revealed few, if any, multi-actor Scottish networks with a clear remit to develop policy in the area of science and innovation. Those fora that do exist, such as the Scottish Foresight Forum or the Health Department’s Pharmaceutical Liaison Group, appear to be responding to a government-led agenda. Others such as the Bioindustry Steering Group seem all but extinct or made redundant by new policy initiatives and appear to have had a limited, or at least not an overt, impact on policy whilst, nevertheless, performing a valuable networking function. In other cases it is probably too soon to judge the performance of emerging networks although the following chapter will explore to what extent the creation and activities of the Scottish Science Advisory Committee are pioneering a new



relationship with policy-makers and whether this reflects some of the ideals of a policy network.

Universities Scotland has called for an intelligent approach to public policy that utilises interdisciplinary and cross-sectoral networks to engage in an ongoing dialogue with elected representatives and officials. Their aspiration is that this:

*would result in public policy which was better informed by the best evidence available, where long-term thinking was the norm, and where new ideas were emerging and being discussed all the time* (Universities Scotland 2002, p.11)

Respondents from the biotechnology sector also clearly articulate the benefits of an interactive, learning approach to the policy-making process but do not see this happening yet in post-devolution Scotland. Instead they criticise bogus consultations that are essentially information dissemination exercises and cite recent examples of failure to learn on a grand scale with the introduction of the ITIs.

So far in the field of STI policy, Scottish policy-makers and policy targets appear to have achieved “interaction but not interconnectedness” (Beesley 2003). Devolution might have fostered the development of Scottish governance models in areas of social policy such as education and justice but similar networks are not yet evident in science and innovation. Furthermore, it is clear that STI policy networks in Scotland do not “self-organise”. Instead they require an impetus such as a charismatic leader (and former Minister Wendy Alexander was often spoken about by respondents in these terms) or an event such as the pharmaceutical industry’s threat to abandon the UK which prompted the establishment of the Pharmaceutical Industry Competitiveness Task Force, discussed in Chapter 6.

Above all, associative governance means achieving long-term, ongoing networks that do not simply coalesce over a specific issue and then disperse. However, as Chapter 7 will demonstrate, the gate-keeping roles of large bureaucracies still present significant barriers to the effective operation of STI policy networks in Scotland and militate against an integrated approach to science and innovation.

## Chapter 5 Scotland's Science Strategy

### 5.1 Introduction

In recently devolved territories, key policy actors tend not to have significant expertise in policy development and often favour a linear approach to STI policy, thus Cooke *et al.* (2000, p.134) suggest that the first challenge for the regional governance level is to facilitate learning processes that look both internally (matching policy to regional needs) and externally (learning from good practice elsewhere).

Chapter 4 presented the findings from a broad survey of policy-makers and policy targets to explore the extent to which users are involved in the policy-making process for STI; to gauge whether Scottish devolution has had a positive impact on the government to governance shift; and to assess whether this move towards a more participative form of policy-making is manifested in the emergence of policy-making networks.

Chapter 5 develops this theme of user engagement in the policy process further and takes the specific example of the Scottish Executive's science policy document, *A Science Strategy for Scotland* (Scottish Executive 2001a) as an exemplar of regional STI policy post-devolution. It examines the consultation process that preceded its publication and the establishment of the ensuing Scottish Science Advisory Committee in order to analyse the extent to which policy targets' views influenced the content of this strategy and consider whether this process has supported the development of policy networks and facilitated policy learning. This examination of Scotland's Science Strategy is highly relevant to the concurrent power theme because science policy is not wholly devolved. One might suppose that, under the terms of the devolution settlement, Scotland would have greater autonomy with respect to innovation policy than science policy, and perhaps infer that the Science Strategy was an attempt to integrate these two areas but, as we shall see, this has proved not to be the case: this chapter will argue that, rather than using the opportunity of greater policy autonomy to achieve greater policy integration, the current approach is in

many respects perpetuating the linear model of science and innovation (Tait and Williams 1999).

## 5.2 Consultation

### 5.2.1 A multi-stage process

The production of the Science Strategy was a multi-stage process that took just under two years to complete (Table 5.1). Only months after the establishment of the Scottish Parliament the then Minister for Enterprise and Lifelong Learning (ELLD) set up a Science Strategy Review Group to conduct a scoping study which would, firstly, identify the questions that needed to be addressed in order to put a Science Strategy for Scotland in place and, secondly, identify what additional mechanisms would be required to answer these questions and to implement such a Strategy.

**Table 5.1** Timeline for Scotland's Science Strategy

September 1999	Science Strategy Review Group appointed by the Scottish Executive*
13 April 2000	Report of the Science Strategy Review Group published and circulated for consultation
30 June 2000	Consultation closed
February 2001	Draft sent to Ministers
27 August 2001	<i>A Science Strategy for Scotland</i> published and launched at the Glasgow Science Centre by Wendy Alexander
17 December 2001	Chair of the Scottish Science Advisory Committee appointed
April 2002	Members of the Scottish Science Advisory Committee appointed*
7 May 2002	First meeting of the Scottish Science Advisory Committee
13 January 2004	First report of the Scottish Science Advisory Committee published

\*See annex to this chapter for membership

The Science Strategy Review Group was chaired by the Head of ELLD and consisted of 15 members including *inter alia* Principals and Vice Principals of a number of Scottish Universities, the Directors of a Scottish government agency and a publicly funded research institute, the then President of the Royal Society of Edinburgh and Chair of the UK Committee for Public Understanding of Science, two senior scientists from industry and the Scottish Social Work Commissioner (see annex to this chapter for full details). The Review Group identified 41 questions under six main themes (see annex to this chapter) that they believed needed to be addressed in the development of a Scottish science strategy. Interested external parties were then invited to contribute their thoughts on what the answers to these questions might be. The consultation on the Review Group's report and the subsequent drafting of the Science Strategy were carried out by a small team of civil servants (the Science Strategy Team, SST) under the overall direction of the Head of ELLD. Although initially intended as a six-month project, the final draft was not submitted to Ministers until February 2001.

Some would claim that the origins of the Science Strategy lay in the Royal Societies' report on devolution and science (Royal Society of Edinburgh and Royal Society of London 1999) which raised, amongst others, the issue of whether Scotland needed a Chief Scientific Adviser. Soon after the publication of this document the Executive conducted an internal, unpublished study into whether Scotland needed a science strategy (Interview with academic, A210202).

The Review Group that was set up following this internal study did not consult any external experts during their deliberations and the process of preparing this consultation document does not seem to have been particularly well conceived<sup>1</sup>. The process was reported as having little sense of structure or focus on the broader questions about the nature of science or the purpose and scope of the strategy, in particular whether it would orchestrate science activities within the Scottish

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<sup>1</sup> It is not clear whether anyone on the Science Strategy Review Group ever had sight of the preliminary study conducted by the Scottish Executive but it was suggested that the Review Group was there to test whether the Executive's conclusions were correct. The Group was later told that it had confirmed the Executive's views: so in a sense the role of the Review Group had been to validate the Executive's own findings as a preliminary to a lengthy consultation process (Interview with academic, A210202).

Executive (Interviews with academic, A210202, and policy-maker, P050502). The final report was a long, rather unstructured document, consisting primarily of a list of issues to be addressed (see annex to this chapter). The Review Group's work essentially ended with the publication of their report in April 2000 and the civil servants then took over the somewhat lengthy consultation process which has been criticised for adding little to the final science strategy document (Interview with academic, A210202).

The strategy document took a number of forms before settling on the one in which it was eventually published (Interview with policy-maker, P140403). Several reasons have been suggested for the delay in approving the final draft (Interviews with academic, A210202, and policy-maker, P050502) including the need to redraft to make the document shorter<sup>2</sup>; the intractability of Ministers (in particular the debate about "the agriculture question"<sup>3</sup>); competing Ministerial priorities; the political handling of the recommendation to set up a new science committee at a time when there was an initiative to cut the number of quangos (Scottish Parliament 2001); and the apparently protracted debates about the desirability of including engineering and social sciences in a "science" strategy.

Responsibility for SST oscillated around various departments within the Executive during the prolonged gestation of the Science Strategy. Although this should have helped to facilitate a balanced strategy, ELLD was the overall champion and what emerged from Ministerial discussions was a diluted version of the draft with a clear emphasis on ELLD policy preoccupations (Interview with policy adviser, P280202). This has probably served to reinforce the pre-devolution policy trajectory, which emphasised the commercialisation of university research, and has not helped to promote a more joined-up approach to STI policy within the Scottish Executive and its agencies, a theme that will be taken up again in Chapter 7.

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<sup>2</sup> Ministers apparently wanted a four-page document, presumably along the lines of their insubstantial and propagandist policy document *Doing it Differently* (Scottish Executive 2002).

<sup>3</sup> Agriculture being a high-spending department within the Scottish Executive where the issue of whether it is right to spend this amount was seen as a political question and not one for civil servants to answer.

SST was a rather isolated policy team within the Executive. Whether this was deliberate to ensure independence and buy-in from all departments or the converse so that all of the departments equally could disown it, in the event, it was generally viewed within the Executive as a non-contentious policy area that, minor territorial skirmishes aside, received inter-departmental support (Interview with policy adviser, P280202). Civil servants have, however, spoken publicly about the “long and tortuous production of the strategy” and the length of time it took to get buy-in from departments<sup>4</sup>.

### **5.2.2 User engagement**

The consultation on the report of the Science Strategy Review Group was described as open but not necessarily very proactive (Interview with policy-maker, P050302). According to Scottish Executive records, 656 individuals from around 460 different organisations received a written invitation to comment on the report. As Table 5.2 shows, of these consultees, over half (54%) were from Scottish government and the tertiary education sector (this figure increases to 61% if other UK government departments and agencies are included; see also Figure 5.1). Industry represented only 8% of the mailing list in the form of trade associations and individual companies and, significantly, the companies consulted in writing included only two biotechnology SMEs.

Unsurprisingly, given this asymmetric sample, there were very few written responses from industry. Of the 106 written responses on file in the Scottish Executive library, only five (5%) were from industry or trade associations, 34% were from the tertiary education sector and 19% from local government (Table 5.2, Figure 5.2).

In addition to the written responses, the Science Strategy Team also conducted a number of meetings with a total of 147 individuals (Table 5.2, Figure 5.3), the majority of whom were other civil servants (48%) and tertiary education representatives (20%) but this time 15 people from companies, including one from a biotechnology SME, and four from trade associations were included in the survey,

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<sup>4</sup> Contribution to SURF (Centre for Sustainable and Urban Regional Futures) seminar, University of Salford, 12 May 2003.

representing 13% of the sample (Table 5.2). Despite the biotechnology sector being regarded as one of Scotland's academic, and potentially economic, strengths there was little representation from this sector. Although organisations such as the Scottish Bionetwork Association, ABPI, CIA, Unilever, and Cyclacel were apparently invited to comment there is no record of them actually doing so or that SST followed up their written invitation with a meeting (Table 5.3). This asymmetry in responses and the focus on the public sector (government departments, agencies and HEIs) suggests that, from the outset, the Scottish Executive's intention with the Science Strategy was to continue its pre-devolution policy focus on the commercialisation of the science base and not to develop an integrated research and innovation policy for Scotland in which industrial R&D actors might have a role in order to improve Scotland's poor commercial research record.

**Table 5.2 Analysis of Science Strategy consultation process**

<i>Category of organisation</i>	<i>Invited to comment</i>		<i>Provided written response</i>		<i>Meeting</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
HE/FE or representative body	161	24	37	34	30	20
Scottish government department or agency	111	17	10	9	53	36
Local government	84	13	20	19	1	1
Industry (inc trade associations)	54	8	5	5	19	13
NHS Trust or Health Board	51	8	5	5	0	0
UK government department or agency	44	7	6	6	17	12
Science education*	38	6	8	8	8	5
Research Institutes (SABRIs & Roslin)	8	1	4	4	1	1
Other**	105	16	11	10	18	12
<b>TOTAL</b>	<b>656</b>	<b>100</b>	<b>106</b>	<b>100</b>	<b>147</b>	<b>100</b>

Data provided by Scottish Executive

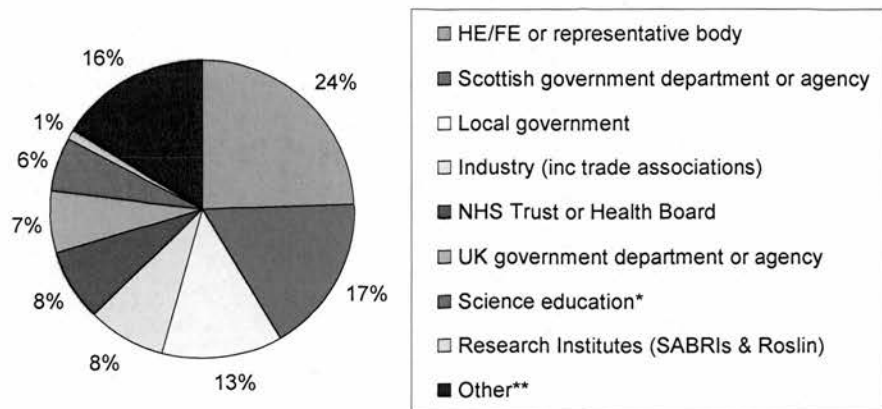
**Notes to table**

\* Science education category includes schools, school-related organisations, science centres, other public understanding of science activities and Education Business Partnerships.

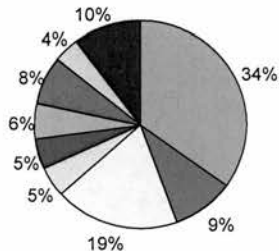
\*\* Other category includes *inter alia* trade unions, water authorities, charities, and EU-related bodies.



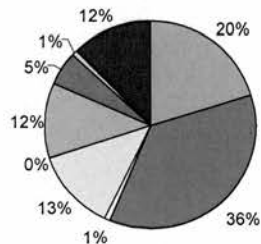
**Figure 5.1 Analysis of invitations to comment**



**Figure 5.2 Analysis of written responses**



**Figure 5.3 Analysis of meetings**



**Notes to Figures**

- \* Science education category includes schools, school-related organisations, science centres, other public understanding of science activities and Education Business Partnerships.
- \*\* Other category includes *inter alia* trade unions, water authorities, charities, and EU-related bodies.

**Table 5.3 Companies and business organisations involved in consultation**

<i>Company</i>	<i>Written response</i>	<i>Meeting</i>
3i (Scotland) plc		✓
BT Scotland		✓
CBI Scotland		✓
CONNECT		✓
Elvingston Science Centre		✓
Federation of Small Businesses	✓	✓
Freelight Systems		✓
Institute of Directors	✓	
Institution of Electrical Engineers	✓	
Intelligent Applications Ltd		✓
Lamellar Therapeutics		✓
LINC Scotland		✓
New Park Management		✓
PPL Therapeutics plc		✓
Provis		✓
Royal Bank of Scotland	✓	
Science Policy and People Ltd		✓
Scottish Chambers of Commerce		✓
SCDI	✓	
Targeting Technology		✓
Technology Ventures Scotland Ltd	✓	✓
The Forum of Private Business		✓
The Object Factory		✓
The Quantum Fund Ltd		✓
VIS Interactive plc		✓
Voxar Ltd		✓

Data provided by Scottish Executive

### **5.3 Recurring themes**

Two recurring themes are strongly apparent in the 106 written responses to the consultation that were made publicly available. These encompass:

- Better co-ordination between “science” and “innovation” and the need to co-ordinate the science strategy with the multiplicity of initiatives and organisations already addressing many of the issues raised by the Review Group
- Improving “industry pull”

As Scottish Enterprise noted in its response to the science strategy “this is already a very busy space” (written response<sup>5</sup> from Scottish Enterprise dated 12 July 2000) and several respondents indicated that many of the issues raised by the Review Group’s report had already been the subject of debate and consultation in Scotland in recent years (written response from SHEFC dated 22 June 2000) and, indeed, were already being progressed by existing organisations, some of which had only relatively recently been created (written response from SHEFC dated 22 June 2000; written response from Technology Ventures Scotland Ltd dated 3 July 2000). In pointing to the many different government technology transfer schemes, managed by a range of different departments and agencies at both the UK and Scottish levels, the Wellcome Trust suggested that some of this confusion and duplication could be obviated by a clear strategy that set the variety of funding schemes for technology transfer in context, allowing for greater synergy and the possibility of comparative evaluation (written response from Wellcome Trust dated 30 June 2000).

The need for co-ordination and coherence was a common theme and the University of Glasgow was one of a number of bodies calling on the Executive to ensure that there was an integrated approach to policy development, which would necessarily cut across the departments and agencies involved (written response from University of Glasgow dated 23 June 2000; see also Institute of Biology (29 June 2000), SUPRA (28 June 2000), Technology Ventures Scotland Ltd (3 July 2000), Scottish Council

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<sup>5</sup> Refers to a written response to the Scottish Executive’s consultation on the Review Group’s report. These were made available to the researcher via the Scottish Executive’s library.

Development and Industry (10 July 2000), Institute of Directors (25 May 2000)).

The RSE noted that:

*Over-compartmentalisation between government departments and between scientific disciplines, and lack of co-ordination across the wider SET base, will frustrate an effective, integrated use of the science base in policy formulation* (written response from Royal Society of Edinburgh dated 10 July 2000)

while the Executive's key agencies expressed the belief that "significant benefits could be achieved by seeking greater co-ordination among the various agencies in Scotland that are involved in science policy" (written response from SHEFC dated 22 June 2000) and called for "a close alignment between frameworks for science, innovation and economic development, supported by close working between respective organisations" (written response from Scottish Enterprise dated 12 July 2000).

Although a policy area such as science presents "an excellent opportunity to practise the ideas of joined-up government and other holistic thinking" (written response from Scottish Council Development and Industry dated 10 July 2000), SCDI pointed out in their response that it would be very difficult to get the support of industry and the universities behind a Science Strategy "if government has not got its own house in order" (written response from Scottish Council Development and Industry dated 10 July 2000). Thus an overriding priority identified for the Scottish Executive was to fully integrate R&D policy into other related policy areas, especially economic development and education (written response from Scottish Council Development and Industry dated 10 July 2000) and not to restrict the focus too narrowly to science (written response from University of Glasgow dated 23 June 2000). As SHEFC noted, many of the questions posed by the Review Group raise wider issues about innovation, enterprise and economic development which go beyond the scope of a science strategy and SHEFC suggested that an important prior question should have been whether Scotland needs a co-ordinated research and innovation strategy rather than simply a "science strategy" (written response from SHEFC dated 22 June 2000). Significantly, the Report omitted to mention the strategic need to encourage more industrial R&D in Scotland and many responses pointed to the fact that universities are limited in their capacity to be engines of the economy if the corporate R&D

capacity is a limiting factor (written responses from University of Glasgow dated 23 June 2000; Institute of Biology dated 29 June 2000). The considerable emphasis placed on encouraging commercialisation of research-generated ideas in Scotland in recent years highlights one of the major weaknesses of the Scottish economy where there is an absence of locally-based businesses capable of developing such ideas and the RSE noted in its response that the model promoted by the Executive was very much one of academic “push” rather than “industry pull” (written response from Royal Society of Edinburgh dated 10 July 2000). In a similar vein, several respondents called for a better understanding of the capacity of the demand-side (written response from University of Glasgow dated 23 June 2000) and greater focus on the development of relevant “industry pull” as part of a science strategy for Scotland (written responses from COSHEP (now Universities Scotland) dated 4 July 2000; Heriot Watt University dated 15 June 2000).

But despite these clearly articulated views from a range of different policy targets, there is a strong sense, reinforced by both respondents and policy insiders, that at the end of the day it is neither the users’ nor even the politicians’ views but those of the civil servants that prevail:

*I think a lot of the civil servants’ views will prevail...in a way it’s good that they do all these consultations but I sometimes wonder if they do too much...because it’s really hard work to do a consultation properly – to really analyse it well and to really feed that in and say, well these are the key things that are coming out, so this is what we should be doing...and kind of comparing that with what their own views are. I think...when you look on the Executive website, there’s just hundreds of consultations and I do wonder how well can any of these actually be done (Interview with policy adviser, P280203)*

*a radical approach needs to be adopted to put in place a science strategy for Scotland...[t]he implementation of the findings of the consultation may require the thinking of the unthinkable. Then again, as so often in the past, it may merely turn out to be cosmetic (written response from Chartered Biologist dated 29 June 2000)*

## 5.4 Launch

When *A Science Strategy for Scotland* (Scottish Executive 2001a) was finally published in August 2001 it appeared to have been written very much as a framework, setting out the Scottish Executive's aspirations for science and indeed is described as such on the Executive's website:

*This Strategy sets the framework which will inform the detailed development of policy for the support and use of science to achieve the Scottish Executive's objectives<sup>6</sup>*

The Strategy took as its starting point a vision of Scotland as a modern, dynamic country where the role of the science strategy is to meet the challenges of global competition, making the nation more prosperous and its economy more competitive. It focused on five key objectives:

- maintaining a strong science base
- increasing the effective exploitation of scientific research
- ensuring that enough people study science to meet the future needs of Scotland
- promoting the awareness, appreciation and understanding of science across society
- ensuring the effective use of scientific evidence in policy formulation and resource allocation by government

Although promoted by the Scottish Executive as an "integrated" strategy that "marks the start of a more 'joined up' approach to policy and investment decisions from the laboratory to business" (Scottish Executive 2001c) and despite the arguments for a coherent and co-ordinated approach to science and innovation set out by many of the respondents to the consultation (described in the previous section), the thrust of the final document was on supporting the science base in Scottish universities and encouraging them to commercialise their inventions in order to foster a vibrant, technology-based, SME community in Scotland. The imagery and language throughout the strategy document imply that science is what takes place in

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<sup>6</sup> <http://www.scotland.gov.uk/library3/education/ssfs-02.asp> (last accessed 28/10/04).

laboratories in universities and publicly-funded research institutes, so it is very much grounded in the “treasure trove model” where universities are exclusively seen as *the* source of innovation.

This notion was reinforced at the official launch of the Strategy at the Glasgow Science Centre on 27 August 2001 where the audience was dominated by representatives from universities and other public sector bodies (Table 5.4, Figure 5.4) and the programme for the event focused on the commercialisation of university research, showcasing a number of successful Scottish Enterprise/RSE Enterprise Fellowships. In her speech, the then Minister for ELLD, Wendy Alexander, spoke about an audience of “educators, researchers and entrepreneurs” and described the Strategy making a difference in a number of areas that were all clearly grounded in the science base:

*it will guide Executive departments towards better policy and investment decisions*

*it will position Scotland better for the future with the Science Advisory Committee helping us identify priority areas*

*by appointing a prominent scientist to act as Chair of the new Committee, we will be establishing a new, authoritative voice in public debates on scientific issues in Scotland*

*above all the Strategy is designed to maintain and enhance Scotland's international reputation. Scientists have always worked as part of a global network. We must maintain and enhance this international reputation and ensure that Scotland is viewed as an attractive and desirable place to invest in scientific research (extracts from speech by Wendy Alexander dated 27 August 2001)*

**Table 5.4 Analysis of audience at Science Strategy launch**

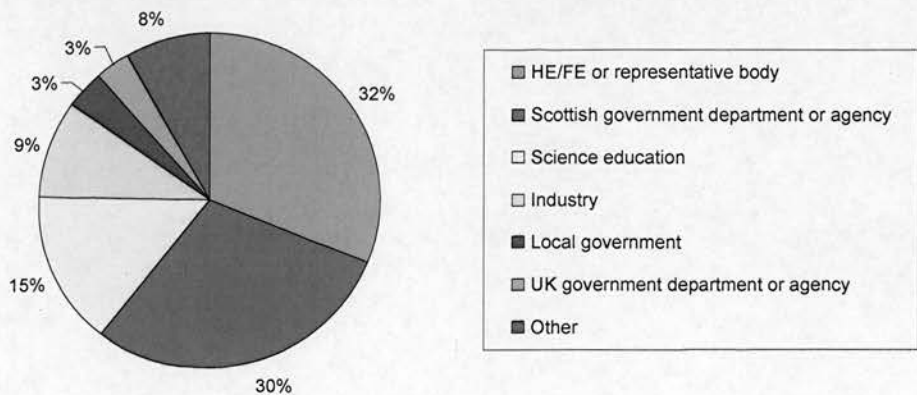
<i>Category</i>	<i>Number</i>	<i>%</i>
HE/FE or representative body	27	32
Scottish government department or agency	26	30
Science education*	13	15
Industry	8	9
Local government	3	3
UK government department or agency	3	3
Other**	7	8
<b>TOTAL</b>	<b>87</b>	<b>100</b>

Based on delegate list.

**Notes to table**

- \* Science education category includes schools, school-related organisations, science centres, and other public understanding of science activities.
- \*\* Other category includes *inter alia* commercialisation promoters, research institutes and a charity.

**Figure 5.4 Analysis of audience at Science Strategy launch**





## 5.5 Outcomes

### 5.5.1 Creation of the SSAC

The publication of the Science Strategy was described by the Scottish Executive as a “major milestone” which resulted in the appointment of a Minister for Science<sup>7</sup> and increased resources for university science as well as increased funding for Proof of Concept and RSE Enterprise Fellowships<sup>8</sup>.

One of the most tangible outcomes, described as the “best achievement”<sup>8</sup> was the establishment of the Scottish Science Advisory Committee (SSAC) to provide independent, expert advice to Scottish Ministers on scientific issues, including science priorities so that funding can be directed strategically. Professor Wilson Sibbett, Professor of Physics at the University of St Andrews, was appointed Chair of the Committee and the Executive’s chief adviser on strategic science matters on 17 December 2001 and the SSAC held its first meeting on 7 May 2002. Although the membership of the Committee represents a breadth of expertise across a range of scientific disciplines, its members are predominantly senior academics with little representation from technology-based businesses (see annex to this chapter for further details).

The SSAC was established under the auspices of the Royal Society of Edinburgh, with funding from the Scottish Executive and was tasked with providing advice to Scottish Executive Ministers on “science strategy, policy and priorities to allow the Scottish Executive to make effective use of available scientific advice, knowledge and techniques in formulating and implementing policies to support the full range of its objectives”<sup>9</sup>. The SSAC is to take a medium- to long-term, horizon-scanning, strategic view in formulating its advice to Ministers and its role is specifically not to provide advice to the Executive on particular scientific matters, such as the previous situations with BSE or foot and mouth disease. The Scottish Executive will continue to get advice from a wide range of bodies and organisations including: the Council for Science and Technology, the established system of UK and European scientific

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<sup>7</sup> An addition to the already very large portfolio of the Minister for Enterprise and Lifelong Learning.

<sup>8</sup> Contribution to SURF seminar, University of Salford, 12 May 2003.

<sup>9</sup> [http://www.scottishscience.org.uk/main\\_files/terms.htm](http://www.scottishscience.org.uk/main_files/terms.htm) (last accessed 28/10/04).

advisory committees which provide independent expert advice on a wide range of specific scientific subjects, the Foresight programme and advice from organisations including the Food Standards Agency Scotland, the Scottish Agricultural Science Agency and the Scottish Environment Protection Agency. The Scottish Executive apparently provided the SSAC with a steering brief, which identified a number of key topics for the SSAC to address based on the commitments contained in *A Science Strategy for Scotland*.

However, the goals of the Strategy itself with some 55 commitments, many of which are given in very general terms, are not very precise, making performance measurement problematic and the SSAC was publicly reported<sup>10</sup> to be finding the identification of science priority areas a challenge. Even policy insiders seem unclear about how these priorities will fit in with national or even Scottish Foresight programmes (Interview with policy-maker, P180203). Above all, the SSAC is only an advisory committee and cannot tell the Executive what to do:

*It can only provide advice...if we deem the committee to be functioning properly, it'll be advice that we would want to take* (Interview with policy-maker, P180203)

### **5.5.2 Establishment of cross-cutting science group**

The Science Strategy has been credited by policy-makers with helping to galvanise action by the Scottish Executive and its agencies and one of the positive outcomes has certainly been that it has led to the establishment of an internal group to co-ordinate the various departments within the Executive that have a responsibility for science policy.

When the SSAC was established, the Executive realised that it needed an internal group, not just to shadow the SSAC but, significantly to improve joint working across the Executive more generally on science issues. This problem is illustrated by the sheer number of consultations the SST had with people across the Executive's

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<sup>10</sup> Contribution to SURF seminar, University of Salford, 12 May 2003.

departments<sup>11</sup>. Every Scottish Executive department was asked to nominate members including Agricultural Biological Research Group, ELLD, Health, Education and the two main research bodies Fisheries Research and Scottish Agricultural Science Agency (SASA) plus a number of representatives from departments without a key science role but who attend with a “watching brief”. In the early stages, the agenda of this group focused primarily on the way the Science Advisory Committee was working so that civil servants could feel confident that it was providing “what ministers want it to deliver” (Interview with policy-maker, P180203); and secondly, on internal presentations and discussions about science-related issues within the Executive but it proved difficult to focus on how to progress the Science Strategy because the format of the group did not lend itself to a discussion of the 55 commitments in the science strategy (Interview with policy-maker, P180203).

Predictably there seem to have been some teething problems in establishing this group and a sense that the Cross-Cutting Science Group has taken quite a while to gel and for trust and unity to develop between some of these key players (Interview with policy adviser, P280203):

*The Science Advisory Committee hasn't really gelled into deciding what it's gonna do...and they seem to be struggling to pin down what their role and remit will be and I think the cross-cutting group, since they're meant to shadow that, are probably playing a waiting game at the moment. Useful to meet, listen to what the advisory committee are talking about, share a wee bit of information, probably more often in the margins of the meeting when they're standing having a coffee – this is always the way* (Interview with policy-maker, P140303)

Although there is apparently “a move to...cross-portfolio working within the Executive now” (with policy-maker, P180203), there are no representatives from either Scottish Enterprise or SHEFC on this Cross-Cutting Science Group and little free flow of information between the Group and the SSAC, prompting the observation that:

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<sup>11</sup> Of the 147 individuals consulted in person by SST, 34 (23%) were other Scottish Executive civil servants and 19 (13%) were individuals in Scottish Executive agencies.

*the Executive preaches collaborations for everybody else, they're not so good at doing it internally...It's very much the civil service mentality of...we can't share with people outside* (Interview with policy adviser, P280203)

### **5.5.3 Making the right connections**

The Scottish Science Advisory Committee's first report *Science Matters: Making the Right Connections for Scotland* (Scottish Science Advisory Committee 2004b) was launched on 13 January 2004. It called for all aspects of science activity in Scotland, including science funding via the research councils and the three main Scottish Executive departments (Enterprise and Lifelong Learning; Environment and Rural Affairs; and Health), to be brought into a better integrated framework to ensure that Scotland is more able to realise its full potential as well as improved access to and engagement with the science base for the public and policy-makers (Scottish Science Advisory Committee 2004a). According to its Chair, Wilson Sibbett, "the report challenges the Scottish Executive to avoid insularity between different government departments" (Wojtas 2004).

In launching the report, Sibbett called on the Executive to add value through greater connectivity but acknowledged that a more integrated approach was difficult to achieve as it required interlinked policies, better connections within and between departments of the Scottish Executive, and better connections within and between government, HEIs, the NHS and industry so that "organisational boundaries should be [viewed as] conduits and not barriers"<sup>12</sup>.

The report's seven recommendations span science education, excellence in the science base, knowledge transfer from the science base, and science and society (see Figure 5.5). In particular, the SSAC takes the view that:

*to ensure the long-term viability and sustainability of science in Scotland, it is essential that there is a suitably broad appreciation of science and that all government departments must work together with the best*

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<sup>12</sup> Speech by Professor Wilson Sibbett at the launch of SSAC report *Science Matters: Making the Right Connections for Scotland*, 13 January 2004 in Glasgow.

*possible coherence and complementarity to realise shared ambitions*  
(Scottish Science Advisory Committee 2004b, p.15)

noting that this is particularly significant where new initiatives are being introduced, where there are “clear advantages to be gained by combining efforts and visions across and between departments and sectors” (Scottish Science Advisory Committee 2004b, p.15).

The report also addresses the multi-level nature of STI policy and stresses the importance of Scottish connections with UK and European science policy discussions, calling on the Executive to establish “robust links into UK and EU networks, at both official and ministerial level, to ensure that the views and aspirations of Scotland are well represented” (Scottish Science Advisory Committee 2004b, p.15). This section of the report also notes the need to develop “a network/forum to facilitate regular exchanges between the science base, policy-makers, funders and users of science” in order to “share visions and aspirations in respect of future planning”. According to the SSAC, such a network should involve the Scottish Executive and its agencies with a range of organisations, including universities and higher education institutes (HEIs), SHEFC, NHS Scotland, research institutes, SEN, HIE and the newly-formed Intermediary Technology Institutes (ITIs).

The report’s section on Science in Scotland concludes with the point that:

*The framework for the support of science in Scotland should be made more effective through closer and better-connected interactions within and between the Executive Departments involved in developing policies that involve science. These connections should be extended to include those bodies, such as SHEFC, SEN, HIE and the Research Councils, that are involved in the distribution of funding for science activities. This will require better linkages being established between Departments and public agencies to promote connectivity within Government and this should extend to UK and EU bodies. (Scottish Science Advisory Committee 2004b, p.16)*

## Figure 5.5 The SSAC's recommendations to the Scottish Executive

### **Recommendation 1**

The SSAC recommends that the optimisation of the science base should be a principal component in the development of government policies and strategies in Scotland.

### **Recommendation 2**

The Scottish Executive should implement with due urgency the recommendations presented in the SSAC paper, *Why Science Education Matters: Supporting and Improving Science Education in Scottish Schools*.

### **Recommendation 3**

The Scottish Executive should continue to address the issues of short-term viability and the longer-term sustainability of Scotland's science festivals and science centres such that they become a national network that fulfils identified educational and cultural roles.

### **Recommendation 4**

The SSAC recommends that the Scottish Executive, SHEFC, SEN, HIE, HEIs, the SEERAD-Sponsored Bodies and the Research Councils should act more collectively and creatively to support exceptional cases for the recruitment, career development, retention and resourcing of outstanding talent in the science base in Scotland.

### **Recommendation 5**

It is recommended that there should be a significant reshaping to optimise the science base in Scotland. This reshaping must focus on globally-competitive areas of science, promote strategic cross-sector collaborations and encourage high-risk, high-reward activities. The Scottish Executive, SHEFC, SEN, HIE and the Research Councils should invite and support proposals for new integrated structures that would lead, where appropriate, to the creation of Scottish Centres of Scientific Excellence.

### **Recommendation 6**

The SSAC recommends that with regard to future planning cycles, the Scottish Executive must ensure that resources are made available for the simultaneous pursuit of excellence in research and the nurturing of knowledge transfer activities. SEERAD, Scottish Enterprise, SHEFC, NHS Scotland, the Research Councils and ITI Scotland should together identify and calibrate intellectual property within the science base in Scotland to promote a better understanding of its scale and value. A major objective must be to establish a new culture for the generation of linkages between relevant aspects of knowledge generation and its subsequent exploitation.

### **Recommendation 7**

The SSAC recommends that the public and policymakers should have improved access to and engagement with the science base in Scotland. The SSAC believes that the Executive, working with organisations such as the BA and the RSE, should provide a means to improve public engagement on key issues arising from current and future scientific research, recognising the need to foster a wider scientific literacy among Scottish citizens.

Scottish Science Advisory Committee 2004b

and this need for greater connectivity is emphasised again in the report's concluding remarks:

*The SSAC believes that Scotland can deliver more effectively, not only in areas of leading-edge research but also in areas of teaching and training through to knowledge transfer and engaging with society. A major component of this endeavour involves a new level of connectivity that engages all of the stakeholders such that planning strategies should extend from elementary science education through to the exploitation of science and associated policy generation (Scottish Science Advisory Committee 2004b, p.52)*

The SSAC was set "a rather amorphous and potentially sizeable agenda" (Interview with policy-maker, P140403) and this is reflected in its report. Given that the SSAC was afforded a relatively high profile by the Executive, some observers felt that it would be difficult for the Executive to ignore the Committee's advice (Interview with director of research institute, R210203) but others are more sanguine:

*It will be interesting to see whether or not that committee can exercise influence – I'm sure it will be used. It would be a disaster if it's not used...A key question will be whether it's used reactively or proactively. Unfortunately, most of what we do...we tend to be reactive (Interview with academic, A220403)*

Other observers criticise the fact that the SSAC's role is to give advice to the Scottish Executive, not the Scottish Parliament, and point to the need for Parliament to have a source of advice on science independent from that of Ministers (Interview with academic, A210202). Others imply that the Committee is a rather grand science lobby group (Interview with director of research institute, R210203), a point that is possibly borne out by the new remit of the SSAC, issued in March 2004:

*With reference to the strategic relevance to the Scottish economy and quality of life, to provide advice and make recommendations on the strategic priorities for the science base in Scotland, including priorities for expenditure (SSAC Remit Phase II<sup>13</sup>)*

In delivering this new remit, the SSAC is required to consider amongst others:

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<sup>13</sup> [http://www.scottishscience.org.uk/main\\_files/word\\_docs/SSAC%20remit%20phase%20II.doc](http://www.scottishscience.org.uk/main_files/word_docs/SSAC%20remit%20phase%20II.doc) (last accessed 28/10/04).

- The distribution of public investment in the science base in Scotland; areas where expansion of investment is justified; areas where ceasing or reducing activity may need to be considered.
- New and emerging areas of science and research that could be of particular strategic relevance for Scotland.
- Consider whether existing funding structures are consistent with the new strategic priorities that emerge and how they or modified structures might best facilitate the development of pan-Scotland initiatives<sup>13</sup>

Rather than optimising the interactions between policies to promote the science base and enhance industrial innovation, one early observer's suspicions that the Scottish Science Strategy might turn out to be "well how much money are we going to put into biotechnology" (Interview with academic, A210202) may well have been justified. Moreover, despite all of the exhortations to "make the right connections", it is not evident that the foresighting role of the new ITI Life Sciences initiative will be integrated with the work of the Scottish Science Advisory Committee which is tasked with advising the Scottish Executive on science funding priorities<sup>14</sup>.

### **5.6 Perpetuating the linear model**

The SSAC is attempting to look at science across the breadth of the Scottish Executive's remit without being bound by civil service policy "silos" and, through a series of working groups, has examined mechanisms to promote excellence in the Scottish science base; the quality and content of science education; and public engagement with science and the use of science in policy-making. However, it is clear from the Executive's steering brief that the real priority is the science base, the commercialisation of its outputs, and the identification of science funding priorities however much of an anachronism this long discredited approach to "picking winners" might be (Interview with policy adviser, P280203):

*What the Executive are looking for is [for the SSAC] to say, well, we want you to put your money...in X, Y and Z and they'd go off and they'd be delighted because they can then just write the policies round these*

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<sup>14</sup> Response to question from floor from the researcher at ITI briefing event, 22 October 2003.



*areas and SHEFC will be putting money into these areas, SEERAD will be putting money into those areas, Health Department will be putting money into these areas* (Interview with policy adviser, P280203)

With so many other organisations already tasked with STI-related priorities, including within the Executive itself, where SEERAD and the Health Department already have clearly articulated research funding priorities, this draws attention to the fact that ELLD is the department that does not have such priorities, which may explain its ardent quest for the SSAC to deliver on this aspect of the Science Strategy.

But from the outset, there have been mixed messages about whether the strategy is simply about science policy or whether it is about co-ordinating science and innovation. The report of the Science Strategy Review Group made the case for developing a coherent and co-ordinated strategic approach, linking the science base with industry but, although it raised the issues of how to foster increased “industry pull” in Scotland and how best to link a science strategy into a related economic framework for Scotland, the report maintains that this “raises wider issues beyond the scope of a science strategy” (Scottish Executive 2000c, p.5).

According to the EC (Anon 2003), “innovation primarily takes place in enterprises, so they need to be involved in developing policies” but Scottish firms certainly view the Science Strategy as being very much about the science base and the membership of the SSAC as being predominantly academic – “the usual suspects” (Interviews with industry representatives, I260602 and I040702). Policy insiders also criticise the remit of the SSAC for taking far too narrow a view of science and feel that it was wrong of the Executive not to integrate enterprise and innovation with science (Interview with policy-maker, P020403). As discussed above, the SSAC, itself, advocates the adoption of a more integrated framework in their report to the Scottish Executive (Scottish Science Advisory Committee 2004b).

However, as it stands, neither Scottish Enterprise nor SHEFC has a role on the SSAC, even as observers, nor are they members of the Scottish Executive’s Cross-Cutting Science Group and instead they must rely on contacts with members to try to influence outcomes (Interviews with policy-makers, P260203 and P130503). Despite the integrationist rhetoric, a policy gulf exists between these key policy

actors, a point that is further developed in Chapter 7 which examines some of the barriers to the effective operation of policy networks. In the meantime, it is evident from interviews that there is a mismatch between the SSAC, which is seen as looking after the science base, and Scottish Enterprise, which sees its role as carrying out commercialisation:

*It's important that the individuals on the committee [SSAC] are aware of what we [Scottish Enterprise] do and they probably are...the majority of them will be. I think...the sorts of things they're deliberating on are things that we...Scottish Enterprise...don't necessarily have a view on. We, individually, certainly have a view on it but that is – we are never going to come to a corporate view because it's not important enough for us to do so...Whichever one they do, there will be commercialisation opportunities for us. It will just be different ones (Interview with policy-maker, P260203)*

As discussed in Chapter 2, accepted wisdom about innovation has evolved from thinking that information flows in one direction from basic science to technology and thence to the production and diffusion of new products, and instead conceptualises the innovation process as interactive, non-linear and characterised by learning across firms, sectors, regions and national systems (Mytelka and Smith 2002). Although public technology policies underpinned by these linear models are now seen as unhelpful (Williams and Edge 1996) and a significant body of work exists that demonstrates that thinking has moved on from the linear conception to produce a more realistic model of innovation<sup>15</sup>, nevertheless many commentators<sup>16</sup> point to the fact that this linear approach is still implicit in much STI policy at both the UK and European levels: the European Commission openly acknowledges that its current structures for innovation policy are:

*overwhelmingly based on separate departments with limited interchange between them, and the predominant perception of innovation is still a very narrow, research-derived process (Anon 2003)*

Nightingale (1998) suggests that the enduring success of this approach “is more to do with how easily it provides a justification for the public funding of science and how

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<sup>15</sup> See, for example, Nightingale (1998) or Massey *et al.* (1992, pp.58-85) for a review of the relevant literature.

<sup>16</sup> See, for example, Nauwelaers and Wintjes (2002), Edler *et al.* (2002), and Tait and Williams (1999), previously discussed in Chapter 2.

well it fitted into established theoretical frameworks, than any empirical validation” and certainly the Scottish Executive’s recent, rather defensive, response to the SSAC’s report (Scottish Executive 2004c) focuses primarily on public investment in science. While paying lip service to collaboration between different departments within the Scottish Executive, it presents a very one-sided view of science policy and makes no attempt to foster a co-ordinated research and innovation strategy.

Although the pharmaceutical and life sciences sectors most closely resemble the linear model, it is far from typical of innovation as a whole. Industrial R&D is a key knowledge source for new technical advances and the knowledge contributions of public sector research are more often indirect (Faulkner and Senker 1995; SUPRA 2000; Bechhofer *et al.* 2001). Tait and Williams (1999) also offer a number of explanations for the resilience of the linear model of innovation including the suggestion that it provides an attractive metaphor for policy-makers who are looking for a straightforward means to influence the highly complex processes of technical change. The Scottish science strategy has been criticised for its focus on “putting science to use” rather than on promoting innovation<sup>17</sup> and, indeed, the approach being adopted by Scottish policy-makers is epitomised by Howard Newby’s criticisms of the linear model when commenting on the 1993 Science and Technology White Paper:

*It leads to a disproportionate emphasis on “getting the science right” and insufficient emphasis on the business processes required to bring technology to the market place (Newby 1994, quoted in Tait and Williams 1999)*

As discussed in Chapter 3, Scotland has a history of pre-devolution policy institutions and a certain track record in regional economic development. In comparison with other emerging regions in Europe, it is perhaps not quite the policy novice that the opening quote from Cooke *et al.* (2000) in the introduction to this chapter implies although clearly in the early days of devolution, the Scottish Executive has recognised the need to develop internal policy capabilities rather than

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<sup>17</sup> Contribution to SURF seminar, University of Salford, 12/05/03.

the self-confessed “tartanising” and implementation of policies developed in Westminster that was previously the case.

However, in attempting to facilitate regional innovation, Scotland must resist the tendency to place artificial boundaries around science and innovation. Such boundaries reinforce the linear model and ignore the fact that innovation does not simply result from research undertaken in universities (Lyll and Tait 2004). These points were made by many of the respondents to the Scottish Executive’s consultation exercise, discussed above, who clearly articulated the need for better coordination between “science” and “innovation” and measures to improve “industry pull” rather than simply focusing on “science push”. What is needed in Scotland is an integrated strategy for research and innovation that can begin to address the “mismatch between the capacity of the knowledge base and an industrial base that is structurally unable to exploit it” (Boulton, quoted in Dalton 2001). While some see the glimmer of a shared agenda between the various players in this game beginning to develop and the slow recognition of the nature of this mismatch (Interview with academic, A210202), if Scotland’s key policy instrument for the governance of STI continues to adhere to a discredited model and its focus remains on university spin outs, we will only ever address half of the equation and will not solve the problem of increasing the innovative capabilities of existing firms.

### **5.7 A missed opportunity**

The SSAC has been described by its Chairman as “clearly a very direct and potentially efficient route of access into the consideration of policy matters” (Institute of Physics 2003). Setting to one side whether it is actually influencing policy-makers (and it is probably too early to make any such evaluation in any case), a question that might be asked is whether the SSAC is performing as a policy network for STI policy in Scotland. In fact, a better question is whether SSAC has the potential to form a node around which other policy networks might coalesce but, as we shall see, the Scottish Executive missed this opportunity, and the failure lies, not with SSAC but with the scoping of the precursor Science Strategy.

Steward (2001) puts forward a range of criteria with which to characterise a policy network, including:

- Membership
- Mobilisation of business interests
- Function
- Rules of conduct
- Autonomy
- Role of the state
- Power relations
- Integration

Some of these aspects have already been addressed in the previous section where we have seen that the membership of the SSAC is thought by some to be unduly academic and not sufficiently inclusive of business interests. This also reflects the lack of integration between a committee essentially tasked with advising on the science base and the much more extensive, multi-actor arena of STI policy in Scotland. SSAC does not evidence overt links to other key policy actors such as Scottish Enterprise or SHEFC, although these relationships are mediated informally through cross-membership of various committees and personal networking and it does seem that Scottish Enterprise is seeking to use the SSAC as a conduit to the Scottish Executive:

*I would hope that the work that we do with the individuals on the Scientific Advisory Committee gets fed back into the Scottish Executive by a variety of different routes (Interview with policy-maker, P260203)*

Although the SSAC operates independently of the Scottish Executive, it is funded by the Scottish Executive via the Royal Society of Edinburgh (RSE) and was established under the auspices of RSE, appointments being made by the President of the RSE, following the approval of the RSE Council after an open advertisement and selection process. The Scottish Executive defined the terms of reference for the SSAC in association with the RSE and the Chair of the SSAC and provided the committee with a steering brief, which identified a number of key topics for the SSAC to address over their first year, based primarily on the actions and commitments contained in *A Science Strategy for Scotland*.

It is worth reflecting on the fact that networks also do a job of exclusion and one could argue that the establishment of the SSAC was a conscious attempt by an influential scientific body, the Royal Society of Edinburgh, to gain a powerful position in science policy in Scotland. The Royal Societies' report *Devolution and Science* (Royal Society of Edinburgh and Royal Society of London 1999) had made a

high-profile contribution to the science policy debate prior to the establishment of the Science Strategy Review Group and the RSE's President at that time, who was also the former Chief Scientific Advisor to the UK government, was a member of that Group. Membership of the first phase of the SSAC also demonstrates an "inner circle" of elite, academic scientists, the majority of whom are Fellows of the RSE, an organisation that although it prides itself on being "multidisciplinary" (in contrast to the Royal Society in London) is, nevertheless, dominated by natural scientists<sup>18</sup>. Although the SSAC was at pains to define science in a broad way<sup>19</sup>, commentators warn against adopting an approach that sustains science for its own sake, rather than its role in supporting much broader societal goals (SUPRA 2000): in a committee of 19 members there is no public interest representation, virtually no industry representation<sup>20</sup> and only one representative from the social sciences.

The SSAC has not therefore had an entirely free rein in terms of its rules of conduct and is not completely autonomous from either the Scottish Executive or the RSE. This means that the SSAC is in an anomalous position because it is not entirely independent of the state but nor is it an NDPB and its members and secretariat are not civil servants.

Much of this links back to the debate about whether Scotland should have a Chief Scientific Adviser, either permanently or on secondment to the Scottish Executive (as is the case for the Chief Medical Officer), and the resulting compromise, where the Chair of the SSAC provides scientific advice to the Executive without actually having the official status of CSA, smacks of political fudge. This has not facilitated smooth relations with higher levels of governance: because Professor Sibbett is not a civil servant he does not have any formal relationships with Whitehall and is not permitted to represent the Scottish Executive or act as an observer on the UK Chief

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<sup>18</sup> This may, of course, change over time as the SSAC advertised for new members in March 2004 and was reported to be seeking greater representation from industry.

<sup>19</sup> SSAC interprets the term "science" to encompass "the life, physical, computational, medical and veterinary sciences through to engineering and technology" (Scottish Science Advisory Committee 2004b, p.11).

<sup>20</sup> The membership includes one serial entrepreneur and one CEO of a university spin out company, neither of whom represent the life sciences sector.

Scientific Adviser's Committee (CSAC) or the UK Science and Engineering Base Co-ordinating Committee (SEBCC).

This demonstrates another stratum of power relations, not simply those between the SSAC and the Scottish level of governance but also the multi-level governance of STI and science policy in particular. Early interviews with OST (Interview with policy-maker, P260202) revealed some anxieties about Scotland "going off and doing its own thing" in an area of concurrent policy and a degree of distrust about Scotland taking responsibility for science in such a visible way which has not necessarily been assuaged with the establishment of the SSAC (Interview with policy adviser, P280203)<sup>21</sup>.

In Chapter 2 it was suggested that a partnership approach is analytically distinct from a policy network as a mode of governance since the creation of a partnership does not imply that relations between actors are conducted on the basis of mutual benefit, trust and reciprocity which characterise the network mode of governance (Lowndes and Skelcher 1998). The relationship between the Scottish Executive and the SSAC does not yet even seem to represent a partnership: in contrast to the *Framework for Economic Development in Scotland* (FEDS) (Scottish Executive 2000a)<sup>22</sup> which is written very much in the language of "partnership", a textual analysis of *A Science Strategy for Scotland* for references to language that might illustrate a collaborative approach to policy-making does not suggest the same strong commitment to collaboration (Table 5.5). While the Executive is regarded as being quite willing to take advice from outside organisations, the SSAC is not within the civil service envelope and constantly has to negotiate relationships in order to access what some civil servants regard as privileged policy information: there is not a two-way flow and information sharing can prove problematic. In order to foster policy networks, or even to achieve the precursor partnership stage, the civil service perhaps needs to reappraise how it operates and change attitudes and internal processes to overcome

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<sup>21</sup> This is mirrored by remarks made at the Royal Society of Edinburgh's *What next for UK science policy?* event (9 December 2003) where it was noted that there should perhaps be more dialogue between OST and SSAC to ensure Scottish expertise was included in Foresight.

<sup>22</sup> Discussed in more detail in Chapter 3.

the “them and us” mind-set that prevails, particularly amongst civil servants of long-standing, when dealing with outside bodies (Interview with policy adviser, P280203).

**Table 5.5** Textual analysis of *A Science Strategy for Scotland*<sup>23</sup>

<i>Word</i>	<i>Number of occurrences</i>	<i>Comments</i>
Coalition	0	
Collaboration/ collaborative	2	
Consultation	6	Just in connection with consultation prior to strategy
Co-operation	4	
Firm	1	
Governance	0	
Innovation	13	
Network	8	Three refer to Scottish Enterprise Network and four to the Scottish science centres
Partnership	8	Solely in the context of partnership with other levels of governance
Society	25	Six of which refer to Royal Society of Edinburgh
Stakeholder	0	
User	1	

### 5.8 Reprise

Although promoted by the Scottish Executive as an “integrated” approach (Scottish Executive, 2001c), this chapter has sought to demonstrate that the thrust of the Science Strategy throughout the policy development process from inception, to consultation, to publication, and then to implementation has been on the public sector and on supporting the science base in Scottish universities and encouraging them to commercialise their inventions in order to foster a vibrant, technology-based, SME community in Scotland. Despite the claim that “science has been interpreted to encompass the development, understanding and application of the physical, life and social sciences” (Scottish Executive 2001a, p.7), the imagery and language throughout the strategy document and the activities of the subsequent advisory committee imply that science is what takes place in laboratories in universities and

<sup>23</sup> Based on search of document at <http://www.scotland.gov.uk/library3/education/ssfs-08.asp> (last accessed 28/10/04).



public sector research establishments (PSREs), and a major role for the strategy is to hasten the transformation of this knowledge into new products, processes and services. Without wishing to down-play the value of what is included in the strategy document or the work of the SSAC, this apparent adherence to the linear model of innovation is disappointing but not unexpected.

Chapter 2 described how policy networks can take a number of forms ranging from policy communities, which are stable, highly interdependent, and with a restricted membership who share core values and attitudes, to issue networks which represent a much looser set of interests and are less stable, non-exclusive and populated by a wide and unpredictable number of participants (Rhodes 1997; Parsons 1995, p.189; Atkinson and Coleman 1992). Significantly, as noted in Chapter 2 but worth repeating in the context of the SSAC, issue networks primarily involve policy consultation rather than shared decision-making (Rhodes and Marsh 1992) and such an exchange of information is unlikely to have much effect on policy outcomes (Smith 1997, p.83).

It remains to be seen whether the Scottish Executive is merely paying lip service to the SSAC or whether it will act on its advice, but for the time being the SSAC clearly conforms to the model of a government advisory committee rather than that of a policy network. For reasons that are discussed further in Chapter 7, various barriers are preventing the SSAC from facilitating a joined up approach to STI policy in Scotland. When it developed *A Science Strategy for Scotland*, the Scottish government missed a valuable opportunity to facilitate the creation of a broader policy network of research and innovation with the SSAC at its core, acting as a central node in that network and cementing roles between policy-makers in different government departments and agencies and with policy targets across the science base and technology-based industry. This lack of co-ordination within and between key government departments and agencies was highlighted in many of the written responses to the consultation exercise and again in the SSAC's report (Scottish Science Advisory Committee 2004b). The SSAC is not able to perform in accordance with the governance model proposed in Chapter 2 as power and control reside with the Executive which is still, and always has been, the agenda-setter dating back to the precursor study to the Science Strategy Review Group. This suggests,

first, that a strongly government-orchestrated style of policy-making prevails and, secondly, that Scottish policy-makers are not developing a policy learning capability but simply repeating old routines.

In their discussion on the new modes of knowledge production, Gibbons *et al.* (1994) conclude that science and technology policies can no longer be regarded as functionally separate from innovation policies (*ibid.* p.159) and describe how distributed knowledge production leads to the de-concentration of loci of advice whereby sources of science advice are more diverse and governments are no longer able to manage outcomes (*ibid.* p.165). This chapter has tried to demonstrate that, although the SSAC has possibly made some very preliminary steps on the way to catalysing an independent, integrated, and interactive policy network, the government is still firmly in control and we are not yet seeing the elision of STI policy envisioned by Gibbons *et al.* (*ibid.*)<sup>24</sup>. As indicated in this chapter and discussed in more detail in Chapter 7, sub-optimal co-ordination between key policy actors within the Scottish system of innovation presents significant barriers to the effective performance of integrated policy networks for STI in Scotland.

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<sup>24</sup> Nevertheless, SSAC has achieved some successes where it has encouraged the Scottish Executive to think about improving its internal co-ordination of policies for science through the Cross-Cutting Science Group and has publicly raised the profile of policy integration in its calls for greater connectivity in its first report to the Executive.

## **5.9 Annex to Chapter 5**

### **5.9.1 Report of the Science Strategy Review Group: Summary of Key Questions**

Extracted from Scottish Executive (2000c)

#### **Science and the Economy**

- How to link the provision and use of science with economic growth and wealth generation in Scotland.
- How to foster technology transfer and uptake.
- How to stimulate entrepreneurship.
- How to target investment in science and technology with this in mind.
- How to manage and co-ordinate the continuing strong science base in Scotland, including the prioritisation of investment in research.
- How to improve Scotland's track record in exploiting the outputs of its science and engineering base
- How to link a science strategy into a related economic framework for Scotland.
- How to foster increased "industry pull" in Scotland (although this raises wider issues beyond the scope of a science strategy).
- There are questions concerning entrepreneurship and business appreciation among scientists and engineers, and questions of technology management in business and industry.
- How to facilitate technology transfer at the interface between academic research and industry.
- Should there be an additional emphasis on supporting pre-competitive development and application.
- Should increased public funding be made available for this purpose of Scottish Enterprise's "Proof of Concept" fund.

#### **Science and Government Policy**

- How to provide an advisory framework which builds on existing systems in a co-ordinated way.
- How to ensure the best and most relevant scientific advice is available to Scottish Ministers and the Scottish Executive.
- How to ensure improved coherence and consistency within the Scottish Executive for the provision of science to underpin aspects of policy making.

- How to achieve an increasingly objective and evidence-based approach to policy making.
- How to define and put in place a Scottish scientific advisory system which is integrated where necessary into UK and European systems, and which at the same time ensures that the best and most relevant scientific advice on specific Scottish issues, or on wider UK and international issues which have an impact on Scotland, is available to Scottish Ministers.
- How to engage the social sciences not only in the development of the Scottish Executive's social policies but also in the development of its economic and environmental policies as well.

### **Science and the Public**

- How to generate a better understanding and acceptance of scientific uncertainty and risk.
- How to secure a debate on scientific issues with the public.
- How to assist the media in presenting science and its role in policy.
- How to address the issues of communication skills for scientists, and help improve public understanding of science (in which school education can also play a significant role).
- How to build up the degree of trust between scientific experts and the public when different scientific opinions on a difficult or novel piece of science may be equally defensible in the light of existing knowledge.

### **Science and Education**

- How to arrest the fall-off in interest and attainment at upper primary and lower secondary levels (at a time when pupils are beginning to develop ideas on choices for the future).
- How to address the relatively low levels of scientific training in primary school teachers (and a concomitant lack of confidence in teaching the general science curriculum at that level).
- What mechanisms should be put in place to provide for the continuing professional development of specialist science teachers in secondary schools as scientific knowledge expands.
- Whether the existing emphasis on a general scientific education and scientific literacy - and its relevance to modern lifestyles and careers - is sufficient.
- Whether there is adequate provision for those pupils who wish to specialise in science and pursue it in the tertiary education sector.
- How to provide the enhanced physical infrastructure (laboratories and equipment) that is required in many schools, and the implications of this for the effectiveness of science teaching.
- How to build on existing activity by companies supporting science education in schools and to engage new companies in such activities.

## **The Science Base in Scotland**

- How to preserve and enhance the excellence and diversity of the Scottish science base.
- How to strike the right balance between encouraging competition and promoting collaboration.
- How to encourage multidisciplinary working as scientific problems become more complex and require a range of disciplines and skills for their advancement.
- What balance to strike between, on the one hand, research aimed at scientific curiosity and the pursuit of new knowledge for its own sake, and on the other, the generation of knowledge and technology - through applied research - which is more immediately relevant to user communities.
- How to maintain the skills base and specifically to provide adequate career paths for research staff.
- How to set a framework of policies, priorities and objectives which could help shape the Scottish Higher Education Funding Council's (SHEFC's) funding of science in order to meet these various requirements in a balanced way, and to ensure that the criteria on which funding of research in Higher Education is based, are appropriate to the needs of Scotland in the 21<sup>st</sup> Century.
- How to achieve a coherent and co-ordinated approach among the various funders of research.
- How to set priorities for research spend across these various budgets.

## **The UK and International Context**

- How a Scottish science strategy how would link into science policy both at the UK level and in Europe and beyond.
- How to address distinctive needs in Scotland while continuing to link into the wider context and drawing as necessary on the UK science base.
- How to ensure that Scottish scientists are able to continue to contribute to science and science policy-making in UK and international fora, and represent Scottish science at those levels.

## **5.9.2 Membership of Science Strategy Review Group**

Mr E W Frizzell, Secretary, Scottish Executive Enterprise and Lifelong Learning Department (Chairman)

Professor J S Archer, Principal of Heriot-Watt University

Professor G S Boulton, Vice Principal and Regius Professor of Geology and Mineralogy, University of Edinburgh

Professor G R D Catto, Vice Principal and Professor of Medicine and Therapeutics at the University of Aberdeen; Chief Scientist, Scottish Executive Health Department

Professor J Cheetham, Social Work Commissioner, Mental Welfare Commission for Scotland

Ms M P Henton, Director of Environmental Strategy at the Scottish Environment Protection Agency

Professor V van Heyningen, Medical Research Council Human Genetics Unit, Western General Hospital, Edinburgh

Dr G A Kenney-Wallace, Managing Director and Vice-Chancellor of British Aerospace SYSTEMS Virtual University

Professor B King, Principal and Vice Chancellor of the University of Abertay, Dundee

Professor P J Lillford, Chief Scientist, Unilever Research Colworth

Professor J McQuaid, Director of Science and Technology and Chief Scientist, Health and Safety Executive (1995-99)

Professor T J Maxwell, (now former) Director of the Macaulay Land Use Research Institute

Professor A Miller, (now former) Principal of the University of Stirling

Dame B M Ogilvie, (now former) Chair of the UK Committee for Public Understanding of Science (COPUS); former Director of the Wellcome Trust (1991-98)

Professor Sir W D P Stewart, (now former) President of the Royal Society of Edinburgh; former Chief Scientific Advisor to the UK Government (1990-95)

## **5.9.3 Membership of the Scottish Science Advisory Committee (First Term)**

Professor W Sibbett, Chair of SSAC and Wardlaw Professor of Physics, University of St Andrews

Professor G Boulton, Vice Principal and Regius Professor of Geology and Mineralogy, University of Edinburgh

Professor J Bower, Professor of Entrepreneurship, Glasgow Caledonian University

Dr D Bruce, Director of the Society, Religion and Technology Project, Church of Scotland

Professor M Calder, Professor of Computing Science, University of Glasgow

Professor J Coggins, Director, Institute of Biomedical and Life Sciences; Dean, Faculty of Biomedical & Life Sciences and Professor of Molecular Enzymology, University of Glasgow

Professor G Durant, (now former) Professor of Science Interpretation and Communication and Deputy Director, Hunterian Museum, University of Glasgow

Professor T Durrani, Deputy Principal and Professor of Signal Processing, University of Strathclyde

Mrs S Fletcher, Principal Teacher of Physics, High School of Dundee

Professor M Gill, Director of the Macaulay Land Use Research Institute, Craigiebuckler, Aberdeen and Honorary Professor in the Department of Agriculture and Forestry, University of Aberdeen

Professor P Grant, Head of School of Engineering & Electronics and Professor of Electronic Signal Processing, University of Edinburgh

Professor S Macintyre, Director, MRC Social & Public Health Sciences Unit, University of Glasgow

Dr S Monro, Scientific Director, Our Dynamic Earth and Principal Geologist, British Geological Survey

Dr J Nicholls, Chief Executive, Photonic Materials Ltd, Bellshill

Professor A Nolan, Dean of the Faculty of Veterinary Medicine and Professor of Veterinary Pharmacology, University of Glasgow

Mr I Ritchie, Entrepreneur

Professor J Savill, Head of College of Medicine and Veterinary Medicine and Professor of Medicine, University of Edinburgh

Professor D Wallace, Vice-Chancellor, Loughborough University

Dr J Whitelock, Team Leader, Applied Sciences, Fife College of Further & Higher Education

## **Chapter 6 Contrasting Policy Networks at Different Levels of Governance**

### **6.1 Introduction**

Improving policy design through undertaking public involvement initiatives has become an “integral part” of the policy-making process according to the UK Cabinet Office (Cabinet Office 2002, p.4), whose advice to policy-makers recognises the distinctions between consulting and engaging with the public in policy-making. Although these policy-making guidelines do not explicitly use the term “policy network”, their description of participation as a relationship with government where policy targets actively define the process, in contrast to a consultation on a pre-identified issue, approximates to what the political studies literature would recognise as a policy network (see Figure 6.1).

In order to avoid an overly parochial view of Scotland’s STI policy, Chapter 6 therefore changes tack slightly and attempts to make some comparisons with related policy activities taking place at different levels of governance throughout the UK and beyond. In order to do so, this chapter analyses the conduct of two examples of industry participation in national (UK level) STI policy networks in the form of the Pharmaceutical Industry Competitiveness Task Force (PICTF) and the Bioscience Innovation and Growth Team (BIGT). It then explores the role of policy networks in a successful regional biotechnology system in Cambridge, UK and concludes with an international comparator in the shape of the German STI system and the BioRegio scheme.

These four case studies adopt a comparative perspective rather than presenting a highly developed comparative case study (see further discussion in Section 1.5). They, nevertheless, enable some lessons to be drawn for Scotland on the role of policy networks in the multi-level governance of science and innovation. These four cases are based on documentary analysis of primary and secondary data sources (including the reports published by PICTF and BIGT and a number of academic



papers) together with interviews with key informants including a small sample of policy-makers and policy targets (analogous to the Scottish case) from the Cambridge region and, for the German case, researchers who had themselves studied participative governance in Germany<sup>1</sup>.

This chapter will also question whether taskforces, so beloved of the New Labour government in the UK, can truly be equated with policy networks. As Daniel (1997) notes, involving business in government taskforces is clearly regarded as adding gravitas and credibility but is often less about participatory democracy than about marketing and policy delivery.

**Figure 6.1 Cabinet Office definition of participation in policy-making**

**Consultation:** a two-way relationship in which government asks for, and receives, citizens' feedback on policy proposals. Typically, consultation might be used when extensive responses are required to a specific policy proposal in order to gather views from the public and civil society groups (CSGs), for example, through publishing consultation papers, organising public meetings, or deliberative polling.

**Participation:** a relationship based on partnership with government in which citizens actively participate in defining the process and developing the policy. Participation activities might see citizens involved directly to draw up policy proposals and develop solutions to a problem. They might include CSGs working with a government department to help develop new operating frameworks by co-opting CSG representatives on to government bodies or stakeholder committees. Methods for engaging the public include referenda, citizens' juries, citizens' panels, or direct delegation of authority to citizens to make decisions (Extracts from *Viewfinder: A Policy Maker's Guide to Public Involvement*, Cabinet Office, 2002)

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<sup>1</sup> This chapter also draws on data gathered from the main body of the interview survey where other respondents also provided information germane to this discussion.

## **6.2 UK national level: Government-industry taskforces**

### **6.2.1 Pharmaceutical Industry Competitiveness Task Force**

The Pharmaceutical Industry Competitiveness Task Force (PICTF) was established in April 2000. It brought together the expertise of industry leaders with senior government policy-makers to identify and report to the Prime Minister on the measures needed to retain and strengthen the competitiveness of the UK pharmaceutical industry. PICTF was co-chaired by the UK Parliamentary Under-Secretary of State for Health and the Chief Executive of Astra Zeneca. Its membership included for the government: the Minister for Science and Innovation, the Minister for Education and Employment, the Minister for Housing and Planning, the Financial Secretary and the Permanent Secretary at the Department of Health and from industry the CEOs of Glaxo Wellcome and SmithKline Beecham, the Chairman of Novartis (who was also then President of the ABPI), and the ABPI Director-General. The secretariat was provided jointly by industry and the Department of Health.

According to the official government line, PICTF was established following a meeting in November 1999 between the Prime Minister and the CEOs of Astra Zeneca, Glaxo Wellcome and SmithKline Beecham. At that meeting, industry described how:

*the traditional factors that underpinned the UK's past success in pharmaceuticals were no longer on their own sufficient to guarantee good performance, and an initiative was required to ensure the UK retained its competitive edge. They expressed particular concern about issues relating to market access, and intellectual property protection (PICTF 2001, p.4)*

The unofficial view from civil servants was that there were more emotive reasons following the considerable disquiet in the pharmaceutical industry over the National Institute for Clinical Excellence's recommendation that Glaxo Wellcome's anti-flu drug Relenza was not cost effective and should not be generally available on prescription. At which point "industry barnstormed Number 10" leading to some very stormy exchanges between the Prime Minister and the then chairman of Glaxo Wellcome, Richard Sykes (Interview with policy-maker, P280303). The general

view of the pharmaceutical industry was that government did not take them seriously and that government policies were not helping the competitiveness and productivity of the industry. In response to threats from the pharmaceutical industry that they “were all going to sort of stamp off in a huff and take the ball with them” (*i.e.* that they were going to take their businesses overseas) the Prime Minister agreed to set up the competitiveness task force (Interview with policy-maker, P140403). Industry’s view puts a more positive spin on the origins of PICTF claiming buy-in from the top down: “we’ve been pushing at a very open door...very much driven by the Prime Minister’s concern” (Interview with industry representative, I040702).

The Task Force was responsible for setting out the detail of its work programme from the framework of topics set out in its Terms of Reference (Figure 6.2) and was free to add further items for inclusion in the work programme with the consent of the co-chairmen. PICTF established six working groups in the following areas:

- Developments in the UK Market
- Intellectual Property Rights
- Regulation of Medicines Licensing
- Science Base and Biopharmaceuticals
- Clinical Research
- Wider Economic Climate

and reported in March 2001 (PICTF 2001) with a report that included 69 recommended actions.

After the Task Force reported, a Ministerial Industry Strategy Group (MISG) was established to oversee the follow-up to PICTF, including ensuring that PICTF actions were followed through and taking forward the ethos of PICTF by taking a joint, strategic view of UK competitiveness. This Group published its report *Pharmaceutical Industry Competitiveness Task Force: One Year On* in May 2002 (Ministerial Industry Strategy Group 2002).

**Figure 6.2 PICTF's terms of reference<sup>2</sup>**

1. Identify all the criteria for maintaining and developing the competitiveness of the UK as a successful and effective base for an innovative pharmaceutical industry in a global market.
2. Address the following specific issues:
  - 2.1. Given the role of NICE in relation to judgements about clinical and cost-effectiveness and other measures intended to improve the quality of prescribing in the NHS, consider how the home market can best support the international competitiveness of innovative medicines produced for the home and international market by the R&D industry in the UK.
  - 2.2. The recognition of intellectual property for pharmaceuticals in the context of: resolution of the tensions caused by national pricing of medicines and the free movement of goods within the European Single Market; global trade in pharmaceuticals.
  - 2.3. Evaluate the importance of the clinical research infrastructure of the NHS and the benefits and costs of its use by industry as a location for clinical studies.
  - 2.4. Consider the aspects of the economic climate in the UK which foster or constrain the competitiveness of an innovative pharmaceutical industry, and identify any changes which would significantly strengthen that environment for the industry.
  - 2.5. Identify further steps that might be taken to foster the development of a vibrant biopharmaceuticals sector, including examination of the potential for technology clusters to develop, taking into account the interface with land use planning.
  - 2.6. Identify the potential for promoting further partnership between the industry and academia and industry and government.
  - 2.7. Consider the future development from a competitiveness point of view of the European medicines licensing system especially in relation to the respective roles of the EMEA and national agencies.
3. Assess, in the light of the Task Force's work, how well the UK is currently meeting the criteria identified at (1) above and what further action is needed.

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<sup>2</sup> <http://www.advisorybodies.doh.gov.uk/pictf/index.htm#tor> (last accessed 28/10/04).

Policy-makers saw one of the key aims of PICTF as providing a more formal, structured way of getting industry, civil servants and Ministers together to talk about the issues facing the industry and explore jointly how to resolve them, rather than the previous linear approach where companies complained to the civil servants who would then make recommendations to the Ministers who ignored them (which was how policy-makers characterised industry's view of the situation) (Interview with policy-maker, P280303). PICTF is credited with raising the profile of the industry-Government relationship and with elevating the dialogue "to a far more strategic level than hitherto" (PICTF 2001, p.14). This improved understanding is said to have engendered "real trust between the partners, which will help to condition perceptions of top decision makers in both industry and Government" (PICTF 2001, p.14). In their respective prefaces to PICTF's report the Prime Minister and the CEO of Astra Zeneca describe an "effective partnership at the highest levels between Government and industry" and a "structured, action-oriented platform for effective dialogue between Government and the pharmaceutical industry" which "strengthened industry-Government relationships, significantly increased mutual understanding and delivered some valuable outputs" (PICTF 2001, pp.1-2).

While the PICTF report (*ibid.*, p.2) expresses delight that "a high level successor mechanism to PICTF has been identified", civil servants believe that PICTF established or re-established a more detailed level of communication, putting government/industry relations on a firmer footing. There had also been and continues to be an industry strategy group which meets four times a year that brings together senior officials and senior directors from the Association of the British Pharmaceutical Industry (ABPI) to discuss industry policy matters, industry strategy matters. This group, which involves Ministers, company chairmen and the ABPI, discusses issues that are broader than the work strands that were discussed in PICTF and it is generally at the level of the ABPI where the policy issues and the strategic issues identified particularly by PICTF are taken forward. However, industry does not necessarily see this distinction:

*When you talk to industry, industry will see this is a continuing process. There's a slight dichotomy of views in that from the government's point of view, the task force per se was always a specific time-limited exercise*

*where its role finished with the publication of the final report and recommendations. What continued after that is an expansion of a formal group existing, pre-existed, to continue the dialogue and to take forward the recommendations, to ensure the recommendations are implemented* (Interview with policy-maker, P280303)

PICTF brought industry together in a concerted way to influence government and, in industry's view, clearly demonstrates evidence of actors having an impact on policy (Interview with industry representative, I040702). PICTF was seen as having a much bigger impact than other government-industry initiatives such as Foresight because of the way it operated with co-chairmen from industry and government and a joint industry-civil service secretariat and because it linked civil servants and industry more closely with targets and follow-up monitoring. Nevertheless, although it is cited by industry as an example of good practice in industry/government relations it was still just a one-off, time-limited activity (Interview with industry representative, I040702).

PICTF did help to break down barriers and demonstrated to both industry and government that they were all moving in the same direction (Interview with industry representative, I040702) but the Task Force did not operate in a devolved way because the devolved administrations were not considered to have strong links with the pharmaceutical industry (Interview with policy-maker, P280303) and relations with the industry are generally regarded as a reserved matter. Nevertheless, PICTF's findings clearly apply UK wide and the fact that it was a very English-based discussion did prompt the Scottish Executive into developing its own liaison with representatives from the pharmaceutical industry (Interview with policy-maker, P140403), as discussed in Section 4.4.1.

Joint working between government and the pharmaceutical industry through PICTF was reported as being a success not just in the official report and in interviews with the protagonists but also by those not directly involved in the Task Force. PICTF's policy of "no surprises" (PICTF 2001, p.7) where new policies are not viewed in isolation, but as part of the overall policy environment and are discussed prior to implementation through a senior, ongoing relationship between government and industry is acknowledged by Scottish firms. A CEO of a Scottish biotechnology

company who was not actually a member of PICTF still felt “inextricably linked” to that group and was “in the loop”, believing that, partly as a result of PICTF there was ready access to the UK government and UK Ministers (Interview with biotechnology CEO, I280802). This same CEO contrasted his experience of PICTF with the Scottish situation where he had “no idea” of what was happening in government (Interview with biotechnology CEO, I280802). Other observers have suggested that there is little sectoral focus in Scottish STI policy and that Scotland might benefit from a PICTF-type approach to its biotechnology industry (Interview with industry representative, I040702).

### **6.2.2 Bioscience Innovation and Growth Team**

The Bioscience Innovation and Growth Team (BIGT) was set up in December 2002 following discussions between the DTI, the UK Department of Health and the BioIndustry Association under the chairmanship of Sir David Cooksey, a leading UK venture capitalist. The establishment of Innovation and Growth Teams (IGT) to look strategically at a range of business sectors including the automotive, chemicals and aerospace sectors had been proposed in the 2001 Competitiveness White Paper (DTI 2001). According to the DTI, the IGT concept represents “a new approach to the formulation and delivery of policy, bringing together a wide range of stakeholders in a strategic look by Government and industry at the future of the sector” (DTI 2003a). Those in the industry clearly make the link between BIGT and the similar process undertaken by DTI for the pharmaceutical industry in the form of PICTF, describing BIGT as “son of PICTF” for the biotechnology industry (Interview with biotechnology CEO, I090603).

The task of BIGT was to identify barriers to growth in the UK bioscience industry and to make recommendations on what action should be taken to overcome these barriers. It was publicly stated by the DTI that these recommendations would “help influence the future shape of Government policy”<sup>3</sup>.

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<sup>3</sup> See <http://www.dti.gov.uk/bio-igt/bio-igt-index.html> (last accessed 28/10/04).

A ten-strong Steering Group was established consisting of the chairman plus three civil servants (from the Prime Minister's Office, the Department of Health and the Treasury), two academics, two representatives from bioindustry trade bodies and two biotechnology chief executives. A further four working groups each led by industry representatives were set up to study the issues of finance and investment, biomanufacturing, the European Market and NHS/Industry partnerships. Workshops were held in April 2003 and in total some 70 researchers, industry representatives and government officials were involved with BIGT.

BIGT's report, issued in November 2003 (BIGT 2003) made the following six key recommendations aimed at securing the UK's leadership in the biosciences:

- Building a mutually advantageous collaboration between the NHS and industry for patient benefit through the creation of a National Clinical Trials Agency
- Creating a public and regulatory environment supportive of innovation
- Ensuring availability of sufficient and appropriate funding is available
- Building a strong bioprocessing sub-sector within UK bioscience
- Developing, attracting and retaining a high quality scientific and managerial talent base
- Creating the Bioscience Leadership Council (BLC)

Of these recommendations, the final one is most germane to the present study. The Bioscience Leadership Council (BLC), which will be led by Sir Richard Sykes, Rector of Imperial College of Science, Technology and Medicine, London, and former Chief Executive of Glaxo Wellcome, will be composed of six leaders of bioscience companies and six strategic stakeholders (*e.g.* from academia, NHS, *etc.*). It will be responsible for implementing BIGT's recommendations and will provide "a forum for Government and industry to work together to develop a successful bioscience industry" (BIGT 2003, p.5).

The BIGT report notes that without such a mechanism for nurturing and monitoring co-operation between government and the bioscience industry "it is likely that much momentum will be lost, and the opportunity for the UK to become a world leader in



bioscience may be missed” (BIGT 2003, p.114). The Council will meet four times a year and report to the Minister of Health and DTI Ministers biannually.

Again, as with PICTF, there was no overt engagement of the devolved administrations in the BIGT process other than through the involvement of industry members who happened to be from Scottish firms (Interview with biotechnology CEO, I090603). Although it was envisaged that there would be an opportunity for Regional Development Agencies and devolved administrations to input their views to BIGT, (Interview with policy-maker, P280303), no Scottish agencies are mentioned in the resources section of the BIGT report under the heading of regional development.

The Chairman’s introduction makes it clear that the BIGT report “is not a Government report, approved by Ministers and stating official policy” (BIGT 2003, p.3). Instead it is described as a report to government as well as to industry and the financial and research communities. The establishment of the Bioscience Leadership Council is, however, a very positive step towards developing an ongoing policy dialogue between industry and government.

### **6.2.3 Are taskforces a proxy for policy networks?**

The early years of the New Labour Government were characterised by the establishment of numerous taskforces (Daniel 1997) but can such transitory assemblages of “experts” ever be considered a policy network? Taylor (2000) describes how the Labour Government’s response to the imputed “hollowing out of the state” has been to promote “joined up” government by the use of taskforces that are now “a permanent, highly visible and important feature of British government”. Taylor’s thesis is that, rather than devolving power, taskforces reinforce central control and he argues that the growth of the taskforce is not a corollary of the process of hollowing out but a form of co-ordination of specialisation by central government. As such, Taylor describes taskforces as “the epitome of steering rather than rowing” although one could also argue that they can sometimes seem more like bailing by a government keen to shift some of the responsibility and (dare one say) blame, for certain policy decisions.

For Taylor, a taskforce is composed of a group of experts from relevant organisations combined with a ministerial network that allows access to, and influence over, relevant existing networks and he offers the following definition:

*A taskforce is a politically inspired, time-limited, institutional response to complexity, validated at the highest level of the political executive, designed to respond quickly to a closely specified issue(s) of complexity and/or political sensitivity. Organisationally the response takes the form of an expert team drawn primarily, but not exclusively, from the centre promoting an innovatory policy response through the co-ordination or recombination of existing policy networks and resources within the heart of the core executive territory (Taylor 2000)*

While PICTF and BIGT correspond to the first part of this definition in that they were both politically motivated and championed by senior government Ministers from the Prime Minister down, their membership was less dominated by the centre than Taylor's definition would imply. They were both, however, acting across major policy departments (DTI and Department of Health) and did draw in existing networks in the form of industry representative bodies. One could take issue with Taylor's assertion that taskforces demonstrate a change of function away from advising policy-makers towards policy-making: as the quote from the Chairman's introduction illustrates (*vide supra*), the BIGT report was not a government report stating official policy but a set of recommendations to government Ministers.

Taskforces do embody many of the characteristics of policy networks described in Chapter 2 and certainly underpin the current UK government's approach to governance with its focus on policy integration and partnership. As discussed in Chapter 2, policy networks and, in particular, policy communities (Rhodes 1997) are often regarded as a source of stability and continuity and because of this can sometimes be resistant to change (Rhodes and Marsh 1992). Tensions can therefore arise between the traditional depiction of networks in the literature as institutionally dense, cumbersome and slow moving and the new governance literature on networks as flexible and dynamic alliances: as such, the establishment of taskforces can present a considerable challenge to the authority of some of the more traditional and well-established policy networks (Hay and Richards 2000).

The temporary, *ad hoc* nature of taskforces such as PICTF and BIGT means that, while they do appear in many respects to be a close proxy, they do not necessarily conform to the model of a policy network as an *ongoing* relationship between policy-makers and policy targets of the type characterised by the Cabinet Office as “participation” as opposed to “consultation” at the beginning of this chapter (Cabinet Office 2002). Although industry participants like to present one of the key outcomes of PICTF as the continuing policy dialogue with Ministers, this was downplayed in interviews with policy-makers (Interview with policy-maker, P280303). The situation with BIGT is, however, rather different because one of the publicly stated outcomes of this taskforce has been the establishment of the Bioscience Leadership Council (BLC) which, while not exactly tasked with policy development is, nevertheless, responsible for facilitating government-industry co-operation and providing a forum to discuss “issues management” (BIGT 2003, p.114). More time is needed to gauge how successful the BLC will be in these tasks and also whether it develops any form of remit in the devolved territories which is currently lacking from its present incarnation.

### **6.3 UK regional level: The Cambridge biotechnology cluster**

PICTF and BIGT were both national initiatives involving the biotechnology industry. This section shifts the focus to the regional level of governance to explore whether there are any lessons for Scotland from the operation of regional policy networks elsewhere in the UK. Cambridge is the most obvious UK regional exemplar with one of the leading biotechnology clusters in Europe, encompassing emerging and mature life sciences companies with a focus on therapeutics and an abundance of science parks and incubators located in the East of England with a strong concentration around Cambridge (Anon 2001b). Much has been written about the Cambridge phenomenon in terms of, *inter alia*, the commercialisation of bioscience research, regional collective learning and regional innovative capacity (see, for example, Cooke 2001b; Keeble *et al.* 1999; Lawson and Lorenz 1999) but the question to be addressed here is how the actors in this cluster engage with policy-makers at both the regional and national levels.

At the regional level there are currently three main policy actors of which the regional development agency (RDA) (East of England Development Agency, EEDA) and the Government Office for the East of England (GO-EAST) are in the public sector and the third, Eastern Region Biotechnology Initiative (ERBI), is an industry-led membership organisation. However, compared with its sister cluster in Cambridge USA, the UK cluster has less sub-national innovation support from the public sector (Cooke 2002a) and has only recently developed any regional governance structures.

So EEDA is a relative newcomer, established in 1999 as one of the nine regional development agencies created by government to bring a new focus to economic development in the English regions by stimulating stronger regional policy networks and “joining up” some of the gaps that existed between regional economic policy and many other policy fields that influence regional planning and development (Roberts and Benneworth 2001). With a budget of £90 million and a staff of around 200, EEDA’s resources are very modest by Scottish Enterprise’s standards<sup>4</sup>, for a comparable population size.

In common with the other regional development agencies (RDAs), EEDA is seeking to establish linkages with regional stakeholders but is faced with the problem of writing a strategy for an area with “little sense of being a region or history of regional co-operation” and its success is predicted to be limited by the necessity of joining up “disparate and indeed divergent purposes under complex and countervailing political pressures” (Roberts and Benneworth 2001).

Institutional tensions have inevitably existed during this transition period. With the establishment of EEDA, the government office (GO-EAST) is trying to redefine its role and the differentiation of activities between the two organisations (Interview with industry representative, I040603). GO-EAST sponsors EEDA which means that it is involved with DTI in the process of developing and approving EEDA’s

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<sup>4</sup> Scottish Enterprise’s budget is currently £453 million and it employs 2,408 FTE staff (Scottish Public Bodies Directory, [www.scotland.gov.uk/government/publicbodies/more.asp?ID=53](http://www.scotland.gov.uk/government/publicbodies/more.asp?ID=53); last accessed 28/10/04).

corporate plan, the financing of that plan through grant-in-aid and the processes of appointments and performance assessment across the range of the RDA's activities (Interview with policy-maker, P040603). In part, GO-EAST's role is to help to keep the bigger picture in focus in terms of UK competitiveness so that issues to do with national policy are fed into and joined up with the local decision-making process (Interview with policy-maker, P040603). GO-EAST describes itself as "DTI's eyes and ears in the region" (Interview with policy-maker, P040603), facilitating DTI's communication with business about government policy and acting as a channel for business opinions back to the DTI<sup>5</sup>. In a sense, GO-EAST mediates between the DTI head office and the economic development agency, although the DTI Bioscience Unit with whom GO-EAST would have only infrequent contacts (reportedly around a dozen times a year (Interview with policy-maker, P040603)), also has direct contacts with EEDA. GO-EAST has a role in reporting back to the centre on the state of the local economy and current issues for local businesses and, as part of this, organises a programme of contacts with business and business organisations such as CBI and the Chambers of Commerce (Interview with policy-maker, P040603) in order to establish "relationships with the regional business community and by working with regional partners to raise awareness and promote the delivery of the DTI agenda at the local level"<sup>5</sup>. As is the case with Scottish civil servants (see Chapter 4), much of this engagement with business revolves around organising ministerial visits where GO-EAST will advise on suitable firms in order to meet the Minister's "parameters about what sort of firm would suit the objectives of the particular visit" (Interview with policy-maker, P040603). GO-EAST aims to develop a rapport with the businesses in the area, actively trying to seek the views and opinions of businesses and the information gathered through that interaction is then fed back to the relevant sponsor division within Whitehall. Again, there is recognition that companies have very limited time available, but a belief that, if a means can be found of allowing firms with a minimum expenditure of their own time

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<sup>5</sup>[http://www.go-east.gov.uk/About\\_Us/Business\\_Groups/Corporate\\_Relationships\\_and\\_Europe/Business\\_Relations/](http://www.go-east.gov.uk/About_Us/Business_Groups/Corporate_Relationships_and_Europe/Business_Relations/) (last accessed 28/10/04).

to achieve some sort of visible result or be convinced that their views are being fed into the right quarters, that such firms are keen to engage with policy-makers provided they believe it is not just a token consultation. Visits were described as a useful means of getting an in-depth understanding of the issue of concern to the firm (Interview with policy-maker, P040603) but much of the language used to describe these activities (*vide supra*) implies a one-way, top-down relationship where government informs business of its policy or government decides which firm to visit in order to advance government policy, rather than a genuine, two-way dialogue.

Indeed, evidence from interviews suggests these interactions are very selective. One start-up company interviewed reported no dealings with the regional development agency and no knowledge or experience of the services or benefits that EEDA or GO-EAST might provide to start-up companies (Interview with biotechnology CEO, I030603). Nor had this company experienced any direct contacts with policy-makers at the national level. All of this company's interaction with government was mediated through the BIA (Interview with biotechnology CEO, I030603) and, as with Scottish companies, there appeared to be a fatalistic tendency to accept the policy *status quo* and to focus their energies on developing their business (Interview with industry representative, I160702):

*if I'm candid, 99% of my time is spent trying to run the company with the structure as it is, accepting the fact that this is how it [government policy] works* (Interview with biotechnology CEO, I030603)

RDAs might present a powerful new mechanism for steering sub-national policy networks (Bache 2000) but it seems that the government's regional agenda is still driven by the centre rather than by local companies. The system has been set up to ensure that companies engage with local governance structures:

*The only way that money can be accessed is through the development agencies...it's actually the DTI's national money...So if we...want to access it...we have to do it through the RDA* (Interview with industry representative, I040603)

This is seen by companies as a way for the government to develop more partnerships, and to further its regional agenda but, although being closer to the local situation

should mean that the government agency spends the money more wisely, this can also introduce “more petty politics” which is not reported to be the case at the national level (Interview with industry representative, I040603).

Eastern Region Biotechnology Initiative (ERBI) predates EEDA by two years and was established with the goal of enhancing the growth and development of biotechnology in Cambridge and the East of England by promoting local, national and international networking, supporting new ventures and infrastructure developments and generally assisting in activities to improve communications and networking in the local biotechnology sector. Although EEDA established a business-led life sciences strategy group, EEDA does not have any sector specialists and works closely with ERBI to provide much of its biotechnology expertise, particularly in relation to the region’s inward investment activities (Interview with industry representative, I040603).

But despite this new regional focus, the national level still remains more important to biotechnology firms in the Cambridge area in terms of trying to influence government policy. That said, their regional representative bodies are not particularly active at national level but, at the same time, also somewhat sceptical of the significance of the regional governance level:

*We’re not as politically active as maybe we should be but the question is what are we going to get out of it? If it’s at a national level, it [DTI] listens to the BIA and to some extent it does the regional thing but I think it’s a bit of lip service* (Interview with industry representative, I040603)

It requires effort to engage with national policy-makers and the impetus for these meetings generally comes from stakeholders:

*if I said, what have the DTI done to contact me in the three years or so, the answer is virtually none* (Interview with industry representative, I040603)

Regionally-based biotechnology networks are also critical of government efforts to over-manage and over-politicise attempts to co-ordinate regionally-based learning and networking activities (Interview with industry representative, I040603) and question the independence of organisations such as the BIA that are heavily funded

by the government. Contrary to the government's decentralisation agenda, the DTI has developed a close relationship with the BIA and focuses on funding national initiatives through the BIA rather than at the regional level (Interview with industry representative, I040603).

This then leads us to ask whether a policy network exists within the Cambridge region that involves both government and non-government actors. The answer from the public sector is:

*In a very, very embryonic form...the extent to which the different agencies that are involved do get together and do agree on a common approach to it is very limited at the moment* (Interview with policy-maker, P040603)

While acknowledging that greater collaborative activity and joint working is an aspiration of central government, this is not yet happening in Cambridge and instead:

*all that happens at the moment is that each agency individually is aware of the target when it sets its corporate plan – who knows how much real attention they pay to that one rather than other things and they don't really seek very much to influence what each other does* (Interview with policy-maker, P040603)

This situation demonstrates one of the problems with the notion of "self-organising" policy networks (Rhodes 1997, p.15) when policy-makers concede that stronger compulsion and someone in overall charge at the regional level would improve the situation (Interview with policy-maker, P040603). The private sector also calls for a partnership approach to co-ordinate activities of the various groups in the region such as ERBI, EEDA, Invest East of England and the Genetics Knowledge Park and notes that:

*public sector intervention...without consideration of the issues, needs and ideas of the private sector...was generally seen as unlikely to be successful* (ERBI 2003)

The origins of the Cambridge cluster lie, not in public policy, nor in the commercialisation of university research from the University of Cambridge, but in a land development initiative by Trinity College which owned the land on which the original Cambridge science park was built (Interview with research representative,



R290702). The development of the Cambridge cluster was market-driven and, in contrast to Scotland, public funding bodies were not central to its success (Cooke, 2001b). Scotland and the Cambridge region therefore epitomise the two extremes of cluster development where significant public money has been ploughed into the development of the biotechnology cluster in Scotland in contrast to Cambridge, where it has developed on its own without public intervention (Interview with industry representative, I040603). The fact that the Cambridge cluster of biotechnology companies predates the establishment of regional governance structures such as EEDA and GO-EAST has also had an impact on the evolution of policy networks. Success seems to be despite, rather than because of, the government economic development agencies. The most effective lobbying is reported to have been from the Cambridge Network (companies from the high technology cluster plus the university) which created a favourable environment where the business community worked together to effect change and encourage the government to take a more joined-up approach to enable growth to take place through affordable housing programmes and improved transport infrastructure (Interview with policy-maker, P040603) but this is a classic case of business lobbying, rather than a collaborative initiative involving both the private sector and policy-makers as equal partners:

*I suppose what's happening in Cambridge is an example of the business community having an impact on policy, you know, they have I think done lots to turn the tide in terms of a sort of prevailing anti-business, anti-growth sort of feeling to the position that is now reflected in the regional planning guidance and the county structure plan which is about accommodating growth. And I think business has been much to the forefront in lobbying government to do its bit (Interview with policy-maker, P040603)*

There is certainly a perception that, in Scotland, companies can engage with policy-makers and Ministers, in particular, on much more mundane matters than can companies in the English regions where, even if a firm managed to get direct access to a Minister, it would probably be on very high level issues (Interview with policy-maker, P240303). There is also clearly the view that there are more sources of help and advice for firms at the Scottish level, at least partly as a result of devolution where more organisations, such as the BIA, have developed a regional presence in

Scotland (Interview with policy-maker, P240902). There is currently no equivalent layer of government in the English regions where companies are likely only to have access to Ministers through the RDA or through an industry trade association where, in each case, the interaction would be one step removed.

This Cambridge case study illustrates the considerably disjointed nature of regional economic development policy in the UK and the dichotomies that exist both between the various regional actors and between the regional and national levels of governance, particularly for a sector such as biotechnology. Much of this is echoed in the recent House of Lords report (House of Lords Select Committee on Science and Technology 2003) which calls for “coherence, longer term perspectives and reduced bureaucracy” at the regional level and asserts that “[T]he picture has become more complex with the establishment of the RDAs”. While EEDA might still have the potential to encourage a policy network to coalesce, at present it seems to be simply adding another layer of bureaucracy for the local biotechnology industry for whom the national level remains the key policy driver.

Biotechnology companies north and south of the border are sometimes wary of accepting government funding because it comes with strings attached (Interviews with biotechnology CEO I090603 and industry representative, I040603). Nevertheless, EEDA does not seem to be attempting to engage with biotechnology companies in the Cambridge area (Interview with biotechnology CEO, I030603). This might partly be because the development agency arrived too late into a region where the biotechnology sector had already developed into an effective cluster without public sector intervention and EEDA believes that there is no case for putting additional public resources into it (Interview with industry representative, I040603). But what impact does this then have on the RDA’s ability to engage effectively with its policy targets? In the Rhodes Model (see Chapter 2), even though the state does not occupy a privileged sovereign position within the policy network, government policy actors still have a role in steering networks to varying degrees depending on the sector, the issue and the point in time (Rhodes 1999) but this is not very evident at the Cambridge level where multiple government and

private sector agencies are not well co-ordinated and a “governance gap” (Edler *et al.* 2003, p.11) exists between the regional and national levels.

#### **6.4 Cross-national comparison: The multi-level governance of German STI policy**

Moving to the international level, German biotechnology policy networks might provide a helpful comparator for a number of reasons. First, and most obviously, Germany has a long tradition of regional governance and well-established institutional actors interacting across federal and Länder levels of governance. There is a closer interaction between government and interest groups and less of a clear-cut divide between public and private sectors in the German administrative structure than in the Anglo-Saxon tradition of policy-making (Diederer *et al.* 1999, p.4). The German academic tradition takes a slightly different view of the associative model, regarding policy networks as a new form of governance; as a mechanism for mobilising political resources in situations where these resources are widely dispersed between public and private actors; and as a specific form of public-private interaction based on non-hierarchical interaction (Marsh 1998a; Borzel 1998). Finally, a strong biotechnology sector has been developed largely as a result of public intervention through initiatives such as the BioRegio competition (BRC).

Perhaps surprisingly, Heald and McLeod (2002) point out that the Scottish Parliament has more decision-making power over taxes than any of the German Länder. In comparing Scotland with the German Länder, Jeffery (1998) notes that the Länder retain exclusive legislative competences in only a limited number of aspects of regional economic policy and that the legislative autonomy of the Scottish Parliament is in fact far more considerable than that of the Länder governments. He also observes a clearer sense of accountability of decision-making in Scotland than in Germany and suggests that this might be “more conducive to high levels of citizen interest and participation in the work of the Scottish Parliament”.

Nevertheless, Germany does have a well-established, powerful system of regional governance arising from a post-war constitution that was designed to share responsibilities between the Federation and the Länder, and thereby avoid a

concentration of power (Schiermeier 2003). Most Länder have their own regional programmes, having established industrial development agencies in the 1960s (Newlands 1999), and the recession of the 1980s provided a further impetus for the Länder to make greater use of technology programmes as a tool of regional policy (Wilson and Souitaris 2002). Government support for research laboratories, agencies and universities is split evenly between the federal government and the Länder (Schiermeier 2003), a system that allows the research community to benefit from being part of a strongly interactive federal system while having strategic and applied capabilities that are part of the regional system of alliances with industry and Länder governments (Boulton 1999).

The federalist structure of Germany is said to have both advantages and disadvantages for the management of knowledge infrastructure, providing, on the one hand, certain flexibility to the Länder in how they handle STI policy issues, but on the other hand, entailing complex decision-making procedures that can lead to significant delays in adapting to change (Diederer *et al.* 1999, pp.203-204). Regionalisation has been a key feature of the evolution of German STI policy in the belief that greater decentralisation ensures better support for regional clusters and research networks with the Länder being in a better position to help co-ordinate the needs of industry with the universities and research institutes (Reinhard 1999). National programmes tend to focus on large firms while Länder initiatives are targeted at SMEs and, as in Scotland, regional innovation policy in Germany promotes innovation, commercialisation and technology transfer (Reinhard 1999). Despite the powers of the Länder, there has, however, been a move towards centralised decision-making, a degree of financial centralisation (Newlands 1999) and, in particular, a move to simplify the research sector (Anon (Editorial) 2003).

In Germany there is a historical culture of networking and associative governance involving large firms, banks, government and universities, and the involvement with civil society and interested parties runs very deep in German policy-making (Interview with German specialist, A260503). Firms are embedded within networks of trade and industry associations, as well as labour organisations (Casper and Mataves 2003) and these organisations are consulted on a regular, but often informal

basis, by civil servants (Diederer *et al.* 1999, p.172). Organisations such as German Chambers of Commerce often have a regulatory role and are far more powerful institutions than their equivalents in the UK (Interview with German specialist, P270303). Given the highly complex situation in Germany, it is particularly difficult for small firms to negotiate through all these levels of governance, which probably goes some way towards explaining why trade association membership is higher in Germany where firms rely on such organisations for assistance and Chambers of Commerce and trade associations appear to regard this service element as an important part of their function. Such organisations therefore have a tangible role in explaining the complexity and run a number of training schemes to talk members through the various processes of government (Interview with German specialist, P270303).

There are two types of trade association in Germany, those responsible for technical standards and training and others that are essentially employers' associations similar to the UK CBI. Larger firms are more likely to have closer interactions with, and assistance from, the relevant government agencies whereas smaller companies with specific needs tend to rely on their Chambers of Commerce (Wilson and Souitaris 2002). However, in the biotechnology sector the skills base mainly derives from universities so there is less of a training need which means that the biotechnology trade associations are less powerful than some of those in more traditional industries (Interview with German specialist, A260503). In the new economy fields such as ICT and biotechnology, firms are less likely to be members of an industry association and instead use alternative ways of engaging with policy-makers (Interview with German specialist, P270303).

In many aspects of German policy there is more of a social partner approach in both policy-making and policy implementation. There is much more emphasis on consulting employers and employees, and the views of the trade associations or, indeed, individual firms are actively sought in order to inform the policy process (Interview with German specialist, P270303). German civil servants stay in the same job for longer than they do in the UK where civil servants move post quite frequently and the impression is that this has a positive impact and means that German STI

policy is a more participative, inclusive activity (Interviews with German specialists, P270303, A260503).

In an early study of the German biotechnology industry, Jasanoff (1985) examined the impact that Germany's tradition of corporatist decision-making had had on industrial policy and found that, in the case of biotechnology, the corporatist approach created a consensus for the adoption of a comprehensive R&D programme but had an overall detrimental effect on competitiveness:

*the reliance on established peak organizations to formulate policy has discouraged structural changes that could have enhanced Germany's early competitiveness in biotechnology (Jasanoff 1985)*

Jasanoff (1985) describes how the 1974 DECHEMA<sup>6</sup> study "effectively laid the groundwork for a coherent federal funding policy" and ensured the support of the major interest groups (large corporations, trade associations and labour organisations) for the programme so that the Federal Ministry for Research and Technology (BMFT) could begin immediate policy implementation without the need for further political negotiation. This approach also facilitated "incremental regulation of the new technology, defusing demands for potentially constraining legislation" (Jasanoff 1985).

However, despite this apparently successful example of user engagement in the policy-making process, Jasanoff (1985) goes on to describe how the impact of corporatism can place constraints on the government's ability to formulate innovative policies, instead allowing powerful interest groups to seize the initiative in policy formulation:

*corporatist interest mediation seems in certain respects antithetical to the notion of an activist industrial policy, especially one geared to the promotion of new technologies...The essence of corporatism is cooperative rather than competitive, favoring continuity over quick change. A new technology policy, by contrast, demands flexibility and*

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<sup>6</sup> German Society for Chemical Engineering, now the Society for Chemical Engineering and Biotechnology.

*the rapid adaptation of existing institutional forms to meet competitive challenges (Jasanoff 1985)*

Jasanoff concludes that the record of corporatist decision-making is mixed. On the positive side, this approach can prevent conflict but involving large, private interests as equal bargaining partners can result in a loss of autonomy for the state and, more significantly, institutional paralysis and ideological conformity which can undermine innovation (Jasanoff 1985). Taking up this theme, Bartholomew (1997) suggests that modern day Germany owes at least some of its competitive advantage to “its highly co-ordinated government policies and institutionalized structures for bridging the gap between scientific research and technological development”. This is further supported through “extensive cooperation across government, research institutions, industry, banks and interest groups”<sup>7</sup> but Bartholomew (1997) considers that, while this system is effective at incremental adaptation to technological change, it is not suited to the rapid commercialisation of new scientific developments in sectors such as biotechnology or pharmaceuticals (Casper and Matraves 2003).

However, by 2001 Germany had caught up with, and in fact exceeded, the UK in terms of numbers of biotechnology companies (Ernst & Young Life Sciences Group 2001)) although German companies tend to be smaller and less mature than those in the UK (Interview with biotechnology CEO, I030603). Kettler and Casper (2000) highlight the role of government policy in promoting the rapid growth of the German biotechnology sector through initiatives such as the BioRegio competition but also point to differences in national institutions and note that the focus of German biotechnology policy in recent years has been on start up rather than sustainability.

The BioRegio competition (BRC) was seen as a departure from traditional technology policy in Germany because it recognised that the region might be the governance level best suited to promote knowledge creation and diffusion (Dohse 2000). The German Federal Government launched the BioRegio initiative in 1995 to

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<sup>7</sup> One example of which would be the high-level participation in the Chancellor’s Council for Research, Technology and Innovation which was established in 1995 with around 20 members plus expert panels to ensure the involvement of participants from politics, universities, industry and trade unions in developing a “well-rounded innovation policy” (Reinhard 1999).

encourage regions to build up their cluster infrastructures in biotechnology with the aims of:

- improving knowledge and technology transfer within the regions
- supporting start ups
- improving regional competitiveness (Georghiou 2003)

BioRegio was considered to be an innovative policy instrument that opened:

*new perspectives for a more effective technology policy by taking the regions seriously and giving prominence to the well-functioning interplay of the various elements of regional innovation systems (Dohse 2000)*

The initiative was heralded as a success, resulting in increases both in employment and in the number of firms operating in the biotechnology area with the number of dedicated life sciences companies apparently rising from 75 in 1995 to 222 in 1998 (Georghiou 2003). Enhanced communication and co-operation among the key regional actors were seen as being BioRegio's major successes, while its major shortcoming, according to a user survey (Dohse 2000), was that it failed to reduce regulation at the national level which suggests a lack of impact of policy targets on policy-makers. Some believe that, while the BioRegio example allowed the Länder considerable flexibility to shape development in particular cases, it also kept strategic responsibility firmly at federal level (Wilson and Souitaris 2002). Others are more optimistic about the positive impact BioRegio had on the role of the regions:

*We conclude that the BRC, in taking the regions seriously, sets new yardsticks not only for technology policy but also for traditional regional policy: the regions are the key actors, the real protagonists in the BRC whereas in traditional regional policy their role is essentially passive as they are merely recipients of assistance from national or supranational (EU) structural funds (Dohse 2000)*

The German multi-level governance system for STI allows for more experimentation than the UK system (Interview with German specialist, A260503). In an empirical study of the multi-level governance of innovation policy in Germany, Wilson and Souitaris (2002) report that the balance is shifting from formal and binding co-ordination mechanisms to informal and voluntary methods as a result of a



combination of factors, including the decline in federal expenditure and an increasing use of competitions such as the BioRegio initiative. The authors take a broad view of what counts as co-ordination and conclude that there is co-ordination to an extent but that “German officials are familiar and comfortable with the areas of untidiness which result”: in a nice inversion of national stereotypes it would appear that British civil servants are more concerned about having everything neatly allocated to their rightful level of governance (Interview with German specialist, P270303).

There is certainly a perception that in well-developed federal systems, such as Germany, regional and national policies are woven together and mutually agreed, in contrast to the UK where regions are not seen to be involved to any significant degree in national STI policy<sup>8</sup>. However, Reinhard (1999, p.59) claims that the apparent close co-ordination between federation and Länder in technology policy is not borne out in practice and Götz (1992) (quoted in Wilson and Souitaris (2002)) concludes that joint federal/Länder processes act as a constraint in some policy areas (aspects of higher education and research policy), although the Länder can exploit their greater authority in the more “social” parts of the innovation agenda. To test this, Wilson and Souitaris (2002) sought evidence of interaction between governance levels in three aspects of innovation policy (innovation infrastructure, promotional programmes and individual projects) and noted that these three areas “represent a spectrum of declining formality” in interaction mechanisms. They attribute this shift partly to political changes in the relationship between Federation and Länder, and partly to the more general global trends in innovation policy towards less formal mechanisms of policy interaction. Although a move towards greater competition between governance levels might be a corollary of this shift away from joint decision-making, the authors disagree that this should automatically mean less co-ordination and conclude that “the system is still typified by large elements of collaboration” (Wilson and Souitaris 2002).

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<sup>8</sup> Contribution to SURF (Centre for Sustainable and Urban Regional Futures) seminar, University of Salford, 12 May 2003.

Unlike the UK, where post-devolution working has been handled through Memoranda of Understanding between the individual departments, there are more political structures in Germany that mediate between the federal and Länder levels, providing co-ordination and funding. Despite this long-established dialogue and a procedural framework for interaction between Federation and Land, the German system still relies very heavily on personal contacts and people knowing who is in the network:

*even when the Federation and the Land...are arguing, the officials themselves actually get on very well and most of the ire tends to be directed at politicians...and that's almost kind of part of the game, that they all know the game they're playing (Interview with German specialist, P270303)*

In the UK, government policy promotes networks because the evidence points to networking as an important driver in innovation, but there is not the same tradition of associative governance in the UK. This attitude works in Germany because networking has been systematically encouraged as an approach to industry policy for over a century but it is not possible to graft a culture of networking on to the UK:

*There are no quick fixes there. If you think networking and those types of associative relationships are important drivers of innovation, you're not going to be able to get that overnight. You're going to have to say this is a long-term project (Interview with German specialist, P270303)*

The other concern is that the UK is becoming more like the German situation but without some of the safeguards to clarify flashpoints. The lack of a constitutional court means that solutions to disputes about the jurisdiction of different governance levels will always ultimately be determined by the UK level government (Interview with German specialist, P270303).

Wilson and Souitaris (2002) looked for evidence of policy co-ordination beyond the formal, constitutionally entrenched, joint decision bodies and found that the pressures facing innovation policy in Germany reflected some of the issues affecting Federation-Länder relationships more generally. They conclude that these pressures are reinforcing a shift away from formally co-ordinated to voluntarily co-ordinated policy-making. While recognising that consensus-based decision-making is one of

the prominent features of German policy-making, Diederer *et al.* (1999, p.172) also confirm that, in contrast with other consensus-oriented countries, there are fewer formalised links between interest groups and government departments in Germany and a higher degree of “self-organisation”. However, as Jasanoff (1985) makes clear, too much industry involvement can be a bad thing. Although there are sometimes procedures within representative groups, such as strict rules on job rotation to prevent regulatory capture (Diederer *et al.* 1999, p.172), over-formalised consultation and partnerships, particularly where there are very well-organised lobbies for the *status quo* amongst both employers and employees, can have a negative impact and actually impede change (Interviews with German specialists, P270303, A260503).

However, despite this German tradition of associative governance, the type of innovation policy that will make headlines will probably not have resulted from a significant process of consultation and stakeholder involvement. For example, the development of the Munich biotechnology cluster has apparently resulted from a high level, top-down political imperative to move away from old industry to new high technology industry and not in response to start-up biotechnology firms calling for more incubator sites or science parks (Interview with German specialist, P270303).

Ultimately, it probably *is* easier for policy targets to have an impact on government policy in Germany, but only if they are part of the formal structure: in contrast to the UK, it is harder to be heard if you are an individual firm in a new industry area (such as biotechnology):

*Whereas I suspect that in the UK, because it's not...as channelled, there probably are more opportunities for sort of...left-field interventions*  
(Interview with German specialist, P270303)

## **6.5 Reprise**

Some informants recommend a “Scottish PICTF” to help focus the minds (Interview with industry representative, I040702) and there are clearly benefits to be derived

from a project-driven, cross-cutting taskforce of the type represented by PICTF and BIGT that can take the broader view and foster government-industry relations. However, one of the key messages from the examination of these UK-led initiatives is the importance of continuity. Although such taskforces can make valuable contributions to the process of informing policy, the true worth of such a dialogue is in the *ongoing* relationship between policy-makers and policy targets so that trust can be established, input sought at an earlier stage, and policy learning can occur. These elements are much less evident in the relationships represented by a one-off, time-limited taskforce. PICTF did include some follow up in the form of the Ministerial Industry Strategy Group (MISG) but opinion was divided as to whether this was truly an ongoing policy network or merely something of a sop to the industry (interestingly, it was industry who appeared to suggest the former, and civil servants the latter). BIGT, on the other hand, was more overt in its call for a permanent policy forum and the establishment of the Bioscience Leadership Council (BLC) might yet prove a significant development. The role of the devolved territories and co-ordination with regional biotechnology strategies has not so far been a facet of this initiative and it will be instructive to observe how Scottish actors from both the industry and policy communities involve themselves in BLC.

Wilson and Souitaris (2002) report the important catalysing effect that federal institutions in the USA can have on local technology-based networks, and the Cambridge case study, although sited in a different type of political system, nevertheless illustrates the importance of the public sector in establishing and steering policy networks. While acknowledging that the Cambridge case (like the Scottish case) represents a system in transition, four years after the establishment of the regional development agency there is still a considerable lack of coherence in public sector involvement and no evident regional policy network for biotechnology. Biotechnology firms and their representatives do not appear to interact at a policy level with regional policy-makers to any significant degree and are more likely to engage with the national level of governance, although this interaction is irregular and not well-refined. The Cambridge case suggests that, despite a thriving biotechnology cluster, the involvement of industry in the regional governance of STI is, if anything, less well-established than in Scotland.

Turning finally to Germany, a country with a long tradition of associative governance, Wilson and Souitaris' (2002) study confirms that national (STI) policy objectives "are increasingly being met by the federation seeking to harness the associative resources and concentrated expertise of regional innovations (*sic*) systems" while at the same time "effective innovation policy in a Land depends on the ability of its actors to draw on national and federal resources in a coherent and focused way".

Informants point to the importance of informal contacts (particularly between officials at different levels of governance) and the tolerance for ambiguity between different levels within this governance system (Interview with German specialist, P270303). Significantly, however, both the literature and informants highlight the fact that there are pros *and* cons in involving policy targets in policy-making in the German system (Interview with German specialist, P270303) (Jasanoff 1985; Batholomew 1997).

There is a less strongly institutionalised structure in the UK compared with Germany which leads UK government departments and agencies to do things that otherwise industry associations could do (Diederer *et al.* 1999, p.62). While this might foster closer government-industry relations it can also lead to a dependency culture, as discussed in the next chapter. Bodies such as Scottish Enterprise might learn from the German situation and consider devolving some of their training and information dissemination activities to the private sector and indeed this is beginning to happen with the Scottish BIA. However, we cannot expect Scotland to emulate the German system of associative governance overnight. In long-established federal systems such as Germany, regional and national policies are closely interwoven and mutually agreed between broad groups of actors but we are still a long way from this relationship between governance levels in the UK.

It has been suggested (Jeffery 1998) that the Scottish system might in fact encourage higher levels of participation than the German system because of a more transparent parliamentary decision-making process but, while Chapter 4 has demonstrated that networking between users in the Scottish biotechnology community undoubtedly

takes place, there is little evidence to support the notion of a self-organising network of policy-makers and policy targets in the Scottish biotechnology sector. The comparative case studies presented in this chapter suggest that there are strong historical and cultural reasons for the prominence of self-organising policy networks in Germany but that, in the UK, the public sector still has an important role both in providing a conducive policy environment for their emergence and in steering their activities, as evidenced by the activities of the PICTF and BIGT taskforces and the absence of a coherent policy network in Cambridge. However, as the following chapter will demonstrate, there is an important balance to be struck when involving the public sector in policy networks.

## Chapter 7 Barriers to the Effective Operation of Scottish Policy Networks

### 7.1 Introduction

Following its inquiry into the delivery of local economic development services in Scotland, the Enterprise Committee could not “stress highly enough that the first crucial step to improving effectiveness of services to consumers must be to bring an end to competition between publicly funded organisations” (Enterprise and Lifelong Learning Committee 2000). This same report highlighted the “congestion, confusion and duplication in the provision of economic development services from local enterprise companies, local authorities and enterprise trusts”, sentiments that were almost precisely echoed by the House of Lords Select Committee (House of Lords Select Committee on Science and Technology 2003) three years later in its study of the role of RDAs in science and innovation policy and more recently, as discussed in Chapter 5, by the Scottish Science Advisory Committee in its report to the Scottish Executive (Scottish Science Advisory Committee 2004b).

The *Modernising Government* White Paper was intended to ensure that government was both inclusive and integrated (HM Government 1999, p.6). It highlighted the need for a range of agencies to work in partnership to develop more holistic solutions to complex policy problems (Newman 2002, p.59), resulting in a policy-making process that was able to learn from experience. The New Labour Government justified its emphasis on integrated policy as a way of dealing with the fragmentation and loss of control from the centre that resulted from the actions of the previous Conservative administration (Bevir and Rhodes 2003, p.13; Newman 2002, p.59). As such, the prevailing governance approach may simply be a way of tackling government’s reduced ability to steer and “joined up” policy a way of keeping control of devolved agencies, *etc.* rather than a natural and desirable consequence of the government to governance shift.

It might be reasonable to assume that a more integrated or “joined up” approach to the governance of science and innovation in Scotland might be a precursor to a fully functioning policy network that spanned different levels of governance but, if policy often results from “an uncoordinated fight between government bureaus (*sic*)” (John 1998, p.44), can devolved administrations hope to integrate policies where national government has failed? If central government departments are themselves not well integrated and UK policy networks are still characterised by “a series of vertical compartments...each segment inhabited by a different set of organisational groups” (Richardson and Jordan 1979, p.174) does devolution really present opportunities to “join up” activities in Scotland as Scottish Executive officials have claimed (Interview with policy-maker, P020403)<sup>1</sup>.

Chapter 2 described the ideal conception of how a policy network might function within a governance system while Chapter 3 suggested that the Scottish system of innovation might provide a favourable set of conditions for the operation of such policy networks for science and innovation. Chapters 4 and 5 discussed whether there are actually examples of successful or emerging policy networks in Scotland, and Chapter 6 suggested reasons why policy networks might work better in other governance systems. Chapter 7 draws these chapters together and demonstrates why, despite apparently having all of the necessary precursors to facilitate a network-based regional polity for STI, Scotland is still failing adequately to integrate its policies for science and innovation or foster more cohesive policy networks.

Macleod (1996) has suggested that the close interpersonal relations spanning the public-private divide in Scotland encourage inter-organisational co-operation but, as Chapter 4 has demonstrated, these *interpersonal* networks have not so far led to *inter-organisational* policy networks so that, in the field of STI policy, in contrast to

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<sup>1</sup> Also lecture by Barbara Doig, Head of Europe and International Affairs Division, Scottish Executive “Operational Activities of the Scottish Executive”, 16 January 2002, University of Edinburgh Politics Department seminar.



some areas of social policy, Scottish policy-makers and policy targets appear to have achieved “interaction but not interconnectedness” (Beesley 2003).

As discussed in Chapter 3, in order for a country such as Scotland to benefit fully from its investments in STI, it must exploit the interrelationships between science and technology, and between basic and applied research. It might therefore seek to adopt an integrated research and innovation policy to create scientific and technical knowledge and provide the incentives for innovation (Branscomb and Keller 1999) rather than draw distinctions between government support for the science base and technology-based SMEs. However, as the House of Lords report on the RDAs stressed (House of Lords Select Committee on Science and Technology 2003), the primary need is for a clear sense of national direction and purpose with coherent, long-term perspectives and reduced bureaucracy. Although this report commented favourably on the utility of a single Enterprise and Lifelong Learning Department in the Scottish Executive, it noted that there was still a long way to go before Scotland had an “integrated strategy” (House of Lords Select Committee on Science and Technology 2003, p.59).

A key aspect of associative governance means achieving long-term, ongoing networks that do not simply coalesce over a specific issue and then disperse. However, as this chapter will demonstrate, the predominance of the public sector and the gate-keeping roles therein still present significant barriers to the effective operation of STI policy networks in Scotland and militate against an integrated approach to science and innovation.

## **7.2 *Predominance of the public sector***

### **7.2.1 *Dependency culture***

Cooke (2002a) describes associative governance as a system where key regional administrative bodies are interactive and inclusive with respect to other regional actors. He suggests that the regional administration’s role in this system is to facilitate “associativeness among representative bodies inside or outside public governance” without seeking to dominate the process. According to Cooke, this might involve a government agency “letting go” of, or at least sharing, a function

with what he terms “legitimate private governance bodies such as chambers of commerce or business organisations”.

Moss (2002) notes that it is at the level of regions, where hierarchical and sectoral structures of government are often weakest, that expectations in new forms of governance are particularly high. He warns that the reality has failed to live up to expectations, prompting scepticism in the ability of “regional governance” to affect substantially mainstream policy beyond isolated model projects. Moss suggests that self-organised regional governance is widely understood as the classic, even ideal, model of governance epitomised by Rhodes’ notion of “governing without government” (Rhodes 1997). However, where dependence on government agencies and conventional decision-making processes is high, the effectiveness of this model is limited (Moss 2002). Bache (2000) has also tested whether Rhodes’ notion of governing without governance provides an accurate description of regeneration policy networks. Bache uses case studies from Yorkshire and Humberside to show that, while Rhodes’ narrative has value in explaining the transformation of the institutions of the Westminster model, the transformation to governing without government is “far from complete” in terms of economic regeneration policy. In these examples, the decentralisation of policy delivery has been coupled with the centralisation of financial control and, significantly, central government also retains control of many non-financial resources including allocating participation rights within the policy networks studied, which makes central government a pivotal actor within these networks. Bache concludes that policy networks will only be allowed to run their own affairs where they present least challenge to the policies of central government (Bache 2000).

There are direct parallels here with the role of the public sector in Scotland where the Scottish Executive and Scottish Enterprise have traditionally been seen to be driving the STI agenda, rather than merely catalysing its formation. Respondents point to examples in the biotechnology sector where matters that could be devolved or outsourced to the private sector are being held onto by Scottish Enterprise (Interviews with service provider, I160702 and industry representative, I260602). As a result of this, respondents criticise the reliance on public funds and the

“dependency culture” that this engenders (Interviews with service provider, I160702 and biotechnology CEO, I120203), claiming that, in some respects at least, Scottish Enterprise has stifled private enterprise and created its own market failures (Interview with university representative, A200203):

*the Scottish Parliament was very much concerned with the delivery of public sector support to the enterprise sector...there is always some assumption that the public sector's going to fix this. Whereas actually it needs collaboration between the public and private sectors and other sectors (Interview with service provider, I020503)*

*I certainly perceive there to be more of a reliance on soft money north of the border than there is when you go and visit companies in Cambridge who view any government money they get as a bonus rather than the reason that keeps them afloat (Interview with service provider, I160702)*

*there was a view within the research organisations...that the LECs, and Scottish Enterprise in general, was there to hand them money, that this was their God-given right to be given money and they didn't have to justify what that funding was for (Interview with service provider, I150702)*

Some link this public sector mentality to Scotland's inability to deal with the possibility of failure, suggesting that the prevalence of public funding leads to risk aversion and, in particular, an unwillingness to take risks with public money (Interview with academic, A260603).

### **7.2.2 Leadership vs. self-organisation**

Although, from a governance perspective, the state is only one of many institutional actors and fora where the role of government is perceived as merely steering society and the economy, theories of governance that focus on self-organising networks tend to side-step the issue of state power (Newman 2002, p.20). It is, however, crucial to remember that government and government agencies usually retain a dominant role because the relationships within the network are asymmetric and government actors often control access to resources (Smith 1997). Peters (1997) asserts that governments are not simply the “passive recipient of the demands being placed upon them by autonomously forming networks” but have the power to create networks themselves and, moreover, “the clever state actor can...manipulate the network to

produce his or her desired results” (Peters 1997). Taylor (2000) also argues that networks do not emerge fully formed and that the centre can, nevertheless, dominate by determining their operational parameters and objectives (which is what appears to be happening with the examples discussed in Chapters 4 and 5). As central government still has the financial and legal powers and political legitimacy that enable it to impose its preferences on a network, Taylor (*ibid.*) questions to what extent the “hollowing out” thesis holds true.

This seems to be rather at odds with Rhodes’ conception of “self-organising” policy networks (Rhodes 1997) discussed in Section 2.4 (a point to which we shall return in the final chapter) and suggests that there may still be a role for the state in providing leadership for such policy networks. Sabatier and Jenkins-Smith (1993, p.213) also highlight the possible role of professional fora, particularly in promoting learning across coalitions and this then raises the question about the extent to which Scottish representative bodies such as BIA Scotland are in a position to provide leadership or whether, because of the traditional dependence on the public sector discussed above, this role must automatically fall to state actors.

The role of representative bodies is still maturing in Scotland, particularly in the biotechnology sector and there is a question mark over where they fit in the policy-making process. Although bodies such as the BIA would like to be seen in an advisory capacity, feeding in to policy debates (Interview with industry representative, I260602), the Scottish Executive, to date, has had very limited, direct involvement with trade associations and seems to take a very compartmentalised and bilateral approach to engagement which is generally only on specific issues<sup>2</sup>. This contrasts with the situation in Germany, discussed in Chapter 6.

Where there is an active trade association, officials do acknowledge that there can be significant benefits and admit that such organisations can often act as a conduit for

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<sup>2</sup> Very recent developments, discussed in Chapter 8, suggest that this might be beginning to change.

early stage intelligence on, for example, planned European legislation, before it reaches the Scottish Executive through official channels (Interview with policy-maker, P280202). Although the Executive has well-established links with generic business representative bodies such as the CBI, in the early stages of devolution it did not have good links with sectoral trade associations which have traditionally been the domain of Scottish Enterprise. However, these sectoral associations are seen as being more effective than general representative bodies because they can talk in details rather than in the abstract (Interview with policy-maker, P280202). The Scottish Executive therefore regards it as increasingly important to get more directly involved with trade associations and to educate them in the policy process so that they are able to produce better quality responses (Interview with policy-maker, P280202).

The DTI has much closer links with technology-based trade associations than the Scottish Executive. As we have seen in Chapter 4, sectoral sponsorship issues still reside primarily with the DTI which does appear to be more confident in its dealings with such representative bodies. Indeed, it is quite open about the benefits of regular interaction with organisations such as BIA and ABPI and actively seeks their advice on issues such as the factors that influence the competitiveness of their industry, enabling policy-makers to put forward informed comment and drive policy decisions on issues such as the operation of government support programmes for the biosciences sector (Interview with policy-maker, P280303). This can, however, raise concerns about the independence of such representative bodies as discussed in Section 6.3.

The Scottish STI arena spans a panoply of organisations, remits and objectives, so how might one foster a common agenda and inject a sense of leadership from someone with personal authority and influence who is able to use their position to further network goals that are wider than their own personal or organisational goals? Respondents see this issue as very personality dependent: ultimately networks are driven by individuals, who are open and willing to engage, rather than being brought about by institutional change. The previous leader of the Scottish Enterprise biotechnology team was highly regarded and was seen to provide strong leadership

to the sector (Interview with biotechnology CEO, I090603) and many respondents held Wendy Alexander in similar high regard when she was Minister for Enterprise and Lifelong Learning (although as we shall see later in the chapter, she was not always as willing to consult as the following quotes imply):

*someone like Wendy [Alexander] was out consulting with the outside world all the time and probably respected the outside world far more than she respected her civil servants* (Interview with policy adviser, P280203)

*[Alexander] recognised that you had to take people with you, so it wasn't a question of...develop a solution and tell people that's what they're getting. It was a question of – I've had this idea and I think you should...put some flesh on the bones of that and then go and talk to people and persuade them this is a great idea* (Interview with policy-maker, P140303)

However, these individuals were both within the public sector fold and it is much harder for the civil service to open itself up to outsiders, despite the fact that people with different experience from industry might be able to reinvigorate policy thinking within the higher echelons of the Scottish Executive (Interview with director of research institute, R290702). MacIntyre-Kemp (2003) suggests that capturing the knowledge needed to allow the business community to prosper requires the creation of a shared purpose and skilful facilitation which he terms “communocratic leadership”. He argues that the reason that traditional networking and business associations struggle to make the transition to communities of influence is that they are too dependent on lobbying, creating a “them and us” situation rather than involving all the influencers from the start of the policy process to design a shared goal.

But the evidence presented in previous chapters suggests that policy networks in Scotland do not self-organise but need an impetus such as a charismatic leader or government endorsement in the form of, say, a taskforce, as discussed in Chapter 6, around which to coalesce. The industry representative bodies emerging in the Scottish biotechnology sector do not yet seem to be sufficiently mature or homogeneous to provide leadership and are hampered by the traditional dominance

of the public sector in Scotland. This means that the leadership role is automatically granted to government actors (Interview with university representative, A110303):

*Well, I think these external inputs are sought and they are used – there's no doubt about that. But it's more on an organised basis. Anything I've described here or anything I've identified has really been on an organised basis, rather than something that is kind of co-ordinated on a self organising basis* (Interview with policy-maker, P170403)

### **7.3 Lack of “joined-up” government**

Tait *et al.* (forthcoming) note that the need for a more integrated approach to policy is “a consistent theme” throughout the governance agenda in order to remove:

*contradictions, inconsistencies and inefficiencies caused when policies or regulations emerging from different government departments or different levels of government...contradict one another or provide incompatible signals to policy targets* (Tait *et al.* forthcoming).

These authors also suggest that policy integration is needed to deal with the complexity and uncertainty associated with many decisions concerning STI. Charles (Regional Studies Association 2003) explains the lack of integration in this policy arena by pointing out that science policy systems are centred on national actors while innovation and technology policy are increasingly regionalised. In order to achieve successful integration both science and technology policies must be embedded within the regional context and this requires commitment from both national and local policy actors. Moreover, Charles *et al.* (2004, p.25) point to “a high degree of ambiguity about mechanisms for linking science investments to economic development and uncertainty about how to measure their impact” and emphasise the need for STI policy to focus on getting the policy mix and linkages (both within the regional innovation system and across governance levels) right. A key role for regions can therefore be “[b]uilding linkages from all elements of the regional science system into innovation, commercialisation and technology transfer” in part because “regions tend to have a better sense of the full system rather than merely understanding those elements of which the state is in control” (Charles *et al.* 2004, pp.13-14).

Tait *et al.* (forthcoming) suggest that policy integration has become more difficult as the diversity and policy competence of interested stakeholders has increased but for astute business organisations this provides opportunities to increase their influence in the policy process:

*of course, all governments struggle with their own internal problems of not being able to join up people and departments. So anything that we can do which cuts across boundaries, that sheds a wider perspective helps to give them ammunition to do something they want to do*  
(Interview with industry representative, I030702)

Peters (1998) describes how complaints about lack of co-ordination date from the time when government began to separate into ministries and departments. The nature of modern government, with the devolution of powers to government agencies or to separate territorial administrations, further exacerbates this co-ordination problem. Peters (1998) notes that, while decentralisation can have benefits, it produces difficulties in policy co-ordination, particularly as societal issues are becoming increasingly cross-cutting and no longer fit neatly into departmental “boxes”. Peters suggests that the ideal situation of policy co-ordination is one where there is “minimal redundancy, incoherence and lacunae” so that, at the very least, government organisations should be aware of each others’ activities and “make good faith efforts not to duplicate or interfere”. While some duplication and “border spats” must be inevitable, especially in the Scottish situation given the permeable nature of the system boundaries (see Section 3.5), surely this should go beyond “good faith” so that agents of government residing at the different levels of governance are charged with making real efforts to be complementary and mutually supporting?

Taylor (2000) observes that government is seen to be losing its ability to govern because of the increasing dominance of autonomous, self-organising policy networks and that Labour’s response to this “hollowing out” of the state has been to promote “joined-up” government by use of the taskforce as described in Chapter 6. Fragmentation reduces central control, and the existence of such complex networks of organisations that are difficult to steer has reduced government’s capacity to plan and co-ordinate increasingly autonomous and expert agencies. Taylor maintains that



“the problem of policy coherence is endemic to government” where the traditional departmental policy silos limit information flows between departments so that:

*government is traditionally viewed as a series of vertically integrated policy networks under a sponsoring department with few horizontal linkages to separate, but often related, policy networks (Taylor 2000)*

This situation is aggravated by a civil service culture that still tends to be departmental and hierarchical in contrast with the cross-sectoral (public/private/voluntary) partnerships emphasised by the governance approach that relies on a systematic dialogue between policy networks so the taskforce is an explicit attempt by government to impose horizontal linkages on vertical networks (Taylor 2000):

*The governance thesis holds that the centre is losing control to complex policy networks and there is a tension between limited government and government's attempts to control its environment (Kooiman 1993, quoted in Taylor 2000)*

### **7.3.1 Within the Scottish level of governance**

The policy community claims that it wants to hear from real businesses and believes “it’s far easier to lobby government because there’s a process for doing it, either through the parliament or directly with the Executive” (Interview with policy-maker, P020403) but officials concede that the process may be more complicated because of the relative roles of the Parliament, the Executive, and Scottish Enterprise (Interview with policy-maker, P020403).

#### **Scottish Executive**

Interaction between policy-makers and policy targets is further complicated by the enduring partitions between policy domains within the Scottish Executive. Respondents note that, while “the Executive preaches collaborations for everybody else, they’re not so good at doing it internally” (Interview with policy adviser, P280203) and point to the slow impact of the supposedly cross-cutting Science Strategy on intra-departmental working:

*I don't think that it's made a huge impact yet on...that true cross-cutting working. I think things within the Executive are starting to change but I think it's a very slow process (Interview with policy adviser, P280203)*

While the existence of the SSAC and the findings of their first report (Scottish Science Advisory Committee 2004b) are probably encouraging the Executive to reflect on the need to take a more co-ordinated approach to research and innovation policy in Scotland, respondents highlight problems with persistent boundaries. While SEERAD and ELLD are both significant funding bodies, they are regarded as very different entities: the impact of devolution on SEERAD, at least to outside observers, was not significant whereas ELLD was a newly created department (Interview with service provider, I150702). Respondents cite differences in policy approaches between these departments, little evidence of co-ordination and, as a consequence, only fairly recently developing links between Scottish Enterprise and SEERAD (Interview with service provider, I150702).

Likewise, managing cross-cutting relations between ELLD and Health is described as “difficult” and “problematic” and developing a partnership approach involving ELLD, Health and Scottish Enterprise is challenging, partly because of sensitivities over operational rules governing funding and the lack of a centralised, co-ordinating role (Interviews with academic, A220403 and service provider, I160702). Civil servants describe a “hierarchy of contact” between Scottish Executive departments which is largely informal (Interview with policy-maker, P140403) but only a limited amount of policy interaction between ELLD and Health which has in recent times been focused on common interests in innovation and managing the relationships with Scottish Enterprise (Interview with policy-maker, P140403).

Within ELLD itself, STI policy is spread across the Science Policy Unit (now called the Science and Higher Education Branch) and the Innovation Policy Unit (described in Section 3.4.2), where the Science and Higher Education Branch covers high level, over-arching science interests within the Executive and is responsible for research through SHEFC and liaison with Whitehall (principally OST and DFES on science funding matters). The Science and Higher Education Branch also has overall responsibility for delivery of the Science Strategy but it is not entirely clear what

“science” means in this context. The Executive continues to distinguish between the science base and the innovation process. Indeed, the word “technology” was dropped from the Science Policy Unit’s original title because this was felt to be fall within the Innovation Policy Unit’s remit (Interview with policy-maker, P180203). Although the Science and Higher Education Branch describes its remit as “almost anything to do with research”, and maintains that this research can take place “across the whole range of bodies and institutions that can have an impact on the economy and quality of life in Scotland” (Interview with policy-maker, P180203), the clear impression is that “science” is what is happening in the universities and research institutes and not something that involves the company base which is the domain of the Innovation Policy Unit and Scottish Enterprise.

Despite the reserved and concurrent nature of many aspects of science policy and the external influences on innovation from reserved macro-economic powers, there is little interaction between these policy units and the Scotland Office (Interview with policy-maker, P180203). Science and innovation are not seen by Scotland Office officials as being difficult cross-cutting issues (Interview with policy-maker, P240303) and yet co-ordination problems clearly persist:

*any future developments in policy...could be inhibited by the range of things that are already on the ground and until those are actually examined, the ability to perhaps develop a more coherent support system is inhibited. And, to some extent, that’s in the Scottish control between the Scottish Executive, SHEFC and [Scottish Enterprise] but, given that there are DTI and other UK and European Union programmes, it’s not by any means totally within Scottish control (Interview with policy-maker, P170403)*

This complexity, in turn, is seen as having a negative impact on the effectiveness of policy and respondents criticise the lack of a national policy unit in Scotland that is able to take an overview (Interviews with university representative, A200203 and director of research institute, R290702):

*there are different bodies with, in some way, a remit to fund or promote science, technology and innovation, commercialisation of research and so on. There is a very, very complicated set of public sector support mechanisms and I think...this has got to be an issue in terms of efficiency and effectiveness (Interview with policy-maker, P170403)*

Scottish officials inevitably take a positive view of the impact of devolution on policy integration while, nevertheless, acknowledging that challenges remain:

*...there's been a much great element of joined-upness in the devolved administration than there ever was in Whitehall...I think the perception is it works very well here but...for every one who says it works well, there's always challenges and there's always difficulties and there's a big change in mindset (Interview with policy-maker, P020403)*

While this lack of integration between governance levels can sometimes be to the benefit of companies (in that it can permit “double dipping”), it may take lobbying from business to get all parts of government to act coherently (Interview with industry representative, I030702)<sup>3</sup>.

The small country benefits undoubtedly help to rescue Scotland from the shortcomings of these institutional policy monoliths, so that personal contacts between actors from the Executive, Scottish Enterprise and the biotechnology sector can sometimes mean that Scottish players are more nimble-footed than their counterparts at the UK level:

*DTI were quite stunned, I think, by the way that we all came together [on planning a conference]...it is a function of knowing each other so well. You can just sit and say things like that in a way that they probably couldn't do. So the joined-upness of the approach, I think, was quite evident to them at that point...they were very impressed by that ability to just say... “yes, we'll do that” ...and we all knew what parts the others would play (Interview with policy-maker, P140303)*

but there is still much more to be done in terms of joining up STI policy at the Scottish level:

*you've got the pearls, now let's make the necklace (Interview with service provider, I160702)*

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<sup>3</sup> As was the case of the Cambridge Network, described in Chapter 6.

## Scottish Enterprise

As discussed in Chapter 3, the creation of Scottish Enterprise should have provided an institutional basis for policy integration in Scotland because it meant that one body was responsible for training, enterprise, local economic development, regeneration, innovation and land reclamation and had the “latitude in its relationship with the Scottish Office to pursue a number of quite distinct agendas” (e.g. promoting clusters and entrepreneurship in the mid 1990s) (Gillespie and Benneworth 2002). As we have seen above, the Scottish Executive has traditionally relied on Scottish Enterprise as their primary source of industry briefing and conduit for “practice into policy”. However, interviews with respondents from a range of organisations highlight some role confusion within Scottish Enterprise as to whether the agency essentially exists to implement government policy developed by the Scottish Executive, or whether they also play a part in policy development. This distinction seems not even to be clearly understood by Scottish Enterprise insiders:

*our primary objective...is delivery. Developing the policy is good because that helps to support delivery in the long term but...we are paid for delivery* (Interview with policy-maker, P260203)

but contrast this with the same interview:

*there has to be a development element in there. We have...a close relationship with what is actually happening on the ground in the industry, both in the company base and in the university base and that is not the case with [officials in ELLD]* (Interview with policy-maker, P260203)

As an agency, Scottish Enterprise has considerable freedom in how it delivers targets set by the Scottish Executive, which leads in turn to issues of ownership and control (Interview with service provider, I020503):

*Scottish Executive cannot dictate to them [Scottish Enterprise] how they do things but they can lobby them to do things in a particular way so we lobby the Executive to lobby SE* (Interview with service provider, I020503)

and even Scottish Executive officials seem unsure of the boundaries:

*The theory is that we set the high level strategy and that Scottish Enterprise are responsible for the implementation and tactical operation level decisions...The process is not perfect. There are times they do things and we only find out afterwards and we get mildly upset about it (Interview with policy-maker, P140303)*

A turning point in the relationship between ELLD and Scottish Enterprise was the publication of *Smart Successful Scotland* (Scottish Executive 2001b) which is credited with establishing a Scottish approach to enterprise issues that had never previously existed and led to a change whereby policy-making was more focused in the Executive than in Scottish Enterprise (Interview with policy-maker, P020403):

*Because of that...we developed much more of a policy approach and a policy steer for the Enterprise networks. What they gained was legitimacy. It gave them a role that they were delivering Executive policy and for an organisation that has been criticised since it was conceived, that was a huge benefit for them (Interview with policy-maker, P020403).*

Despite this change, Executive officials maintain that Scottish Enterprise was left with “significant room for manoeuvre” which granted them a policy development role as well as having independence on delivering it (Interview with policy-makers, P020403 and P170403) but Scottish Enterprise’s consultation and engagement with stakeholders seems to be primarily on the detail of implementation rather than on the policy itself (Interview with policy-maker, P170403).

But how well does Scottish Enterprise then feed back and communicate with the Executive about the intelligence that is gathered via the Enterprise Network and the implications that this might have on policy? *Smart, Successful Scotland* hinted at a less than amicable past relationship between Scottish Executive and Scottish Enterprise when it spoke of the need to build “relationships of trust” (Scottish Executive 2001b, p.7) (see Section 3.4.2) and, while officials now maintain that this process works well, results reported in Chapter 4 imply that somehow this circle is not being closed. Although the links between the two organisations (Scottish Executive and Scottish Enterprise) are reported to have improved, since devolution and the review of the Enterprise networks, contacts between the two are inevitably in

the civil service mode and “tend to be peer to peer rather than...more inclusive” (Interview with policy-maker, P170403).

Scottish Enterprise could be regarded as a once trail-blazing organisation that has outlived its purpose and become ossified, no longer sufficiently responsive to industry’s needs, having lost track of the biotechnology industry and how the industry has changed (Interviews with university representative, A200203 and biotechnology CEO, I090603):

*I think it has become an end in itself instead of a means to an end* (Interview with university representative, A200203)

*I think the organisation is jaded and I don’t think it is developing policies or strategies which are appropriate or well-informed and they’re never actually implemented...it’s also stopping other things from happening because the public sector support is all within Scottish Enterprise and if they don’t want to support it, then there isn’t public sector support* (Interview with university representative, A200203)

*I know how I’m going to build [my company] but I don’t need Scottish Enterprise to help me do it. If they’d like my advice on how to do it, I’ll give it but they’re not asking the right questions* (Interview with biotechnology CEO, I090603)

Scottish Enterprise is criticised for carrying on with old programmes that are focused on company birth and small-scale start up rather than growth and sustainability<sup>4</sup> (Interview with biotechnology CEO, I090603) and observers call on them to concentrate on “big ticket” expenditure items, such as infrastructure, rather than organising networking events (Interview with service provider, I160702). Although Scottish Enterprise’s activities are purported to be geared towards eventual handover to the private sector, commentators do not see this happening in practice (Interview with service provider, I160702) and point to a contradictory strategy of customer retention. This means that Scottish Enterprise adopts an insular approach to

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<sup>4</sup> Although this appears to be changing, at least in the rhetoric of Scottish Enterprise policy statements, with an attempted shift in emphasis away from business birth rate towards sustainability (Scottish Enterprise 2002).

programme delivery in order to keep people in the SE network and is reluctant to use third party organisations. The result is that they appear to prefer to maintain a direct relationship with a firm rather than working through an industry representative body (Interview with service provider, I020503). Indeed, some respondents are quite blunt in their assessment of relations with Scottish Enterprise:

*they just won't engage people in debate. They won't take you into their confidence...I trust [others with whom I work in this network] and I can talk to them and I know that I won't get screwed. I don't trust Scottish Enterprise (Interview with service provider, I020503)*

However, others (significantly, from outside Scotland) are far more content with the working relationship between Scottish Enterprise and the biotechnology industry, describing how Scottish Enterprise encouraged the BIA to open a Scottish office and take over various activities that enabled Scottish Enterprise to redirect resources to other strategic priorities within the biotechnology sector (Interview with industry representative, I030702). However, the relationship between industry and civil servants within the Scottish Executive has apparently been slower to develop largely because they do not share activities in the same way (Interview with industry representative, I030702).

Representatives from Scottish Enterprise have talked publicly about the connection with the Scottish Executive making life easier for Scottish Enterprise than the equivalent relationship between the English RDAs and the UK government<sup>5</sup> and describe interaction “on a whole range of things from straightforward information to inform discussions with the Minister; to accompanying the Minister on visits” (Interview with policy-maker, P260203). They acknowledge that in the past there has been an arm’s length relationship between the Executive and industry because of the presence of Scottish Enterprise. The relationship between Scottish Enterprise

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<sup>5</sup> *Thistle Bioscience Forum*, BIA Scotland Annual Meeting, Edinburgh, 13-14 February 2003.



and ELLD is not yet a close one (Interview with policy-maker, P180203) and steps have only recently been taken to formalise it:

*we've just instituted regular meetings [with the Innovation Policy Unit] ...they come up here for a day every couple of months and sit in this office and we bring our clients to see them* (Interview with policy-maker, P260203)

but tensions remain:

*I don't know how much influence they [Scottish Executive] actually have on the day-to-day running [of Scottish Enterprise]...I imagine there are tensions there* (Interview with policy adviser, P280203)

A former insider notes that these two very powerful public sector bodies lack mutual respect and often seem to be at odds with each other (Interview with university representative, A200203). Despite the integrationist rhetoric, animosity and professional jealousies remain between Scottish Enterprise and Scottish Executive who have an imperfect understanding of each other's responsibilities and are therefore less able to give out one consistent message to industry, academia, and the public (Interview with university representative, A200203). Respondents suggest that the answer is either for a more joined-up approach, or more radically, to disband Scottish Enterprise and transfer a slimmed down version of their current role to ELLD, which would result in one strategy and one government body developing relationships with its user community (Interview with university representative, A200203). Ultimately, however, it probably suits the Executive's political purposes to maintain the *status quo*:

*the Executive sometimes like to have their cake and eat it and the Scottish Enterprise system is a very convenient means of them handing over responsibility and blame for things they would actually like to do for*

*political reasons but would not want to be accused of it being strictly on a political agenda* (Interview with university representative, A311002)<sup>6</sup>

## **SHEFC**

Although, as noted in Chapter 3, this study is not about higher education policy *per se*, and does not therefore address the role of SHEFC to any great extent, the funding council is still a key policy actor. It has a dominant role in the creation of the science base in Scotland and is playing an increasing role in the economic development agenda through its work on knowledge transfer. As such, SHEFC was a key partner in the Technology Ventures initiative and, indeed, direct relationships are now much stronger between the Scottish Executive and SHEFC, and Scottish Enterprise is no longer seen as driving the knowledge transfer agenda to the same extent:

*Ten years ago, Scottish Enterprise would have said we need to get these people round the table because this is what needs to happen. It seems to me now that Scottish Enterprise gets invited to the table, rather than is kind of promoting it and instigating it* (Interview with university representative, A200203)

In the recent past, the relationship between Scottish Enterprise and SHEFC has been described as “a bit stormy” (Interview with policy-maker, P260203) but they are now reported to be moving towards a better working relationship following a Memorandum of Understanding between the two agencies (Interview with policy-maker, P130503). Scottish Enterprise’s relationship with SHEFC is clearly mixed and problems remain, relating to the disparity in staff numbers in the two organisations and fundamental cultural differences. SHEFC has a policy of “no surprises” and is more inclined to try to take stakeholders with them rather than introduce major policy initiatives without the support of their sector (the surprise announcement of the ITI initiative being a case in point – see Section 4.5.3). These

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<sup>6</sup> As discussed in Section 4.5.3, the research design did not encompass any specific iteration of findings between informants. The views of all respondents were given equal weighting in the analysis and, as detailed in the Appendix, Scottish Enterprise representatives were of equivalent seniority to other interviewees in the sample and were therefore in a position to speak in a critical context themselves.

disparities make it difficult for the two bodies to behave in a totally joined-up manner and a lot of effort has to be devoted to maintaining the relationship which “would be helped enormously by there being more opportunity for sharing ideas before [they are taken] forward” (Interview with policy-maker, P130503).

SHEFC’s key stakeholders generally believe that the funding council consults appropriately, listens and gives feedback and, as a consequence, this interaction appears to have an impact “or if it’s not going to have an impact, they’ll tell you why” (Interview with service provider, I020503). So why does SHEFC appear to be more successful in its policy interactions with users than Scottish Enterprise? Significantly, some ascribe this to very different corporate styles where SHEFC, because it has a much smaller resource, sees its role as delivering through others (Interview with service provider, I020503).

Scottish Enterprise clearly does not have the same ongoing dialogue and relationships with its stakeholders in the university sector and is censured for its poor understanding of higher education (Interview with university representative, A110303) and is further criticised for its lack of awareness of national (UK) issues, resulting in a perceived lack of integration between national policies and local economic development policy as developed by Scottish Enterprise:

*there could be a higher degree of awareness within Scottish Enterprise of what policies are emanating from Westminster that have a profound effect on their operation* (Interview with policy-maker, P130503)

Ultimately, it is apparent that, although efforts are underway to improve policy integration within the Scottish level of governance, there is still much to be achieved:

*The priorities [of key government agencies] are not the same and there are enormous areas of overlap* (Interview with policy-maker, P130503).

### **7.3.2 Between governance levels in the UK**

Benneworth and Roberts (2002) find that the network approach has improved the quality of Scottish policy-making (based on research in the context of policy for environmental sustainability) but that building such “local regimes” (comprising local government, local firms, government departments, pressure groups, *etc.*) is

difficult when local actors have to deal with issues beyond their spatial boundaries. Likewise in STI policy, the new multi-level approach to policy-making means that research and innovation policy initiatives must be developed at the national, trans-national and the regional level which leads to a “governance gap of poor integration and co-ordination” (Edler *et al.* 2003, p.11).

As already discussed in Chapter 3, political devolution is building on a well-established system of administrative devolution in Scotland. In Section 3.6 it was noted that, prior to devolution, the territorial offices were tied into the Whitehall policy network through “a dense network of ministerial and official committees and regular working contacts” (Keating 2002). However, the devolution settlement has meant that “over large areas of public policy, there is now no ‘centre’ at all” (Keating 2002). Also, prior to devolution, Jeffery (1998) expressed concern that the mechanisms to facilitate Scottish-UK co-ordination were unclear, warning that this lack of formal procedures might cause particular difficulties if party majorities in Holyrood and Westminster were no longer congruent:

*It is unclear how UK traditions of adversarial party politics will impinge in these circumstances on the necessity and practice of power-sharing between units of government inherent in a devolved system of government (Jeffery 1998)*

In describing the regional governance of science and innovation in the North West of England, Perry (2003) highlights both the lack of integration between national and regional science policy and between science and innovation strategies, where policy development and implementation processes remain parallel rather than fully integrated across governance levels, such that “the relationship between the new regional ‘science’ policies, regional roles in innovation and national science policy remains disjointed and muddled” (Perry 2003). Instead, there is a “complex and fluid pattern of interaction between regional and national actors within a multi-level system” which is characterised by permeable policy boundaries, uneven responsibilities across territorial levels, and a lack of any obvious interconnections between the science and innovation strategies in the North West. As such, her case study of a newly emerging regional STI governance system has strong resonances

with both the situation within the Scottish level of governance and between the Scottish and UK levels.

Some DTI officials admit to not having a clear understanding of the detail of Scottish STI policy (Interview with policy-maker, P280303) and policy targets point to persisting asymmetries and disconnections between national (UK) and local STI initiatives:

*I'm not sure if there's any overlap between the DTI and the Scottish Executive. It seems terrible that they're both trying to do the same thing and an awful waste of resource* (Interview with biotechnology CEO, I280802)

*It's my understanding there's very little connection, you know, between those funds [University Challenge Fund] and what they're doing in Scottish Enterprise* (Interview with service provider, I020503)

There is also a prevailing hierarchy of knowledge within the policy-making community:

*We have very good relationships with the DTI in the biotech [team]...[but] I think there's very much this mentality of – we're here and you're there and we know everything, you know nothing* (Interview with (Scottish) policy-maker, P140303)

The DTI's Innovation Report (DTI 2003b) claims that the department will work in close partnership with the RDAs and devolved administrations (DAs) to ensure that national policy and priorities “take full account of devolved and regional priorities” and that they “also shape more effectively what is delivered” in terms of regional innovation. Although the report states that “[e]ffective cooperation amongst the UK Government, DAs and the RDAs requires a consensus on defining success and

assessing progress” (DTI 2003b, p.106), the primary focus of this report seems to be on the English RDAs<sup>7</sup> and not on co-ordination across the new levels of governance.

Although representatives of the Scottish biotechnology sector appreciate the continuity of senior DTI officials and Ministers such as Lord Sainsbury, believing that there is no one of the same calibre in Scotland (Interview with biotechnology CEO, I090603), middle-ranking officials in the DTI Biosciences Unit have few contacts in Scotland:

*Fairly limited...that interaction is largely with Scottish Enterprise rather than the Scottish Executive. I have to say that when we've had formal consultation exercises with other government departments...we've had...very little response on anything from any of the devolved administrations...something we probably ought to be doing more of when there are issues that affect Scotland per se is keeping them informed of the discussion we have with the corporate body [i.e. pharmaceutical firms] (Interview with policy-maker, P280303)*

In turn, some Scottish biotechnology commentators report poor integration between the governance levels:

*I think the DTI's biotech team views Scotland as, at best, an irrelevance and, at worst, a threat because of the ability that Scotland has, with its small size and more cohesive structure, to be dynamic. And I think the DTI views that dynamism as aggression. I know that words have been had in the past about those damn Scots usurping the UK position. So I think there is still an issue with regard to separation and certainly the collaboration potential, I think, is not as strong as it should be (Interview with service provider, I160702)*

Some express disappointment that trade and industry policy was not fully devolved to Scotland “because the DTI just isn't interested in Scottish specific trade issues”

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<sup>7</sup> In the context of responding to the House of Lords Science and Technology Committee's report (House of Lords Select Committee on Science and Technology 2003) which called for simplified performance measures to take better account of the importance of science and technology to economic development.

(Interview with university representative, A110303) and others find it much harder to access business services at the DTI level:

*organisations like Scottish Trade International...are very accessible. That is absolutely not the case with the DTI. The DTI has all kinds of barriers in place to prevent access by people who use their services* (Interview with biotechnology CEO, I120203)

But, in general, the UK bioindustry describes a “very open and supportive” relationship with the DTI (in a way that firms in Scotland are much less likely to describe relations with Scottish Enterprise) to the extent that:

*[DTI] trust us with policy thinking as they develop it and trust us to keep confidence and we have sometimes a relationship supporting Ministers' initiatives directly* (Interview with industry representative, I030702)

However, other observers view the Scottish Enterprise model as positive compared with the more centralised DTI model:

*[Scottish Enterprise] has enough connection – enough pressure from the centre but it is somewhat independent...I suspect if Scottish Enterprise had been set up today it would be a wing of the Scottish Executive as in the DTI. The DTI don't let their biotechnology go* (Interview with director of research institute, R290702)

#### **7.4 Gate-keeping role of key government agencies**

The governance approach can lead to the blurring of state-society roles which can, in turn, place an emphasis on the important position of intermediary organisations (Ansell 2000). It is conceivable that such an intermediary function might be fulfilled by the “ideal typical” RDA which Halkier *et al.* (1998) view as a multifunctional agency that is semi-autonomous from central administration. This autonomy grants the agency the latitude to adopt “integrated” policy strategies and to act as a hub in a web of public and private actors. This agency might in turn act as a *gateway* in many-to-many relations in order to facilitate interactions between non-communicating parties (Ansell 2000).

This implies that less bureaucratic, hierarchical institutions might be more willing to engage with users: interviewees' comments about the contrasting corporate styles of

SHEFC and Scottish Enterprise would certainly seem to bear this out at the Scottish level. Indeed, Mytelka and Smith (2002) suggest that, in contrast to more hierarchical organisations (such as the International Monetary Fund and the World Bank), opportunities to influence policy-making have been far greater in ostensibly weaker organisations that allow for greater diversity, such as the OECD and the European Community.

Bureaucratic organisations tend to compartmentalise information and resources which in turn leads to boundaries between policy initiatives. The networked approach assumes a shared jurisdiction and authority and Ansell (2000) describes how a shift from a bureaucratic to a networked polity can lead to a more inclusive attitude that focuses on integrative solutions rather than specific programmes. State actors with a high degree of centrality in the network should be in a position to provide “facilitative leadership”, adopting a critical brokerage role in bringing actors together. Where this brokerage role requires mobilisation across departmental boundaries or across the public-private divide, Ansell (*ibid.*) suggests that it may be facilitated by the creation of semi-autonomous agencies, but in Scotland it would appear that the key government agency, Scottish Enterprise, is too focused on dedicated programmes (for example the Proof of Concept initiative) rather than on integrative solutions and is too insular in both its policy development and delivery roles (Interview with service provider, I020503):

*[Scottish Enterprise] is anything but an open organisation and they do, by and large, see themselves as setting the scene and setting the policy...there is a need for a greater openness as to the decision-making process...there is definitely a need for them to respond to the user community...What you don't do is make a decision and then retrospectively try and justify it (Interview with university representative, A311002)*

The BIA's annual report (BIA 2002, p.25) describes the establishment of BIA Scotland and the fact that the trade body is now developing direct links with the Scottish Executive and Scottish Parliament without the need to rely as heavily on the efforts of Scottish Enterprise as was previously the case when Scottish Enterprise essentially acted in lieu of a trade association. Prior to the establishment of the Parliament, this was seen as working quite well (Interview with biotechnology CEO,



I090603) but the industry recognised the potential for conflict and the need for an independent voice:

*Scottish Enterprise sort of half accept it but half resent it and so we do get some funny reactions when we actually quotes "lobby" 'cos they're not used to it in Scotland (Interview with biotechnology CEO, I090603)*

Nevertheless, while firms do have opportunities to talk directly to Ministers and government, Scottish Enterprise's very success is seen as being responsible for starving policy-makers of interaction with industry (Interview with industry representative, I030702) and there is still the view that, if the Executive wanted an opinion on some aspect of biotechnology, it would consult Scottish Enterprise rather than industry directly (Interview with service provider, I160702). Scottish Executive policy-makers are rather unaccustomed to dealing directly with industry precisely because, in the past, they have always relied on Scottish Enterprise as a conduit for industry views (Interviews with biotechnology CEO, I090603 and industry representative, I260602). This requires a cultural change for some Scottish Executive officials in order for them to reach outside into the open industry environment and recognise that other bodies such as BIA also have considerable expertise in the biotechnology sector (Interview with industry representative, I030702). Other observers are more forthright, claiming that civil servants in the Executive do not have the skills and experience to deal directly with firms (Interview with university representative, A200203).

Moreover, it is convenient for the Scottish Executive to use Scottish Enterprise as a buffer (Interviews with university representatives, A311002 and A200203) and this fragmentation is seen to suit the Scottish Executive's purposes (Interview with service provider, I150702):

*there is a convenience in having a bit of a heat shield in Scottish Enterprise and although there is a lot of talk about, you know, downsizing, streamlining, etc., I think ultimately they quite like having an arm's length organisation (Interview with service provider, I160702)*

In the end, the question is really whether we believe that knowledge flows and influence in the form of company intelligence and the views of industry flow back

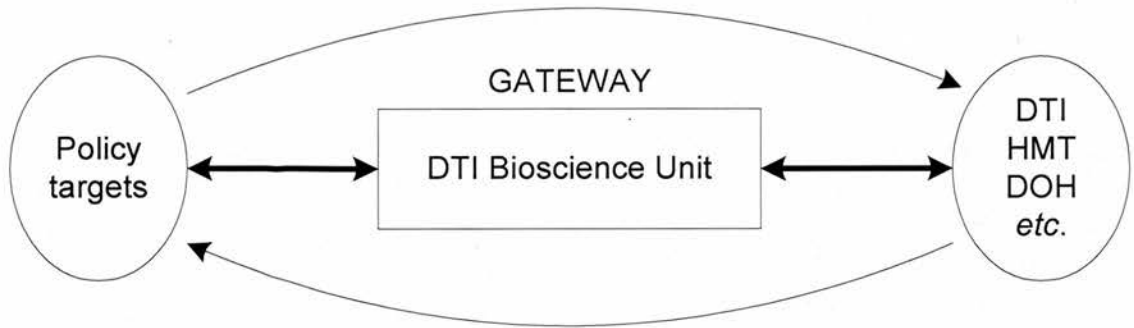
and forward through the Scottish system of innovation and thereby inform the policy process. Ansell (2000) contrasts “dense” networks which have high degrees of connectivity and a predominance of symmetrical relationships with “sparse” networks which have low degrees of connectivity and are predominated by asymmetrical relationships. It is in Scottish Enterprise’s interest to promote this asymmetry in order to restrict access to government and preserve its status so that, rather than being a virtuous circle where multiple interactions between Scottish Enterprise, the Scottish Executive and firms help to inform the policy process, it is actually more of a linear sequence. Perhaps a better analogy is that of an hour glass whereby Scottish Enterprise is positioned in the middle and everything is channelled through them:

*I think possibly the dialogue is more between the Executive and [Scottish Enterprise] on a daily basis than it is between the Executive and the private sector...I think it's more of a two-way street with [Scottish Enterprise] in the middle and I think there is a certain amount of vested interest within [Scottish Enterprise] (Interview with service provider, I160702)*

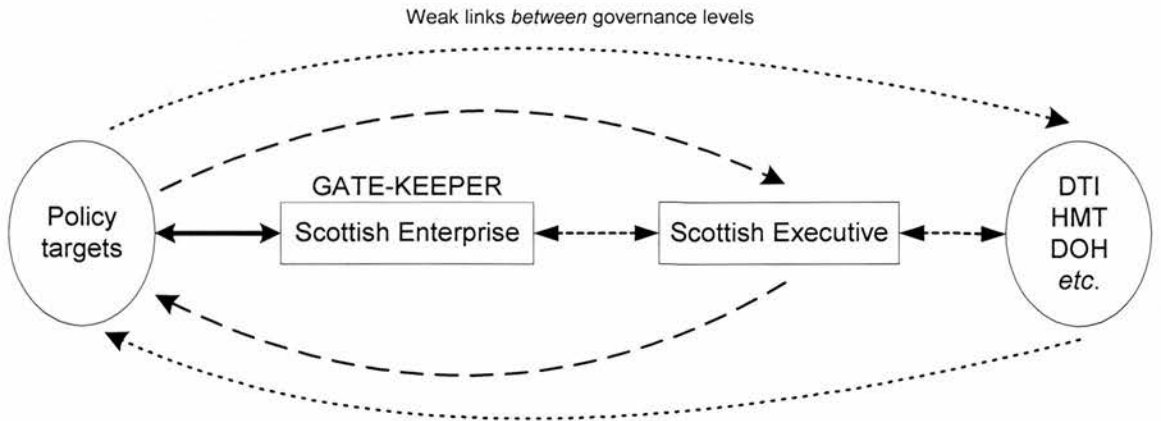
At the UK level, the sponsorship role of the DTI Bioscience Unit gives it a specific remit to act as a conduit for the two-way exchange of information between policy targets (primarily biotechnology SMEs and pharmaceutical firms) in the life sciences sector and other UK government departments such as the Treasury (HMT) or the UK Department of Health (DOH) without preventing direct contacts between these two groups of actors (see Figure 7.1). This contrasts with the Scottish governance level depicted in Figure 7.2 where Scottish Enterprise mediates relations between policy targets in the bioindustry and policy-makers within the Scottish Executive but without seemingly a clear remit to channel industry views to policy-makers in order to inform policy. Direct links between Scottish policy targets (especially those from industry) and the Executive are weak, and only a very few of the Scottish policy targets (*e.g.* one or two of the larger biotechnology SMEs) have any direct engagement with the UK governance level. In this sense, Scottish Enterprise is acting as a *gate-keeper* that regulates and restricts flows of knowledge and influence in the Scottish level of governance rather than as a *gateway* that facilitates knowledge flow and government-industry policy interaction. The contrasting roles

played by Scottish Enterprise and the DTI Bioscience Unit may be explained in part by their status within government: in the case of the UK level, the intermediary is a peer department whereas in Scotland the intermediary is a government agency trying to protect its privileged knowledge base in an asymmetric power relationship with its parent department.

**Figure 7.1** Government-industry policy interaction at the UK level of governance



**Figure 7.2** Government-industry policy interaction at the Scottish level of governance



## 7.5 Reprise

Beesley (2003) notes that, while the necessity to establish communication, collaboration and co-operation between industry and research is generally accepted, there remains an unwillingness or inability for either party to liberate themselves from the linear perspective of science. Until this occurs, rather than the interacting networks of the triple-helix model (Etzkowitz and Leydesdorff 2000), Beesley (2003) suggests that innovation systems will continue to be portrayed as interacting but not interconnected systems. A directly analogous situation exists for the policy model being sustained within the Scottish system of innovation post-devolution where policy-makers and policy targets from technology-based companies and the research base are interacting but are failing to exploit the full policy learning potential of these interactions. This failure to learn results from institutional separation both between and within key government departments and agencies, weak relationships with policy targets, and different personal and institutional motivations that are not necessarily oriented towards effective associative governance.

There are pockets of good practice within existing or developing networks (such as SHEFC's strategic dialogue with stakeholders) but, as the Scottish Science Advisory Committee (2004b) and many of the respondents in this study have reported, there is still a pressing need to "join up" Scottish Executive funding and policy initiatives. This is further illustrated by some unambiguous examples of recent policy development in a vacuum, such as the establishment of the ITIs (see Section 4.5.3) and the development of *Smart, Successful Scotland*:

*there was no consultation whatsoever about Smart Successful Scotland. It was announced in a parade of...publicity and...we did lots of...selling of it in a way. But it wasn't consultative at all and it was very much dreamt up in Meridian Court and Atlantic Quay<sup>8</sup>...and while it was written as, you know, a policy document for the Enterprise networks, it*

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<sup>8</sup> Synonyms for ELLD and Scottish Enterprise respectively.

*effectively has become our economic strategy* (Interview with policy-maker, P020403)

There is a recognition that debate and discussion can inform policy but there is not yet a well-established, structured, integrated mechanism in Scotland to involve users in agenda-setting in anything that might resemble a fully functioning policy network. However, learning takes place over time and we should bear in mind that Scotland is still in the early stages of devolution and learning how to function successfully in a multi-level governance environment. This is an evolving situation and key questions remain in terms of how the SSAC's role will develop and what might happen to Scottish Enterprise: whether, for example, Scottish Enterprise might lose its gate-keeping role as trade associations develop their relationship with the Scottish Executive directly. As we shall see in the final chapter, recent developments indicate that the Scottish Executive might be reasserting its control over Scottish Enterprise and taking steps to weaken this gate-keeping function. However, the reasons behind this may well be inspired by politics rather than a desire to promote good associative governance.

## Chapter 8 Concurrent Power: Closing the Governance Gap

*Interdisciplinary work provides not so much the opportunity to learn about new things but to open our eyes to different ways of knowing the familiar (Rowland 2004)*

### 8.1 Introduction

This thesis set out to explore the theme of “Concurrent Power” in the context of science, technology and innovation (STI) policy in Scotland. As discussed in Chapter 3, this term refers to policy competences that are shared between Westminster and Holyrood and typifies the concept of multi-level governance. However, devolution was intended not only to transfer powers downwards territorially but to foster a new type of politics with more participation that would lead to more consensus politics, stronger Parliamentary committees, and power sharing between the Executive, Parliament and the civil service. This research has therefore extended the concept of concurrent power to study relationships between these key policy actors in order to examine how policy responsibilities for STI are negotiated and co-ordinated and to determine whether Scottish devolution has resulted in a more integrated policy approach in this area. Finally, a key focus of the research has been on whether devolution has had a significant impact on the *process* of policy-making for STI. It has adopted an ethnographic approach to examine the interactions between policy-makers and policy targets to explore whether this process has become more interactive and participative.

The theoretical context for this research was situated at the nexus between the systems of innovation literature and the political studies literature on governance and the role of policy networks. Drawing on this theme of concurrent power, the research has addressed two perceived lacunae in academic deliberations on STI policy: on the one hand, innovation systems models focus on interactions between firms and learning processes within firms and pay less attention to policy interactions and policy learning. On the other hand, the governance approach in general, and the

policy networks model in particular, is more usually applied to areas of social policy and neglects STI policy and its particular challenges. By considering the topic from this dualist perspective, the research has looked at a range of relevant actors and their interactions in a novel policy context and has used these observations to test existing theories about policy networks and innovation systems in a complex and changing political system. This approach has advanced understanding about emerging systems of multi-level governance and has contributed to the growing and interdisciplinary knowledge domain of the regional governance of science and innovation.

This research has shown that devolved Scotland might be on the cusp of achieving good associative governance in the life sciences but is held back, not by the concurrent nature of the policy domain, but by the lack of co-ordination between institutions which continue to exhibit a number of characteristics that pre-date devolution; a dominant public sector that is still operating in an essentially top-down, consultative rather than participative policy network mode; and an adherence to an old way of thinking about STI policy that continues to focus on the science base rather than taking the opportunity to develop an integrated and inclusive research and innovation model. The main obstacles to effective associative governance therefore lie *within* Scotland in terms of co-ordination, integration and engagement with policy targets, rather than *between* levels of governance: the light that devolution has shone on the SSI has shown that long-standing issues are still more problematic than any that devolution might have brought about. A key conclusion of this research is that the governance gap that must be closed lies not between Scotland, the UK and Europe but between the Scottish Executive, Scottish Enterprise and Scottish policy targets.

## **8.2 Research questions revisited**

Reflecting on the empirical data discussed in Chapter 4 and elsewhere in this thesis, it is clear that, within the Scottish level of governance, network-based interactions do take place but that there is a lack of cohesion. Moreover, the prevailing model is still one of involving policy targets in *ad hoc* (and indeed often *post hoc*) consultation rather than in agenda-setting. Analysis of various key policy documents (discussed

in Chapters 3 and 5) also confirms that policy targets are not yet working effectively with government to identify jointly the objectives for government policy. Hence, the Scottish Executive still seems to be entrenched in the rhetoric of partnership without actually demonstrating real commitment to the engagement of policy targets in the policy-making process. As demonstrated in Chapter 5, post-devolution activities such as the SSAC have not been granted the scope to develop into fully-fledged policy networks but instead merely serve to reinforce this consultation model.

Our findings therefore support the general view of the present government's approach which fails to recognise that participative policy-making goes beyond "communication" to genuine dialogue (Parsons 2001) and we have adopted the terminology of "interaction but not interconnectedness" (Beesley 2003) to describe the process of engagement in STI policy in Scotland where a key challenge for Scotland is to retain the good interpersonal contacts that exist by virtue of the small country size without reinforcing the exclusive "star system" (see Section 4.5.2). Furthermore, we have questioned the validity of the self-organising network model (see Section 7.2.2) which is unable to flourish in a policy environment dominated by the public sector. We conclude from this that, if STI policy networks exist at all in Scotland, then we are seeing what Rhodes and Marsh (1992) would term an issue network rather than a policy community<sup>1</sup>.

So, has participation in the policy-making process been facilitated by the establishment of the Scottish Parliament? Many of the key policy drivers for STI are reserved to higher levels of governance so that, for the Scottish life sciences sector in particular, and probably the Scottish system of innovation more generally, our findings imply that the Scottish Parliament is more or less an irrelevance despite its achievements in promoting participation in other areas of public policy. This

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<sup>1</sup> As discussed in Section 2.4, an issue network involves primarily policy consultation rather than shared decision-making because there is no shared understanding either among interests or between the interests and the bureaucracy.



reinforces earlier commentators' views (Kerley 1999; Sloat 2000a) that this is not really a Parliament for business, and emphasises the notion that the governance ideal is working in areas of social policy but not STI. The parliamentary committees and cross-party groups that are the main conduit for participative governance do not have a history of engagement with the biotechnology industry because so little policy affecting this sector is actually devolved to the Scottish Parliament. Moreover, there is an underlying concern from industry that the Parliament has the potential to damage the competitiveness of the Scottish life sciences sector if it started to introduce additional layers of bureaucracy.

However, before we condemn the policy-makers entirely for their lack of engagement with this area, it needs to be borne in mind that STI is not a homogeneous policy field that relates in a straightforward way to politics: unlike education or health, STI policy is not a cohesive entity, nor is it necessarily seen as a core function of government. Additionally, the equivalent "civil society" that is necessary for good governance in other policy domains is only gradually beginning to emerge in the Scottish life sciences sector. It seems rational to conclude that the causes of this deficit in associative governance owe something to the devolution settlement and the concurrent character of STI policy but are also related to the nature of STI policy itself.

Nevertheless, there is still little firm evidence of changes in practice or outcomes as a result of interactions between policy-makers and policy targets that might be termed "policy learning". While Rhodes' approach suggests that policy networks can link sub-national bodies to national bodies (Smith 1997, p.84), the current data highlight the poor integration *between* governance levels which supports Benneworth and Roberts' (2002) finding that building networks is difficult when local actors have to deal with issues beyond their spatial boundaries. Likewise in STI policy, the new multi-level approach to policy-making means that research and innovation policy initiatives must be developed at the national, trans-national and the regional level which leads to a "governance gap of poor integration and co-ordination" (Edler *et al.*

2003, p.11). In turn, Scottish biotechnology commentators observe poor integration between the governance levels, and the following quote bears repetition:

*I think the DTI's biotech team views Scotland as, at best, an irrelevance and, at worst, a threat because of the ability that Scotland has, with its small size and more cohesive structure, to be dynamic. And I think the DTI views that dynamism as aggression. I know that words have been had in the past about those damn Scots usurping the UK position.*  
(Interview with service provider, I160702)

The data point to the lack of a co-ordinating national policy unit in the Scottish Executive that is able both to integrate within Scotland and co-ordinate with the rest of the UK; to take an overview of Scottish STI policy; and to undertake a “boundary spanning role” in order to facilitate more productive MLG relationships. In theory, the DTI has this role for the whole of the UK but the collected evidence from DTI representatives and others indicates that it does not do this successfully and sometimes has difficulty managing its dual role as both a UK-wide government department and the lead department on STI policy for the English regions. These conclusions chime with the recent interim findings from the ESRC’s Devolution and Constitutional Change Programme<sup>2</sup> which report that, although devolution across the UK has been smoothly implemented, it is a fragmented project, lacking an overarching UK-wide purpose. These researchers find no evidence to suggest greater participation but do report that intergovernmental relations are under-structured and the role of the centre unarticulated. At some stage in the future this is a situation that would be exacerbated if the Scottish and UK governments were no longer congruent.

In Scotland, we have seen that the public sector dominance, and the gate-keeper roles played by some of these government actors, obstructs integration and learning. It seems reasonable to assume from the evidence that we will not achieve effective policy networks until these government actors properly co-ordinate. Above all, the context is still one of promoting the linear model of innovation, with a continuing

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<sup>2</sup> Reported by Programme Director, Professor Charlie Jeffery, Politics Seminar, University of Edinburgh, 20 October 2004. See also <http://www.devolution.ac.uk/> (last accessed 25/10/04).

focus on the supply side (*i.e.* the science base in Scottish universities) and a disregard for the demand-side role that could be played by innovative Scottish firms. This ongoing separation of science and innovation policy is reflected in the separation of responsibilities between the Scottish Executive and Scottish Enterprise. As such, the Scottish Science Strategy, which augured well in terms of a new emphasis on science post-devolution, actually missed a great opportunity to promote an integrated research and innovation policy for Scotland.

### **8.3 Recent developments**

One of the challenges of undertaking contemporary research on such a political system is that the situation is often dynamic, with changes occurring over time. Five years into the Scottish devolution experiment, the actors who are charged with weaving a new fabric of governance are still maturing and still heavily influenced by past, pre-devolution structures and repertoires. As this study drew to a close a number of announcements were made by the Scottish Executive and others that have the potential to shape the future development of policy networks within the Scottish system of innovation.

At the beginning of April 2004, the Enterprise Minister announced that the Scottish Executive's *Smart, Successful Scotland* strategy was to be "refreshed" to take account of developments in the Scottish economy, with the revised version expected to be published in autumn 2004. *Smart, Successful Scotland* was first published in 2001 to give strategic direction to the enterprise networks, although, according to the Minister's press release, it has since "gained wider acceptance and endorsement as an overall enterprise strategy for Scotland" (Scottish Executive 2004a). Among other things, the revised strategy will apparently aim to ensure a better link-up between the strategy and other cross-cutting policy areas such as social justice, equal opportunities, rural development and transport.

However, recent press criticism of initiatives to help Scottish business to create economic growth (Sunday Herald 2004a) would indicate that the Scottish Executive and Scottish Enterprise are still failing to "join up" their policies. Indeed, the newly

appointed Chief Executive of Scottish Enterprise has indicated publicly that he wishes to divest the agency of many of its social responsibilities and “return to a sharper focus on pure economic development” (Sunday Herald 2004b): while welcomed by the business press, this statement would appear to run contrary to the Enterprise Minister’s desire to link the government’s social and economic agendas.

A recent development of greater relevance to the argument of this thesis was the announcement of a new government and industry advisory body to link the Scottish Executive and Scottish Enterprise with senior figures in the life sciences industry. This joint advisory body “will give senior industry figures an opportunity to participate in policy-making, and allow the Scottish Executive and Scottish Enterprise to tap into their expertise”; it will be chaired by Scottish Enterprise (Scottish Executive 2004b).

It is clear from interviews reported in Chapter 4 that the Scottish Executive has not had the necessity for direct interaction with the biotechnology sector in the past, but this relationship is changing as a more vocal and policy-aware sector is beginning to mature. Companies within the Scottish life sciences sector criticise the Enterprise Network for engaging with individual companies in a piecemeal fashion rather than interacting in a holistic way with the industry so that, up until recently, the feeling expressed by leading industry figures was that they were not very high on either the Parliament or the Executive’s agenda in Scotland because “Scottish Enterprise had it all taken care of and they didn’t need to worry about it” (Interview with biotechnology CEO I090603). It would appear, therefore, that this new advisory body is a response to industry lobbying for more regular, scheduled interactions between both Scottish Enterprise and the Scottish Executive and the bigger companies and the BIA. Some informants recommend a “Scottish PICTF” to help focus the minds (Interview with industry representative, I040702) and others suggest that:

*we could probably go a long way by having a small group of people [in Scotland] who have the relevant experience to be able to tell you or remind you...and perhaps prioritise one or two simple things that could*

*be done first in order to receive or establish the flow of information*  
(Interview with biotechnology CEO, I280802)

Significantly, according to the Executive's press release, this new advisory body's role will be to "provide expert advice on the *implementation* (emphasis added) of the next Scottish Enterprise Life Sciences strategy for 2004-2007" (Scottish Executive 2004b). It is undoubtedly instructive to contrast this statement with comments from the Scottish director of the BIA, quoted in the press following the announcement of this new body, who claimed that "ministers and experts at Scottish Enterprise did not understand the industry they were meant to be helping to develop" and said that "the failure to consult properly meant policies were *developed* (emphasis added) without understanding what was needed to help the key sector grow" (Williamson 2004)<sup>3</sup>. This new joint body is certainly to be welcomed if it brings together all of the key players in a constructive dialogue but these contrasting quotes suggest that it is still predicated on the consultation model discussed in Section 4.2.1. This group cannot be considered to be a policy network until there is evidence that the industry members are actually having an impact on the shape and structure of new policy rather than merely advising on the implementation of pre-existing policy designed by the government actors. There is also an underlying agenda that would have been interesting to explore further if time had allowed and this is the perhaps heretical thought that the true purpose of this new joint body is actually to enable the Executive to rein in its development agency, to exert greater control over its activities in this key industry sector, and to try to challenge its gate-keeping role, posited in Section 7.4.

Other actors have also moved on since the start of this study. Having published its first report to the Scottish Executive in January 2004, the Scottish Science Advisory Committee is now entering a second phase with a new membership and a revised remit that will charge it with advising the Executive on narrower and more focused aspects of the Scottish science base. However, the SSAC's most recent report on

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<sup>3</sup> These comments are reflected in more general criticisms in the business press which noted that government policy needs to connect more directly with the business community's real agenda, instead of the one "imagined by the bureaucrats and policy-makers" (Murden 2004).

knowledge transfer (Scottish Science Advisory Committee 2004c) suggests that it is still trying to push issues to do with the co-ordination of research and innovation up the Scottish Executive's agenda.

New players have also emerged on the Scottish scene such as the Scottish Stem Cell Network established in May 2003 as a "multidisciplinary forum bringing together scientists and clinicians with the aim of improving the rate at which laboratory research translates into therapeutic benefits for patients"<sup>4</sup>. While this might have the potential to develop into a policy network at some future point, its current status is more akin to a lobby group but it is interesting to note that it is essentially bypassing the Scottish level of governance and lobbying primarily at the EU level, illustrating once again the limits of the Scottish Parliament which has no devolved policy competences in this field. Other recent co-ordination efforts include the launch of the "Edinburgh Science Triangle" where seven scientific institutions and technology parks in the Edinburgh area have joined forces to boost R&D competition (Buxton 2004). Finally, the emergence of the ITI as a potentially major player in the life sciences sector and its interactions with the SSI may yet prove significant.

#### **8.4 Implications for policy and theory**

What these recent developments perhaps best serve to demonstrate is that current political situations are unlikely to remain static for the duration of a PhD thesis and that, especially in the case of contemporary, policy-focused research, a key concern may be to get early insights out into the policy domain in order to inform the development of that policy system.

Looking beyond Scotland, the European level of governance has not been a primary focus but has nevertheless contextualised this research. Across Europe we see a general trend towards regionalisation but significant differences in the devolution models adopted in terms of scope and scale. Conflicts within the governance perspective are evident at the European policy level where there is a danger that the

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<sup>4</sup> <http://www.sscn.co.uk/default.asp> (last accessed 28/10/04).

EC's attempt to use the ERA to integrate European R&D might run contrary to the increasing divergence of (and competition between) national, and increasingly regional, systems of innovation (Edler *et al.* 2003, p.21). On the other hand, the ERA could be a force for good if it is able to provide an effective co-ordination mechanism across governance levels within Europe<sup>5</sup>.

Small countries such as Scotland should provide greater opportunities for people to overcome professional boundaries and be in a better position to bring about governance changes and systemic approaches (Edler *et al.* 2002, p.21). The Scottish case described in this study therefore has broader relevance to discussions about the regionalisation of research and innovation policy within multi-actor spaces and on the role of these actors in the definition, implementation and evaluation of such policies. However, as discussed in Section 2.2.4, small countries can face their own particular challenges with respect to innovation systems and the dominance of certain key individuals can lead to policy-makers becoming too close to some parties while excluding other legitimate participants from the policy process (see also Section 4.5.2 on the "star" system).

The governance thesis purports that the centre is losing direct control to complex policy networks but the evidence does not support this for STI policy in Scotland. One could either argue that, so far, there has been weak institutionalisation, whereby the networks that do exist are interpersonal rather than inter-organisational or, on the contrary, that there are actually very strong institutions (*i.e.* Scottish Enterprise) that act as an obligatory point of passage, or gate-keeper, and are preventing policy network formation. So, one of the things the present study has illustrated is the need to understand better the differences that institutional trajectories can have on the performance of regional governance systems, a point that Maskell and Tornquist

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<sup>5</sup> Moreover, the evidence from the successful Cambridge cluster (reported in Chapter 6) suggests that the existence of a governance gap may be less significant if there are alternative mechanisms in place: the Cambridge case has demonstrated that public support for networking activities was not a prerequisite for a successful RSI.

(1999 p.50) make when they describe the process of “making do” with the historical legacy of institutions and routines (see Section 1.2).

Respondents to the Science Strategy consultation gave the Scottish Executive a clear signal to get its own house in order and implement the ideas of joined-up government and holistic thinking in order to integrate R&D policy fully with other related policy areas (in particular, economic development and education) and not to restrict the focus too narrowly to science. Indeed, its own agencies were telling the Executive to consider the wider issues about innovation, enterprise and economic development which go beyond the scope of a “science” strategy (see Section 5.2.3) and suggested that an important prior question should have been whether Scotland needs a co-ordinated research and innovation strategy; yet the published strategy document is very much grounded in the “treasure trove model” where universities are exclusively seen as *the* source of innovation. For many years now governments of all political persuasions have been pre-occupied with trying to get British industry to exploit science, with comparatively little success (Lyall 1993; Wilkie 1991, p.129) but Scotland continues to pursue a blinkered vision of STI and Scotland’s Science Strategy does little to address this particular governance gap.

Transparency and co-ordination within an innovation system require a true commitment to user involvement that goes beyond just offering the opportunity to “participate in participation” (de la Mothe 2001a, p.8) and this is likely to fail if pursued in a top-down fashion by a dominant policy actor (Cooke *et al.* 2000, p.142). We have found that the dominance of the public sector, combined with the fact that sectoral trade associations are traditionally weaker in the UK than in other European countries, leads to a dependency culture where Scottish technology-based firms are seen to be more reliant on public subsidy than their counterparts in other regions of the UK. But, there are signs that the life sciences sector is beginning to exert its independence and demand more direct access both to policy-makers within the Scottish Executive and to the policy-making agenda.

A key theme throughout this research has been the need for co-ordination and coherence in order to tackle the over-compartmentalisation between government



departments and agencies and the lack of effective integration across the wider science and innovation policy sphere. While Scotland should have all of the necessary precursors to facilitate a networked-based polity, the initial hypothesis was that the nature of the devolution settlement, which resulted in the multi-level governance of STI, would militate against the optimal performance of such networks. Having used Scottish devolution to unpick the relationship between the innovation system and the policy system, we have to conclude that devolution has so far had less of an impact on the policy-making process for the life sciences sector than anticipated. We have found that the Scottish system of innovation currently lacks the necessary feedback loops that would create a virtuous circle whereby public policy emanated from the Scottish Executive to Scottish Enterprise to policy targets which then fed back to the Executive in order to reiterate and refine the policy process.

The idea of a policy network has informed both the study and practice of public policy and has led to the theory and concept building described in this thesis. It has done so by shifting attention from national institutions to sub-systems and sectors and, by emphasising the links between actors at all stages of the policy process, has provided a useful heuristic device to aid understanding of the governance of STI.

Networks may not, however, be a universal panacea and there is a growing recognition that they are not without their problems: they can be closed to outsiders, unrepresentative, relatively unaccountable, and difficult to steer (Bevir and Rhodes 2003, p.75), so it is important to remember that networks can also *limit* participation in the policy process. Organically formed, “self-organising” policy networks are thus often *exclusive* bodies. Likewise, by establishing a group such as the Bioscience Leadership Council described in Section 6.2.2, the government is actually controlling access to the policy process rather than opening up participation<sup>6</sup>. This belies the notion of self-organising policy networks put forward by Rhodes (see Section 2.4) if government still retains the financial resources, legislative powers and political legitimacy that enable it to impose its will on a network (Taylor 2000; Marinetto

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<sup>6</sup> This is borne out by the policy-maker’s comment (Section 4.5.1) that the establishment of PICTF actually reduced industry lobbying.

2003). The Rhodes Model of governance may only present a partial picture (Marinetto 2003) and, indeed, some go so far as to predict the demise of policy networks as policy-making is increasingly brought back “in-house” (Thompson 2003, p.187). Others believe that networks only cohere around a specific problem (such as, for example, the GM crops debate in the UK), by which time people have taken entrenched positions, making it difficult to get them to work together as a network (Bruce *et al.* in preparation). Conversely, there may also be the danger of regulatory capture if policy-makers and policy targets get too close.

The governance perspective might just be “a simplifying lens to a complex reality” as far as academics are concerned (Stoker 1998), but policy-makers at all levels of governance believe that improved participation in the policy-making process will create more confidence in the resulting policies and ensure more effective implementation. As noted in Section 1.3, there appears to be general agreement that an active civil society is necessary for a healthy democracy (Sloat 2002b), with many of the prosperous regions of Europe also being regions of participatory politics (Amin 1999). But this approach is not without its contradictions, and control issues still remain in a network approach to policy. In the UK, the emergence of multiple tiers of governance and the development of a more plural, inclusive policy process has been accompanied by substantial conflict over political power (Newman 2002, p.162). While Newman finds some evidence of decentralised, network forms of governance, the Labour Government’s approach has been to intensify the “command and control” style of governing (*ibid.* p.38). Thus, network-based governance under New Labour exhibits a mix of centralisation *and* decentralisation and patterns of inclusion *and* exclusion. As Bevir and Rhodes (2003, p.137) note, the White Paper on *Modernising Government* may recognise the need to manage networks but such management by negotiation means agreeing the objectives with others beforehand, which perhaps goes some way to explain why we find that the prevailing model is still one that uses consultation as a proxy for genuine dialogue (see Chapter 4).

## 8.5 Reflections on research design

Before reflecting further on the research design, it is worth considering whether this thesis has judged the Scottish system of innovation too harshly from a critical insider's perspective that may have emerged, in part, from the research design used<sup>7</sup>. Outsiders may take a more positive view of the SSI, for example, commending Scotland for its "relatively visionary policy approach towards economic development" (Cooke 2003) and its apparent rationalisation:

*we see Scotland as actually doing rather well in terms of academic industry liaison...They've got a variety of initiatives up there, which are more streamlined and actually attuned to what's required. I think they're more nimble footed (Interview with industry representative, I040702)*

*now that the Scots can do their own thing...they've actually simplified their procedures within Scotland...They de-layered...it's a one stop shop...we're not particularly close to the detail of the way it works but that's something that seems to have served the Scots very nicely (Interview with policy-maker, P280303)*

The notion of differing insider/outsider perspectives was reflected by several interviewees who, whilst themselves critical of Scottish policy actors, recognised that others viewed the system more sympathetically:

*from the European side Scotland is seen as a kind of well-functioning, joined up – ha ha ha [ironic laughter] – policy community (Interview with European policy-maker, P240902)*

*from abroad...people are envious at how cohesive we've managed to be. So I think there's a danger that by navel gazing, we throw away what's good...I think also there is a fairly cohesive network within Scotland, albeit composed of fragments, but those fragments are at least aware of each other (Interview with service provider, I160702)*

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<sup>7</sup> As previously noted in Sections 1.5 and 4.5.3, although some elements of triangulation were attempted in this research in order to draw data from a variety of sources and from different categories of respondent, the research design did not allow for iteration of interview comments amongst informants which may, in retrospect, have permitted a more nuanced critique.

With this caveat in mind, it is also worth reflecting on some of the current fashions in academic research. Some authors have described the so-called network paradigm as “not so much a theory as a potentially rich analytical framework” (Cooke and Morgan 1993). As we have seen in Chapter 2, the policy networks approach is essentially a descriptive tool and is considered by some to be just a metaphor with no explanatory value (Dowding 1995). The term “governance” has also been described as a “rather promiscuous concept”<sup>8</sup> without much theoretical grounding. Nevertheless, these two paradigms are quite clearly the discourse of the day for many researchers. They are also used extensively by public service practitioners.

Some might advocate a more institutionalised approach to this type of study by, for example, focusing on the activities of one key government agency. However, the data from the current research support John’s (1998, p.49) proposition that actors often circumvent institutions in order to pursue their own interests<sup>9</sup> and that the institutional approach presents a static view of the policy process that is less useful during a period of change (*ibid.*, p.53).

This study did not set out to conduct a systems of innovation analysis for Scotland but to use the system as a jumping off point in order to explore the impact of devolution on the policy-making process. In doing so, the research drew on comparative case studies within the UK and elsewhere to demonstrate that there are strong historical and cultural reasons for the prominence of self-organising policy networks in some countries but that, in the UK, the public sector still has an important role both in providing a conducive policy environment for their emergence and in steering their activities.

An alternative inter-country comparison might have been provided by a study of the life sciences sector in Denmark, a country with an acknowledged tradition of

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<sup>8</sup> “Modernising Governance”, lecture by Professor Janet Newman, University of Edinburgh, Social Policy Seminar, 22 November 2002.

<sup>9</sup> This is borne out, for example, by the evidence that shows that the Scottish biotechnology industry is now seeking to engage directly with Scottish Executive officials and Ministers rather than via Scottish Enterprise.

negotiative and consensual decision-making and formal, organised participation (Bevir and Rhodes 2003, pp.96-98). Other comparative approaches might have incorporated a form of longitudinal comparison (*e.g.* by comparing the role of STI policy networks within Scotland pre- and post-devolution) or considered the wider context of regionalisation within the rest of the UK and the developing role of the RDAs (*e.g.* comparing the NW science strategy with the Scottish situation).

With any such comparative approach there can be difficult trade-offs. There are, for example, significant differences in political structures between Scotland and either other small, autonomous nations such as Denmark or federated states within a larger country such as Germany. Indeed, even within the UK, the Cambridge case study (Section 6.3) seemed to indicate that the English RDAs were currently too immature to make any comparison sufficiently detailed. Ultimately, we chose to focus on the Scottish case study because we had the resources to do this thoroughly and the richness of the resulting data was felt to provide sufficient evidence to support the argument of the thesis. That said, there are undoubtedly alternate interpretations of the data and others might have opted to ground this research in alternate theoretical frameworks.

As we have suggested above in Section 8.3, we are already seeing some developments in areas related to participative governance with the launch of the life sciences advisory group and planned changes to the remits of the SSAC and Scottish Enterprise. It is hoped that this early study of the impact of Scottish devolution should provide some base data for a future longitudinal study. Future research in this area might also consider the role of *public* participation in STI policy-making in Scotland, an area specifically excluded from this study but which is, nevertheless, highly relevant given the advances that the Scottish Parliament, the Scottish Executive and bodies such as the Scottish Civic Forum have made in other policy fields.

European governance has been less of a focus of this research than anticipated, possibly reflecting interviewees' more domestic preoccupations. It may be the case that, while science is increasingly carried out across borders, science policy is still

made by nations (Kennedy 2003), although other aspects of current European policy, for example, pertaining to biotechnology regulation or international trade, clearly have an impact on Scottish actors. A useful extension of this current study would be to shift the focus on to the supra-national dimension of MLG in the context of the European Research Area (ERA) to examine how Scottish policy targets and policy-makers can optimise their participation in these European debates given the reserved nature of European policy.

Writing recently in the *Times Higher*, Rowland (2004) (see opening quote, this chapter) claimed that interdisciplinary research is necessary and can lead to new insights, particularly if academic knowledge is to address the problems of the wider world. But he highlighted the danger of research that too readily transcends disciplinary boundaries without any disciplinary commitment, on the grounds that, while the ability to solve technical problems may be gained, an awareness of the value of solutions and the need to exercise critical judgement may be lost. Rowland warns that interdisciplinary work can be exciting, but it is hard: it involves negotiating disciplinary boundaries, not removing them.

Devolution studies is a new, interdisciplinary field of enquiry within the UK and the current research has drawn on theory, policy and practice in an attempt to advance knowledge across several allied disciplines. The concurrent power theme has thus provided insights into a relatively neglected area in terms of the geographic region, the policy sphere, and the unit of analysis. First, it has provided a case study on the impact of devolution on a particular policy domain (that of STI) which is relevant to the regional studies community of academics and practitioners. Secondly, it has taken the political studies concept of a policy network and applied it to a novel, under-studied policy sphere. Thirdly, it has reversed the telescope within the systems of innovation model and focused on the influence of system actors on the policy-making process in contrast to the more usual perspective of the impact of the policy regime on innovation actors, thereby providing a new contribution to the innovation studies oeuvre.

At times, this research may have felt like wading in Schön's swamp<sup>10</sup> and the high, hard ground of theoretical rigour may have presented a more attractive proposition. Ultimately, however, there seems to be general agreement amongst scholars from various academic disciplines of the benefits to be derived from the confluence of a range of theoretical and empirical approaches under the umbrella of "multi-level governance" (Bache and Flinders 2004, p.1). Using this interdisciplinary approach we have extended the knowledge domain of multi-level governance studies, more usually reserved to the European policy context, into the area of STI policy. In doing so, this research has demonstrated the utility of the MLG concept to the study of systems of innovation by relating the vertical components of MLG theory (*i.e.* interactions between governments operating at different territorial levels) to the horizontal dimensions (*i.e.* interaction between government and non-government actors) (Bache and Flinders 2004, p.3) in order to provide a deeper understanding of the complexities of a new and developing political system.

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<sup>10</sup> See opening quote in Chapter 1.

## Bibliography

- Amin, A. (1999). "An Institutionalist Perspective on Regional Economic Development", *International Journal of Urban and Regional Research*, 23(2): 365-378.
- Andersen, E.S. and Lundvall, B.-A. (1988). "Small National Systems of Innovation Facing Technological Revolutions: An Analytical Framework" in Freeman, C. and Lundvall, B.-A. (eds.) *Small Countries Facing the Technological Revolution*, London, Pinter.
- Anon (2001a). "A cornucopia of industrial aids", 14 February 2001, *Financial Times*, London.
- Anon (2001b). "Spotlight: Cambridge", *Nature*, 1 November 2001 available from [www.nature.com/naturejobs/spotlight/cambridge](http://www.nature.com/naturejobs/spotlight/cambridge) (last accessed 28/10/04).
- Anon (2003). "Joined-up policy-making", *Innovation & Technology Transfer*, 5/03(September 2003): 6-8.
- Anon (Editorial) (2003). "Pros and cons of centralization", *Nature*, 423(6942): 787.
- Anon (2004). "Call for stakeholders' input", *Innovation & Technology Transfer*, 2(4): 6.
- Ansell, C. (2000). "The Networked Polity: Regional Development in Western Europe", *Governance*, 13(3): 279-291.
- Atkinson, M. M. and Coleman, W. D. (1992). "Policy Networks, Policy Communities and the Problems of Governance", *Governance*, 5(2): 154-180.
- Bache, I. (1998). *The Politics of European Union Regional Policy. Multi-Level Governance or Flexible Gatekeeping?*, Sheffield, Sheffield Academic Press.
- Bache, I. (2000). "Government within governance: Network steering in Yorkshire and the Humber", *Public Administration*, 78(3): 575-592.
- Bache, I. (2003). "Governing through Governance: Education Policy Control under New Labour", *Political Studies*, 51(2): 300-314.
- Bache, I. and Flinders, M. (2004). "Themes and Issues in Multi-level Governance" in Bache, I. and Flinders, M. (eds.) *Multi-level Governance*, Oxford, Oxford University Press.
- Bartholomew, S. (1997). "National Systems of Biotechnology Innovation: Complex Interdependence in the Global System", *Journal of International Business Studies*, 28(2): 241-266.



- Baur, C. (2002). "What bosses won't buy", *Scottish Business Insider*, June 2002.
- BBC News (2003). "Blair launches 'Big Conversation' ", 28 November 2003, BBC News website [http://news.bbc.co.uk/go/pr/fr/-/1/hi/uk\\_politics/3245620.stm](http://news.bbc.co.uk/go/pr/fr/-/1/hi/uk_politics/3245620.stm) (last accessed 28/10/04).
- Bechhofer, F. and Paterson, L. (2000). *Principles of Research Design in the Social Sciences*, London, Routledge.
- Bechhofer, F., Rayman-Bacchus, L. and Williams, R. (2001). "The Dynamics of Social Science Research Exploitation", *Scottish Affairs*, 36 (Summer): 124-155.
- Beesley, L.G.A. (2003). "Science policy in changing times: are governments poised to take full advantage of an institution in transition?", *Research Policy*, 32(8): 1519-1531.
- Benneworth, P. and Roberts, P. (2002). "Devolution, Sustainability and Local Economic Development: Impacts on Local Autonomy, Policy-making and Economic Development Outcomes", *Local Economy*, 17(3): 239-252.
- Bevir, M. and Rhodes, R.A.W. (2003). *Interpreting British Governance*, London, Routledge.
- Bevir, M. and Rhodes, R.A.W. (2004). "Interpreting British Governance", *British Journal of Politics & International Relations*, 6(2): 130-136.
- Bevir, M., Rhodes, R.A.W. and Weller, P. (2003a). "Comparative governance: prospects and lessons", *Public Administration*, 81(1): 191-210.
- Bevir, M., Rhodes, R.A.W. and Weller, P. (2003b). "Traditions of governance: interpreting the changing role of the public sector", *Public Administration*, 81(1): 1-17.
- BIA (2002). *Bringing Innovation to All*, London, BioIndustry Association.
- BIGT (2003). *Bioscience 2015. Improving National Health, Increasing National Wealth*, London, BioIndustry Association.
- Blaikie, N. (2000). *Designing Social Research*, Cambridge, Polity Press.
- Blair, T. (2003). "I want us to go faster and further", Speech by the Prime Minister to the Labour Party conference, Bournemouth, 30 September 2003.
- Blom-Hansen, J. (1997). "A 'New Institutional' Perspective on Policy Networks", *Public Administration*, 75 (Winter): 669-693.
- Borras, S. (2003). *The Innovation Policy of the European Union: From Government to Governance*, Cheltenham, Edward Elgar.

- Borzel, T.A. (1998). "Organizing Babylon - on the Different Conceptions of Policy Networks", *Public Administration*, 76 (Summer): 253-273.
- Boulton, G. (1999). "Devolution and Science", *Science & Public Affairs*, June 1999: 23-30.
- Braczyk, H.-J. and Heidenreich, M. (1998). "Regional Governance Structures in a Globalized World" in Braczyk, H.-J., Cooke, P. and Heidenreich, M. (eds.) *Regional Innovation Systems*, London, UCL Press.
- Braczyk, H.-J., Cooke, P. and Heidenreich, M. (eds.) (1998). *Regional Innovation Systems*, London, UCL Press.
- Branscomb, L. M. (1999). "From Science Policy to Research Policy" in Branscomb, L. M. and Keller, J. H. (eds.) *Investing in Innovation. Creating a Research and Innovation Policy that Works*, Cambridge MA, MIT Press.
- Branscomb, L. M. and Keller, J. H. (1999). "Towards a Research and Innovation Policy" in Branscomb, L. M. and Keller, J. H. (eds.) *Investing in Innovation. Creating a Research and Innovation Policy that Works*, Cambridge MA, MIT Press.
- Brown, A. (2001). "The Scottish Parliament: Hopes and Aspirations", *Scottish Affairs*, Special Issue: Stateless Nations in the 21st Century: Scotland, Catalonia and Quebec: 78-84.
- Brown, A. and McCrone, D. (1999). *Business and the Scottish Parliament Project Executive Summary*, Edinburgh, Governance of Scotland Forum, University of Edinburgh.
- Brown, A., McCrone, D. and Paterson, L. (1998). *Politics and Society in Scotland*, Basingstoke, Macmillan.
- Bruce, A., Lyall, C., Tait, J. and Williams, R. (2004). "Interdisciplinary Integration in Europe: the case of the Fifth Framework Programme", *Futures*, 36(4): 457- 470.
- Bruce, A., Lyall, C. and Laurie, G. (in preparation). "What is the role of values in policy learning?", To be submitted to *Science and Public Policy*.
- Burnside, R. and Wakefield, S. (2003). *Economic Development - Subject Profile*. Edinburgh, SPICE, Scottish Parliament.
- Buxton, J. (2004). "Edinburgh scientific institutions club together to boost R&D competition", 1 October 2004, *Financial Times*, London.
- Cabinet Office (1999a). *Memorandum of Understanding and Supplementary Agreements between the United Kingdom Government, Scottish Ministers and the Cabinet of the National Assembly for Wales*, Cm 4444, London, Cabinet Office.

- Cabinet Office (1999b). *Devolution Guidance Notes (DGN1-13)*, London, Cabinet Office.
- Cabinet Office (2002). *Viewfinder: A Policy Maker's Guide to Public Involvement*, London, Cabinet Office Strategy Unit.
- Cabinet Office Performance Innovation Unit (2000). *Wiring it up. Whitehall's Management of Cross-cutting Policies and Services*, CABI 99-5265/0001/D16, London, Cabinet Office.
- Cabinet Office Strategic Policy Making Team (1999). *Professional Policy Making for the Twenty First Century*, London, Cabinet Office.
- Callon, M., Law, J. and Rip, A. (1986). *Mapping the dynamics of science and technology*, Basingstoke, Macmillan.
- Cameron, G. and Danson, M. (2000). "The European Partnership Model and the Changing Role of Regional Development Agencies: A Regional Development and Organisation Perspective" in Danson, M., Halkier, H. and Cameron, G. (eds.) *Governance, Institutional Change and Regional Development*, Aldershot, Ashgate.
- Cameron, G., Danson, M. and Halkier, H. (2000). "Perspective: Institutional Change, Governance and Regional Development: Problems and Perspectives" in Danson, M., Halkier, H. and Cameron, G. (eds.) *Governance, Institutional Change and Regional Development*, Aldershot, Ashgate.
- Carlsson, B. (Forthcoming 2005). "Innovation Systems: A Survey of the Literature from a Schumpeterian Perspective" in Hanusch, H. and Pyka, A. (eds.) *Elgar Companion to Neo-Schumpeterian Economics*, Cheltenham, Edward Elgar.
- Casper, S. and Matraives, C. (2003). "Institutional frameworks and innovation in the German and UK pharmaceutical industry", *Research Policy*, 32(10): 1865-1879.
- Charles, D. and Benneworth, P. (2001). "Are We Realizing our Potential? Joined up Science and Technology Policy in the English Regions", *Regional Studies* 35(1): 73-79.
- Charles, D., Perry, B. and Benneworth, P. (2004). *Towards a Multi-level Science Policy: Regional Science Policy in a European Context*, Seaford, Regional Studies Association.
- Commission of the European Communities (2001). *European Governance: a White Paper*, Brussels, Commission of the European Communities.
- Common, R. (2004). "Organisational learning in a political environment. Improving policy-making in UK government", *Policy Studies*, 25(1): 35-49.

- Consultative Steering Group (1998). *Shaping Scotland's Parliament*, Report of the Consultative Steering Group on the Scottish Parliament, Edinburgh, Scottish Office.
- Cooke, P. (1998a). "Introduction. Origins of the Concept" in Braczyk, H.-J., Cooke, P. and Heidenreich, M. (eds.) *Regional Innovation Systems*, London, UCL Press.
- Cooke, P. (1998b). *Regional Innovation Systems : Designing for the future - REGIS (Final Report)*, TSER Contract Number CT95-1010, Brussels, EC.
- Cooke, P. (2001a). "Regional Innovation Systems, Clusters, and the Knowledge Economy", *Industrial and Corporate Change*, 10(4): 945-974.
- Cooke, P. (2001b). "Biotechnology Clusters in the UK: Lessons from Localisation in the Commercialisation of Science", *Small Business Economics*, 17:43-59.
- Cooke, P. (2002a). "Regional Innovation Systems: General Findings and Some New Evidence from Biotechnology Clusters", *Journal of Technology Transfer*, 27(1): 133-145.
- Cooke, P. (2002b). "Towards Regional Science Policy? The Rationale from the Biosciences". Unpublished conference paper, *Rethinking Science Policy*, 21-23 March 2003, SPRU, University of Sussex.
- Cooke, P. (2003). *Varieties of Devolution: Visionary and Precautionary Economic Policy Formulation in Scotland and Wales*, Birmingham, ESRC Devolution and Constitutional Change Programme.
- Cooke, P. and Morgan, K. (1993). "The network paradigm: new departures in corporate and regional development", *Environment and Planning D: Space and Society*, 11:543-564.
- Cooke, P. and Morgan, K. (2000). *The associational economy: firms, regions and innovation*, Oxford, Oxford University Press.
- Cooke, P., Boekholt, P. and Todtling, F. (2000). *The Governance of Innovation in Europe. Regional Perspectives on Global Competitiveness*, London, Pinter.
- Cooke, P., Heidenreich, M. and Braczyk, H.-J. (eds.) (2004). *Regional Innovation Systems. The Role of Governance in a Globalized World*, London, Routledge.
- Cooke, P., Roper, S. and Wylie, P. (2003). "'The Golden Thread of Innovation' and Northern Ireland's Evolving Regional Innovation System", *Regional Studies*, 37(4): 365-379.
- Cooke, P., Uranga, M.G. and Etxebarria, G. (1997). "Regional innovation systems: Institutional and organisational dimensions", *Research Policy*, 26(4-5):475-491.

- Coombs, R., Saviotti, P. and Walsh, V. (1987). *Economics and Technological Change*, Basingstoke, Macmillan Education.
- Dalton, A. (2001). "Failing to exploit scientific talent", 19 November 2001, *The Scotsman*, Edinburgh.
- Daniel, C. (1997). "May the taskforce be with you", *New Statesman*, August 1, 1997, 126(4345): 27-31.
- Danson, M. (1999). "Economic development: the Scottish Parliament and the development agencies" in McCarthy, J. and Newlands, D. (eds.) *Governing Scotland: Problems and Prospects. The economic impact of the Scottish Parliament*, Aldershot, Ashgate.
- Danson, M. and Gilmore, K. (2000). "Devolution and the Political Economy of Scotland" in Wright, A. (ed.) *Scotland: the Challenge of Devolution*, Aldershot, Ashgate.
- Danson, M., Halkier, H. and Cameron, G. (2000). "Introduction: Regional Governance, Institutional Change and Regional Development" in Danson, M., Halkier, H. and Cameron, G. (eds.) *Governance, Institutional Change and Regional Development*, Aldershot, Ashgate.
- Daugbjerg, C. (1998). "Linking Policy Networks and Environmental Policies: Nitrate Policy Making in Denmark and Sweden 1970-1995", *Public Administration*, 76 (Summer): 275-294.
- Devine, F. (1995). "Qualitative Analysis" in Marsh, D. and Stoker, G. (eds.) *Theory and Methods in Political Science*, Basingstoke, Macmillan.
- Dexter, L.A. (1970). *Elite and Specialized Interviewing*, Evanston, Northwestern University Press.
- Diederens, P., Stoneman, P., Toivanen, O. and Wolters, A. (1999). *Innovation and Research Policies*, Cheltenham, Edward Elgar.
- Dodgson, M. and Bessant J. (1996). *Effective Innovation Policy: A New Approach*, London, International Thomson Business Press.
- Dohse, D. (2000). "Technology policy and the regions - the case of the BioRegion contest", *Research Policy*, 29(9): 1111-1133.
- Dowding, K. (1995). "Model or Metaphor? A Critical Review of the Policy Network Approach", *Political Studies*, XLIII: 136-158.
- Dowding, K. (2001). "There Must Be End to Confusion: Policy Networks, Intellectual Fatigue, and the Need for Political Science Methods Courses in British Universities", *Political Studies*, 49: 89-105.

- DTI (2001). *Opportunity for All in a World of Change*, Cm5052, London, DTI.
- DTI (2003a). “Strategic Look at Bioscience”, Press release (P/2003/185), 24 March 2003, London, DTI.
- DTI (2003b). *Innovation Report - Competing in the Global Economy: the Innovation Challenge*, DTI/Pub 7035/2k/12/03/NP URN 03/1607, London, DTI.
- Eames, B. (2001). “The 5 Question Interview: The Scotland Office.” *Scoop* (June/July 2001), Edinburgh, Scottish Executive.
- Edler, J., Kuhlmann, S. and Behrens, M. (2003). *Changing Governance of Research and Technology Policy*, Cheltenham, Edward Elgar.
- Edler, J., Kuhlmann, S. and Smits, R. (2002). *New Governance for Innovation? The Need for Horizontal Policy Co-ordination*, Karlsruhe, Fraunhofer ISI.
- Edquist, C. (2000). “Systems of Innovation Approaches - Their Emergence and Characteristics” in Charles Edquist (ed) (1997), *Systems of Innovation: Technologies, Institutions and Organizations*, Chapter 1, London and Washington, Pinter.” in Edquist, C. and McKelvey, M. (eds.) *Systems of Innovation: Growth, Competitiveness and Employment*, Cheltenham, Edward Elgar.
- Edquist, C. and McKelvey, M. (eds.) (2000). *Systems of Innovation: Growth, Competitiveness and Employment*, Cheltenham, Edward Elgar.
- Enterprise and Lifelong Learning Committee (2000). *Inquiry into the delivery of local economic development services in Scotland*, Edinburgh, Scottish Parliament.
- Enterprise and Lifelong Learning Committee (2003). *Legacy Paper*, Edinburgh, Scottish Parliament, [www.scottish.parliament.uk/business/committees/historic/x-enterprise/reports-03/elr03-legacy-01.htm](http://www.scottish.parliament.uk/business/committees/historic/x-enterprise/reports-03/elr03-legacy-01.htm) (last accessed 28/10/04).
- ERBI (2003). *Enhancing the greater Cambridge biotechnology cluster in the East of England through partnership*, Cambridge, ERBI.
- Ernst & Young Life Sciences Group (2001). *Integration. Ernst & Young's Eighth Annual European Life Sciences Report*, London, Ernst & Young.
- Etzkowitz, H. and Leydesdorff, L. (2000). “The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations”, *Research Policy*, 29(2): 109-123.
- Faulkner, W. and Senker, J. (1995). *Knowledge Frontiers: public sector research in industrial innovation in biotechnology, engineering ceramics and parallel computing*, Oxford, Clarendon Press.

- Finch, J. (1986). *Research and policy. The uses of qualitative methods in social and educational research*, Lewes, Falmer Press.
- Freeman, C. (1987). *Technology Policy and Economic Performance: Lessons from Japan*, London, Pinter.
- Freeman, C (1988). "Introduction" in Freeman, C. and Lundvall, B.-A. (eds.) *Small Countries Facing the Technological Revolution*, London, Pinter.
- Georghiou, L. (2003). *Raising EU R&D Intensity. Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development. Direct Measures*, Brussels, EC.
- Geuna, A., Salter, A. and Steinmuller, W.E. (eds.) (2003). *Science and Innovation. Rethinking the Rationales for Funding and Governance*, Cheltenham, Edward Elgar.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994). *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*, London, Sage.
- Giddens, A. (1999). *Runaway World*, BBC Reith lecture series on the theme of globalisation, [http://news.bbc.co.uk/hi/english/static/events/reith\\_99/](http://news.bbc.co.uk/hi/english/static/events/reith_99/) (last accessed 27/10/04).
- Gillespie, A. and Benneworth P. (2002). "Industrial and regional policy in a devolved United Kingdom" in Adams, J. and Robinson, P. (eds.) *Devolution in Practice: Public Policy Differences Within the UK*, London, IPPR.
- Glaser, B.G. and Strauss, A. (1967). *The discovery of grounded theory*, Chicago, Aldine.
- Götz, K.H. (1992). *Intergovernmental Relations and State Government Discretion: The case of Science and Technology Policy in Germany*, Baden-Baden, Nomos Verlagsgesellschaft.
- Gray, H.P. and Dunning, J.H. (2000). "Towards a Theory of Regional Policy" in Dunning, J.H. (ed.) *Regions, Globalisation and the Knowledge Economy*, Oxford, Oxford University Press.
- Greer, A. (2003). "Policy networks and policy change in organic agriculture: a comparative analysis of the UK and Ireland", *Public Administration*, 80(3): 453-474.
- Hakim, C. (1987). *Research Design: strategies and choices in the design of social research*, London, Allen & Unwin.
- Halkier, H., Danson, M. and Damborg, C. (1998). *Regional Development Agencies in Europe*, London, Jessica Kingsley.

- Hay, C. and Richards, D. (2000). "The Tangled Webs of Westminster and Whitehall: The Discourse, Strategy and Practice of Networking within the British Core Executive", *Public Administration*, 78(1): 1-28.
- Heald, D. and McLeod, A. (2002). "Fiscal autonomy under Devolution: Introduction to Symposium", *Scottish Affairs*, 41 (Autumn): 5-25.
- Hill, M. (1997). *The Policy Process in the Modern State*, Harlow, Prentice Hall.
- HM Government (1999). *Modernising Government White Paper*, Cm 4310. London, Cabinet Office.
- Hogg, K. (2000). *Making a Difference: Effective Implementation of Cross-Cutting Policy*, Edinburgh, Scottish Executive Policy Review Unit.
- Hogwood, B.W. and Gunn, L.A. (1992). *Policy Analysis for the Real World*, Oxford, Oxford University Press.
- House of Commons Science and Technology Committee (2000). *Government expenditure on research and development: the forward look, fifth report 1999-2000*, HC 196-I, London, Stationery Office.
- House of Lords Select Committee on Science and Technology (2003). *Science and the RDAs: SETting the regional agenda*, HL 140-I, London, Stationery Office.
- Ince, M. (1986). *The Politics of British Science*, Brighton, Wheatsheaf Books.
- Institute of Physics (2003). *Science Policy in Scotland*, Report of a meeting held at Heriot Watt University, Edinburgh, July 2003.
- Jacobs, D. (1998). "Innovation policies within the framework of internationalization", *Research Policy*, 27(7): 711-724.
- Jasanoff, S. (1985). "Technological innovation in a corporatist state: The case of biotechnology in the Federal Republic of Germany", *Research Policy*, 14(1): 23-38.
- Jeffery, C. (1998). *Multi-layer Democracy in Germany: Insights for Scottish Devolution*, London, Constitution Unit, UCL.
- Jenkins-Smith, H.C. and Sabatier, P.A. (1994). "Evaluating the Advocacy Coalition Framework", *Journal of Public Policy*, 14(2): 175-203.
- John, P. (1998). *Analysing Public Policy*, London, Pinter.
- Johnson, B. (1988). "An Institutional Approach to the Small Country Problem" in Freeman, C. and Lundvall, B.-A. (eds.) *Small Countries Facing the Technological Revolution*, London, Pinter.



- Kaufmann, A. and Tödtling, F. (2001). "Science-industry interaction in the process of innovation: the importance of boundary-crossing between systems", *Research Policy*, 30(5): 791-804.
- Keating, M. (2002). "Devolution and public policy in the United Kingdom: divergence or convergence" in Adams, J. and Robinson, P. (eds.) *Devolution in Practice: Public Policy Differences Within the UK*, London, IPPR.
- Keeble, D., Lawson, C., Moore, B. and Wilkinson, F. (1999). "Collective Learning Processes, Networking and 'Institutional Thickness' in the Cambridge Region", *Regional Studies*, 33(4): 319-332.
- Kennedy, D. (2003). "European science must find a new formula", 28 August 2003, *Financial Times*, London.
- Kerley, R. (1999). "Economic Intervention and Devolved Institutions: Parliaments, Assemblies, Chambers and Business" in Gardner, M.d.P., Hardy, S. and Pike, A. (eds.) *New Regional Strategies: Devolution, RDAs and Regional Chambers*. Conference proceedings of the Regional Studies Association Annual Conference, November 1999, Seaford, Regional Studies Association.
- Kettler, H.E. and Casper, S. (2000). *The Road to Sustainability in the UK and German Biotechnology Industries*, London, Office of Health Economics.
- Kooiman, J. (1993). *Modern Governance. New Government-Society Interactions*, London, Sage.
- Landabaso, M. (1997). "The promotion of innovation in regional policy: proposals for a regional innovation strategy", *Entrepreneurship and Regional Development*, 9(1): 1 - 24.
- Latouche, D. (1998). "Do Regions Make a Difference? The Case of Quebec" in Braczyk, H.-J., Cooke, P. and Heidenreich, M. (eds.) *Regional Innovation Systems*, London, UCL Press.
- Lawson, C. and Lorenz, E. (1999). "Collective Learning, Tacit Knowledge and Regional Innovative Capacity", *Regional Studies*, 33(4): 305-317.
- Lofland, J. and Lofland, L.H. (1995). *Starting Where You Are*, Belmont CA, Wadsworth.
- Lovering, J. (1999). "Theory Led by Policy: The Inadequacies of the New Regionalism", *International Journal of Urban and Regional Research*, 23(2): 379-395.
- Lowndes, V. and Skelcher, C. (1998). "The Dynamics of Multi-Organisational Partnerships: An Analysis of Changing Modes of Governance", *Public Administration*, 76 (Summer): 313-333.

- Lyall, C. (1993). *The 1993 White Paper on Science and Technology: Realising Our Potential or Missed Opportunity?*, Unpublished MSc Thesis, SPRU, University of Sussex.
- Lyall, C. and Tait, J. (2004). "Foresight in a Multi-level Governance Structure: Policy Integration and Communication", *Science and Public Policy*, 31(1): 27-37.
- Lyall, C., Bruce, A., Firn, J., Firn, M. and Tait, J. (2004). "Assessing end-use relevance of public sector research organisations", *Research Policy*, 33(1): 73-87.
- MacIntyre-Kemp, G. (2003). "The evolution of power", 20 July 2003, *Sunday Herald*, First Tuesday Supplement, Glasgow.
- Mackinnon, D.F. (1998). *Local Governance and Economic Development: re-figuring state regulations in the Scottish Highlands*, Unpublished PhD Thesis, Department of Politics, University of Edinburgh.
- Macleod, G. (1996). "The Cult of Enterprise in a Networked, Learning Region? Governing Business and Skills in Lowland Scotland", *Regional Studies*, 30(8): 749-755.
- Marinetto, M. (2003). "Governing beyond the Centre: A Critique of the Anglo-Governance School", *Political Studies*, 51(3): 592-608.
- Marks, G., Hooghe, L. and Blank, K. (1996). "European Integration from the 1980s: State-Centric v. Multi-level Governance", *Journal of Common Market Studies*, 34(3): 341-378.
- Marsh, D. (ed.) (1998). *Comparing Policy Networks*, Buckingham, Open University Press.
- Marsh, D. (1998a). "The development of the policy network approach" in Marsh, D. (ed.) *Comparing Policy Networks*, Buckingham, Open University Press.
- Marsh, D. (1998b). "The utility and future of policy network analysis" in Marsh, D. (ed.) *Comparing Policy Networks*, Buckingham, Open University Press.
- Maskell, P. (1998). *Competitiveness, localised learning and regional development: specialisation and prosperity in small open economies*, London, Routledge.
- Maskell, P. and Tornquist, G. (1999). *Building a cross-border learning region - emergence of the North European Oresund Region*, Copenhagen, Copenhagen Business School Press.
- Massey, D., Quintas, P. and Wield, D. (1992). *High Tech Fantasies. Science Parks in Society, Science and Space*, London, Routledge.

- McCarthy, J. and Newlands, D. (1999). "Introduction" in McCarthy, J. and Newlands, D. (eds.) *Governing Scotland: Problems and Prospects. The economic impact of the Scottish Parliament*, Aldershot, Ashgate.
- McKelvey, M. (1991). "How do National Systems of Innovation Differ?: A Critical Analysis of Porter, Freeman, Lundvall and Nelson" in Hodgson, G. M. and Screpanti, E. (eds.) *Rethinking Economics*, Cheltenham, Edward Elgar.
- Miller, A. (2000). *Research - A Scottish Perspective*, Unpublished speech to CVCP Conference on 21st Century Research: New Challenges for Universities, 28 November 2000, London.
- Ministerial Industry Strategy Group (2002). *Pharmaceutical Industry Competitiveness Task Force: One Year On*, London, Department of Health
- Molina, A. and Kinder, T. (2001). "National systems of innovations, industrial clusters and constituency-building in Scotland's electronics industry", *International Journal of Entrepreneurship and Innovation Management* 1(2): 241-275.
- Morgan, K. (1997). "The Learning Region: Institutions, Innovation and Regional Renewal", *Regional Studies*, 31(5): 491-503.
- Morgan, K., Rees, G. and Garmise, S. (1999). "Networking for Local Economic Development" in Stoker, G. (ed.) *The New Management of British Local Governance*, Basingstoke, Macmillan Press.
- Moss, T. (2002). "The role of the "regional" in multi-level governance- in the mainstream or on the sidelines?". Unpublished conference paper prepared for *Governance and Sustainability - New challenges for State, Companies and the Civil Society*, 30 September – 1 October 2002, Berlin, organised by the Institute for Ecological Economic Research and the Friedrich-Ebert Foundation, Berlin.
- Mothe, J.d.l. (2001a). "Knowledge, Politics and Governance" in Mothe, J.d.l. (ed.) *Science, Technology and Governance*, London, Continuum.
- Mothe, J.d.l. (ed.) (2001b). *Science, Technology and Governance*, London, Continuum.
- Murden, T. (2001). "Risky Business", 8 July 2001, *The Sunday Times*, London.
- Murden, T. (2004). "Surprise choice Sir John has much to do at Scottish Enterprise", 1 February 2004, *Scotland on Sunday*, Edinburgh.
- Mytelka, L. and Smith, K. (2002). "Policy learning and innovation theory: an interactive and co-evolving process", *Research Policy*, 31(8-9): 1467-1479.

- Nauwelaers, C. and Wintjes, R. (2000). *SME Policy and the New Regional Dimension of Innovation: Towards a New Paradigm for Innovation Policy?*, Maastricht, MERIT.
- Nauwelaers, C. and Wintjes, R. (2002). "Innovating SMEs and Regions: The Need for Policy Intelligence and Interactive Policies", *Technology Analysis and Strategic Management*, 14(2): 201-215.
- Nelson, R. (1992). "National Innovation Systems: A Retrospective on a Study", *Industrial and Corporate Change*, 1(2): 347-374.
- Nelson, R. (ed.) (1993a). *National Innovation Systems. A Comparative Analysis*, New York, Oxford University Press.
- Nelson, R. (1993b). "A Retrospective" in Nelson, R. (ed.) *National Innovation Systems. A Comparative Analysis*, New York, Oxford University Press.
- Nelson, R. and Rosenberg, N. (1993). "Technical Innovation and National Systems" in Nelson, R. (ed.) *National Innovation Systems. A Comparative Analysis*, New York, Oxford University Press.
- Newby, H. (1994). *Innovation in UK Industry: The Role of the Social Sciences*, (Report of occasional lecture no. L12.11), London, Royal Academy of Engineering.
- Newlands, D. (1999a). "The economic impact of the Scottish Parliament: possibilities and constraints" in McCarthy, J. and Newlands, D. (eds.) *Governing Scotland: Problems and Prospects. The economic impact of the Scottish Parliament*, Aldershot, Ashgate.
- Newlands, D. (1999b). "Devolution in England: Lessons from Scotland" in *New Regional Strategies: Devolution, RDAs and Regional Chambers*. Conference Proceedings of the Regional Studies Association Annual Conference, November 1999, Seaford, Regional Studies Association.
- Newman, J. (2002). *Modernising Governance. New Labour, Policy and Society*, London, Sage.
- Nicholson, M. (2002). "Serendipity set to transform Lothians' status", 1 May 2002, *Financial Times*, London.
- Nightingale, P. (1998). "A cognitive model of innovation", *Research Policy*, 27(7): 689-709.
- Nutley, S. and Webb, J. (2000). "Evidence and the policy process" in Davies, H.T.O., Nutley, S.M. and Smith, P.C. (eds.) *What Works? Evidence-Based Policy and Practice in Public Services*, Bristol, The Policy Press.

- ODPM (no date). *Devolution in Practice. A Checklist for Officials*, London, Office of the Deputy Prime Minister.
- OST (1993). *Realising our Potential. A Strategy for Science, Engineering and Technology*, Cm2250, London, Stationery Office.
- Padmore, T., Schuetze, H. and Gibson, H. (1998). "Modeling systems of innovation: an enterprise-centred view", *Research Policy*, 26(6): 605–624.
- Parry, R. (2000). "The Civil Service and the Scottish Executive's Structure and Style" in Hassan, G. and Warhurst, C. (eds.) *The New Scottish Politics: The first year of the Scottish Parliament and beyond*, Norwich, Stationery Office.
- Parsons, W. (1995). *Public Policy. An introduction to the theory and practice of policy analysis*, Cheltenham, Edward Elgar.
- Parsons, W. (2001). "Modernising Policy-making for the 21st Century", *Public Policy and Administration*, 16(3): 93-110.
- Patel, P. and Pavitt, K. (1994). "The Nature and Economic Importance of National Innovations Systems", *STI Review*, 14: 9-32.
- Pavitt, K. and Sharp, M. (1993). "Technology Policy in the 1990s: Old Trends and New Realities" in Bekemans, L. and Tsoukalis, L. (eds.) *Europe and Global Economic Interdependence*, Bruges, College of Europe.
- Perry, B. (2003). "Making Science History: The Regionalisation of Science Policy?" Unpublished conference paper, *BA Festival of Science*, 9 September 2003, University of Salford.
- Peters, B.G. (1997). "Shouldn't row, can't steer: what's a government to do?", *Public Policy and Administration*, 12(2): 51-61.
- Peters, B.G. (1998). "Managing Horizontal Government: The Politics of Co-ordination", *Public Administration*, 76 (Summer): 295-311.
- Peters, E. and Hood, N. (2002). "Scotland's Biotechnology Cluster: Strategic Issues and Responses" in Hood, N., Peat, J., Peters E. and Young, S. (eds.) *Scotland in a Global Economy: The 2020 Vision*, London, Palgrave.
- PICTF (2001). *Pharmaceutical Industry Competitiveness Task Force Final Report*, London, DoH/DTI.
- Pierre, J. and Peters, B.G. (2000). *Governance, Politics and the State*, Basingstoke, Macmillan.
- Platt, J. (1981a). "Evidence and Proof in Documentary Research 1. Some specific problems of documentary research", *Sociological Review*, 29: 31-52.

- Platt, J. (1981b). "Evidence and Proof in Documentary research 2. Some shared problems of documentary research", *Sociological Review*, 29: 53-66.
- Platt, J. (1981c). "On interviewing one's peers", *British Journal of Sociology*, 32(1): 75-91.
- Porter, M. (1990). *The Competitive Advantage of Nations*, London, Macmillan.
- Regional Studies Association (2001). *Labour's New Regional Policy: An Assessment*, Seaford, Regional Studies Association.
- Regional Studies Association (2003). *Towards a Multi-level Science Policy: Regional Science Policy in a European Context*, Seaford, Regional Studies Association. (Subsequently published as Charles, D., Perry, B. and Benneworth, P. (2004). *Towards a Multi-level Science Policy: Regional Science Policy in a European Context*, Seaford, Regional Studies Association.)
- Reinhard, M. (1999). *Science and Technology Policy and Broad Industrial Policy: The Co-Evolution of Policies at the National, Regional and European Level. Country Report: Germany*, Munich, ifo Institut für Wirtschaftsforschung.
- Rennie, M. (2002). "Put research into business, not business into research", *Research Fortnight*, 27 February 2002: 17.
- Rhodes, R.A.W. (1997). *Understanding Governance. Policy Networks, Governance, Reflexivity and Accountability*, Buckingham, Open University Press.
- Rhodes, R.A.W. (1999). "Foreword: Governance and Networks" in Stoker, G. (ed.) *The New Management of British Local Governance*, Basingstoke, Macmillan Press.
- Rhodes, R.A.W. and Marsh, D. (1992). "New directions in the study of policy networks", *European Journal of Political Research*, 21: 181-205.
- Richardson, J.J. and Jordan, A.G. (1979). *Governing under Pressure. The Parliamentary Process in a Post-Parliamentary Democracy*, Oxford, Martin Robertson & Company.
- Rip, A. (2002). "Regional Innovation Systems and the Advent of Strategic Science", *Journal of Technology Transfer*, 27(1): 123-131.
- Roberts, P. and Benneworth, P. (2001). "Pathways to the Future? An Initial Assessment of RDA Strategies and their Contribution to Integrated Regional Development", *Local Economy*, 16(2): 142-159.
- Ronayne, J. (1984). *Science in Government*, Caulfield East Victoria, Edward Arnold (Australia).

- Rowland, S. (2004). "Crossing borders can be risky but rewarding", 2 April 2004, *Times Higher Education Supplement*, London.
- Royal Society of Edinburgh and Royal Society of London (1999). *Devolution and Science*, Edinburgh, Royal Society of Edinburgh.
- Sabatier, P.A. and Jenkins-Smith, H.C. (1993). *Policy Change and Learning: An Advocacy Coalition Approach*, Boulder, Westview Press.
- Sabatier, P.A. and Jenkins-Smith, H.C. (1999). "The Advocacy Coalition Framework: An Assessment" in Sabatier, P.A. (ed.) *Theories of the Policy Process*, Boulder, Westview Press.
- Sainsbury (1999). *Biotechnology Clusters*, DTI/Pub 4306/1.5k/08/99. URN 99/1027, London, DTI.
- Salter, A. (1998). *Faint expectations: science and technology policy in Ontario*. Unpublished PhD Thesis, SPRU, University of Sussex.
- Schiermeier, Q. (2003). "German reform plan arouses fears for autonomy", *Nature*, 423(6942): 790.
- Schön, D.A. (1983). *The Reflective Practitioner: How Professionals Think in Action*, London, Maurice Temple Smith.
- Scottish Civic Forum (2003). *Briefing Paper: The Scottish Parliament Committee System*, Edinburgh, Scottish Civic Forum.
- Scottish Enterprise (2002). *Biotech Scotland - Framework for Action 2002-2003*, Glasgow, Scottish Enterprise.
- Scottish Enterprise and Royal Society of Edinburgh (1996). *Commercialisation Enquiry Final Research Report*, Glasgow, Scottish Enterprise.
- Scottish Executive (1999). "Cluster Action Plan points way forward for biotechnology says McCleish", News Release: SE1235/1999, 9 November 1999, Edinburgh, Scottish Executive.
- Scottish Executive (2000a). *The Way Forward: Framework for Economic Development in Scotland*, SE/2000/58, Edinburgh, Scottish Executive.
- Scottish Executive (2000b). "Biotechnology to drive knowledge economy", News Release: SE2938/2000, 14 November 2000, Edinburgh, Scottish Executive.
- Scottish Executive (2000c). *Report of Science Strategy Review Group*, Edinburgh, Scottish Executive.

- Scottish Executive (2001a). *A Science Strategy for Scotland*, Edinburgh, Scottish Executive.
- Scottish Executive (2001b). *A Smart, Successful Scotland. Ambitions for the Enterprise Networks*, Edinburgh, Scottish Executive.
- Scottish Executive (2001c). “Wendy Alexander Launches First Ever Scottish Science Strategy”, News Release: SE1979/2001, 27 Aug 2001, Edinburgh, Scottish Executive.
- Scottish Executive (2002). *Scotland’s Economic Future. Doing it Differently*, Edinburgh, Scottish Executive.
- Scottish Executive (2003). “New Cabinet named at Bute House”. News Release: SENW513/2003, 20 May 2003, Edinburgh, Scottish Executive.
- Scottish Executive (2004a). “Smart Successful Scotland”. News Release: SEel316/2004, 2 April 2004, Edinburgh, Scottish Executive.
- Scottish Executive (2004b). “Biotechnology Scotland Awards”. News Release: SEel262/2004, 12 April 2004, Edinburgh, Scottish Executive.
- Scottish Executive (2004c). *Scottish Executive Response to the Scottish Science Advisory Committee's Reports: 1. “Science Matters: Making the Right Connections for Scotland” and 2. “Why Science Education Matters: Supporting and Improving Science Education in Scottish Schools”*, 1 July 2004, Edinburgh, Scottish Executive.
- Scottish Parliament (2001). *Official Report 31 March 2001*, Edinburgh, Scottish Parliament.
- Scottish Science Advisory Committee (2004a). “Connecting Scottish Science. Science Matters: Making The Right Connections for Scotland”, Press release, 13 January 2004, Edinburgh, Scottish Science Advisory Committee.
- Scottish Science Advisory Committee (2004b). *Science Matters: Making the Right Connections for Scotland*, Edinburgh, Scottish Science Advisory Committee.
- Scottish Science Advisory Committee (2004c). *Knowledge Transfer*, Edinburgh, Scottish Science Advisory Committee.
- Searle, C. (2000). “Using Computers to Analyse Qualitative Data” in Silverman, D. (ed.) *Doing Qualitative Research. A Practical Handbook*, London, Sage.
- Senker, J., Marsili, O., Worner, S., Reiss, T., Mangematin, V., Enzing, C. and Kern, S. (1999). *Literature Review for European Biotechnology Innovation Systems (EBIS)*, Brighton, SPRU.



- Shapira, P., Klein, H. and Kuhlmann, S. (2001). "Innovations in European and US innovation policy", *Research Policy*, 30(6): 869-872.
- SHEFC/Scottish Enterprise (2002). *Research and Knowledge Transfer in Scotland*, Edinburgh, SHEFC.
- Skidelsky, R. (1992). *John Maynard Keynes: A Biography Vol. 2 The Economist as Saviour, 1920-1937*, London, Macmillan.
- Sloat, A. (2000a). "Scotland and Europe: Links between Edinburgh, London and Brussels", *Scottish Affairs*, 31 (Spring): 92-110.
- Sloat, A. (2000b). *Scotland's role in the European Union: expectations of multi-level governance among political elites: an actor-centred approach*. Unpublished PhD Thesis, Department of Politics, University of Edinburgh.
- Sloat, A. (2002a). *Scotland in Europe*, Oxford, Peter Lang.
- Sloat, A. (2002b). "Governance: Contested Perceptions of Civic Participation", *Scottish Affairs*, 39 (Spring): 103-117.
- Smith, M.J. (1997). "Policy networks" in Hill, M. (ed.) *The Policy Process. A Reader*, London, Prentice Hall.
- Smits, R. and Kuhlmann, S. (2002). *Strengthening Interfaces in Innovation Systems: rationale, concepts and (new) instruments*, Report for EC STRATA workshop 22-23 April 2002, Brussels, EC.
- Smits, R. and Kuhlmann, S. (2004). "The rise of systemic instruments in innovation policy", *International Journal of Foresight and Innovation Policy*, 1(1/2): 4-32.
- Solesbury, W. (2001). *Evidence Based Policy: Whence it Came and Where it's Going*, Working Paper No 1, London, ESRC UK Centre for Evidence Based Policy and Practice.
- SPICE (2001). *Strategy for Enterprise*, Research Note, 31 January 2001, Edinburgh, Scottish Parliament Information Centre.
- Steward, F. (2001). "Shaping Technological Trajectories Through Innovation Networks: Investigating the Food Sector" in Jones, O., Conway, S. and Steward, F. (eds.) *Social Interaction and Organisational Change. Aston Perspectives on Innovation Networks*, London, Imperial College Press.
- Stoker, G. (1998). "Governance as theory: five propositions", *International Social Science Journal*, 50(155): 17-28.

Storper, M. (1995). "The Resurgence of Regional Economies, Ten Years Later: The Region as a Nexus of Untraded Interdependencies", *European Urban and Regional Studies*, 2(3): 191-221.

Sunday Herald (Business Leader) (2004a). "'Joined-up' thinking failed Scotland on a brand scale", 30 May 2004, *Sunday Herald*, Glasgow.

Sunday Herald (Business Leader) (2004b). "More focused SE can only be good for Scotland", 16 May 2004, *Sunday Herald*, Glasgow.

SUPRA (2000). *Response to Science Strategy Review Group*, SUPRA, University of Edinburgh.

Tait, E.J. (1987). "Research policy and review 14. Environmental issues and the social sciences", *Environment and Planning A*, 19: 437-445.

Tait, J. and Lyall, C. (2001). *Investigation into ESRC-funded Interdisciplinary Research*, Report to ESRC, May 2001, available from [www.supra.ed.ac.uk/Publications/ESRC\\_report\\_Interdisciplinary\\_research.pdf](http://www.supra.ed.ac.uk/Publications/ESRC_report_Interdisciplinary_research.pdf) (last accessed 28/10/04).

Tait, J. and Williams, R. (1999). "Policy approaches to Research and Development: Foresight, Framework and Competitiveness", *Science and Public Policy*, 26(2): 101-112.

Tait, J., Chataway, J. and Wield, D. (Forthcoming). "Governance, Policy and Industry Strategies: Agro-biotechnology and Pharmaceuticals", submitted to *Technology Analysis and Strategic Management*, available as Innogen Working Paper 12 from [www.innogen.ac.uk/ownPubs/Innogen\\_paper\\_12.pdf](http://www.innogen.ac.uk/ownPubs/Innogen_paper_12.pdf) (last accessed 28/10/04).

Tait, J., Williams, R., Bruce, A., Lyall, C and others (2002). *Interdisciplinary Integration in the Fifth Framework Programme (II-FP5)*, Report to EC (Accompanying Measure SEAC-1999-00034).

Taylor, A. (2000). "Hollowing out or filling in? Taskforces and the management of cross-cutting issues in British government", *British Journal of Politics and International Relations*, 2(1): 46-71.

Technology Ventures Scotland (2003). "Scottish Research Facts", *Resource* (Newsletter of the Royal Society of Edinburgh), Spring 2003: 3.

Thatcher, M. (1998). "The Development of Policy Network Analyses. From Modest Origins to Overarching Frameworks", *Journal of Theoretical Politics*, 10(4): 389-416.

Thomas, K. (2000). "Creating Regional Cultures of Innovation? The Regional Innovation Strategies of England and Scotland", *Regional Studies*, 34(2): 190-198.

- Thompson, G.F. (2003). *Between Hierarchies and Markets. The Logic and Limits of Network Forms of Organisation*, Oxford, Oxford University Press.
- Universities Scotland (2002). *The Knowledge Society. Submission to the Scottish Higher Education Review*, Edinburgh, Universities Scotland.
- Walker, W. (1993). "National Innovation Systems: Britain" in Nelson, R. (ed.) *National Innovation Systems. A Comparative Analysis*, New York, Oxford University Press.
- Walsh, V. (1988). "Technology and the Competitiveness of Small Countries: Review" in Freeman, C. and Lundvall, B.-A. (eds.) *Small Countries Facing the Technological Revolution*, London, Pinter.
- Wilkie, T. (1991). *British Science and Politics since 1945*, Oxford, Blackwell.
- Williams, R. and Edge, D. (1996). "The social shaping of technology", *Research Policy*, 25(6): 865-899.
- Williamson, M. (2004). "Biotech leader attacks SE experts and ministers", 13 February 2004, *The Herald*, Glasgow.
- Wilson, D. and Souitaris, V. (2002). "Do Germany's federal and land governments (still) co-ordinate their innovation policies?", *Research Policy*, 31(7): 1123-1140.
- Wojtas, O. (2004). "Scots join forces to compete globally", 16 January 2004, *Times Higher Education Supplement*, London.
- Wolfe, D.A. (1997). "The Emergence of the Region State" in Courchene, T.J. (ed.) *The Nation State in a Global Information Era: Policy Challenge*, Kingston, Bell Canada Papers on Economic and Public Policy 5, John Deutsch Institute for the Study of Economic Policy.
- Yin, R.K. (1994). *Case Study Research. Design and Methods*, London, Sage.

**A.1 Topic guide**

Variations of the following topic guide were used to steer interviews with policy-makers and policy targets.

**Policy concerns and interactions with government**

1. What are your firm's current policy preoccupations (particularly in relation to innovation)? (What are you trying to achieve and what are the barriers to success?)
2. How do you raise these concerns with government?
3. With whom do you engage – Holyrood, Westminster, Brussels or all three? Specifically, which departments/agencies, e.g.

Scotland

Scottish  
Parliament/MSPs  
Scottish Executive  
Science Policy Unit  
Innovation Policy Unit  
Policy Unit  
Regulatory Impact  
Unit  
Scottish Enterprise  
Other

UK

Scotland Office Industry  
Department  
DTI Biotechnology Unit  
DTI other  
OST  
DoH  
Home Office  
HMT  
Westminster  
Parliament/MPs  
Other

Europe

European Commission  
European Parliament  
Other

4. What are the types of interactions that you have with government in Scotland and are these interactions likely to inform policy? E.g.
  - One-to-one meetings with civil servants/MPs
  - Attendance at govt sponsored events
  - Membership of working groups (e.g. time limited on specific topics)
  - Formal consultation on specific issues (e.g. Scotland's Science Strategy)
  - Formal working relationship e.g. advisory role
5. Who takes part in these meetings from the company?

6. How do you know which issues to raise at which levels of government (Scottish, UK, EU) and with which part of government department/agency?
7. Does the Scottish biotechnology industry have a champion within government of DTI Biotechnology Directorate (or is their focus just on English based companies now?)
8. If you don't have direct policy related interactions with government do you do it through intermediaries/representative bodies? (See Q13)

### **Policy networks**

9. Do you regard interactions with government as a one-way lobbying process or is there genuine dialogue?
10. Is there an established policy network that brings together government and non-government actors or is one evolving? Who is in the network? Is this a Scottish network or UK wide?
11. Has there been a key policy issue that has brought the industry together to work in a concerted way with government? If so, is there evidence that this had an impact on government policy? i.e. do the actors in these policy networks actually shape policy or is policy still being driven along some pre-existing trajectory developed by pre-devolution institutions? (Does consultation mean anything?)
12. Is your firm involved in any EU funded activities that promote networking? If so what has been your experience of this network?
13. Membership of networks e.g. trade associations such as BIA or Edinburgh Bio-Alliance
  - what knits the network together
  - what you get out of these activities
  - what you are expected to put into them
  - how you got involved
  - whether it has specific, quantifiable, measurable goals

### **Perceptions of devolution**

14. How has the situation changed since devolution?
15. Is there now an opportunity for firms to communicate more directly with policy-makers at the local level or has the multi-level system made things more complex?
16. Is there any evidence of policy-oriented learning as a result of dialogue between policy-makers and policy targets?
17. How does the Scottish system compare with companies based in SE England – is it easier to lobby government now there is a Scottish Parliament and does it have a more immediate impact?

## A.2 Interviews

Table A.1 Breakdown of category and location of interviewees

<i>Category of Informant</i>				
Academic	Industry	Policy	Research	Total
10	12	23	3	48
<i>Location of Informant (or locus of expertise)</i>				
Scotland	UK	Cambridge	Germany	
35	8	3	2	48
<i>Category</i>	<i>Type of Organisation (and Division, where appropriate)</i>			<i>No. of interviews</i>
<b>Academic</b>	Advisory body			1
	Representative body			2
	Service provider			1
	University of Cambridge			1
	University of Edinburgh			5
<b>Academic Total</b>				<b>10</b>
<b>Industry</b>	Service provider			2
	Representative body			4
	SME			6
<b>Industry Total</b>				<b>12</b>
<b>Policy</b>	DTI (Bioscience Unit, Devolution Unit, Government Office, OST & Trade Directorate)			8
	Scotland Europa			1
	Scotland Office (Economy and Industry Dept)			1
	Scottish Enterprise (Knowledge Management, Life Sciences & Commercialisation Teams)			4
	Scottish Executive (ELL and Health Depts. & Policy Unit)			7
	SHEFC			2
<b>Policy Total</b>				<b>23</b>
Research	PSRE			2
	NHS research institute			1
<b>Research Total</b>				<b>3</b>
<b>Grand Total</b>				<b>48</b>

The majority of the interviews summarised in Table A.1 lasted one hour and generally involved the researcher and one informant. In a small minority of interviews, and only in the case of policy-makers, up to three informants took part. All respondents were offered anonymity and are therefore classified by their role and identified in the text by a code number based on the date of interview:

A = academic (*i.e.* based in HEI)

I = industrialist (includes individuals from representative bodies)

P = policy-maker

R = other researcher (*e.g.* based in PSRE rather than HEI)

### **A.3 Data analysis**

Figure A.1 draws an analogy between the data analysis technique described in Chapter 1 and a common purification method where the substrate (in this case the interview data) is gradually passed through a series of successively finer filters in order to condense and refine the information, resulting finally in a distilled, analytical narrative and a few key quotes which are reported in Chapters 4-7.

As discussed in Section 1.5, N6 is a document management and data analysis software package that enables code-based interrogation and searching of large quantities of text. By gathering together all material related to a particular topic under one “node” (a process known as “coding”) the analyst can then browse and explore everything grouped under that particular node and ask questions, find patterns and begin to build and test theories about the data. Nodes can represent concepts, processes, people, organisations, abstract ideas, places or any other categories appropriate to the particular research project<sup>1</sup>. Nodes can be kept as freestanding categories (“free nodes”), which can be useful for identifying early ideas or apparently unconnected initial concepts, or can be organised hierarchically into “trees”. In N6, the node system is designed to be modified as the research develops so early, “broad brush” coding (using primarily free nodes) can be reviewed as new ideas or more nuanced understanding develop, allowing nodes to be reorganised, combined or deleted and subcategories of node to be created into a more sophisticated tree node structure<sup>2</sup>. Figures A.2-A.4 represent the development of the analytical framework through a sequence of evolving tree node structures which were derived after several iterations. This process was guided by the topic guide, some use of grounded theory to explore emerging themes, and by the analytical questions discussed in Chapter 4 (see Figure A.5). Eventually, in the final iteration

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<sup>1</sup> *Introducing N6: A workshop handbook* by Lyn Richards (February 2002) [www.qsrinternational.com/resources/teachingmaterials/N6workbook.pdf](http://www.qsrinternational.com/resources/teachingmaterials/N6workbook.pdf) (last accessed 08/02/05).

<sup>2</sup> See *Getting Started in N6* (May 2004) [www.qsrinternational.com/products/productoverview/Getting%20Started%20in%20N6.pdf](http://www.qsrinternational.com/products/productoverview/Getting%20Started%20in%20N6.pdf) (last accessed 08/02/05).

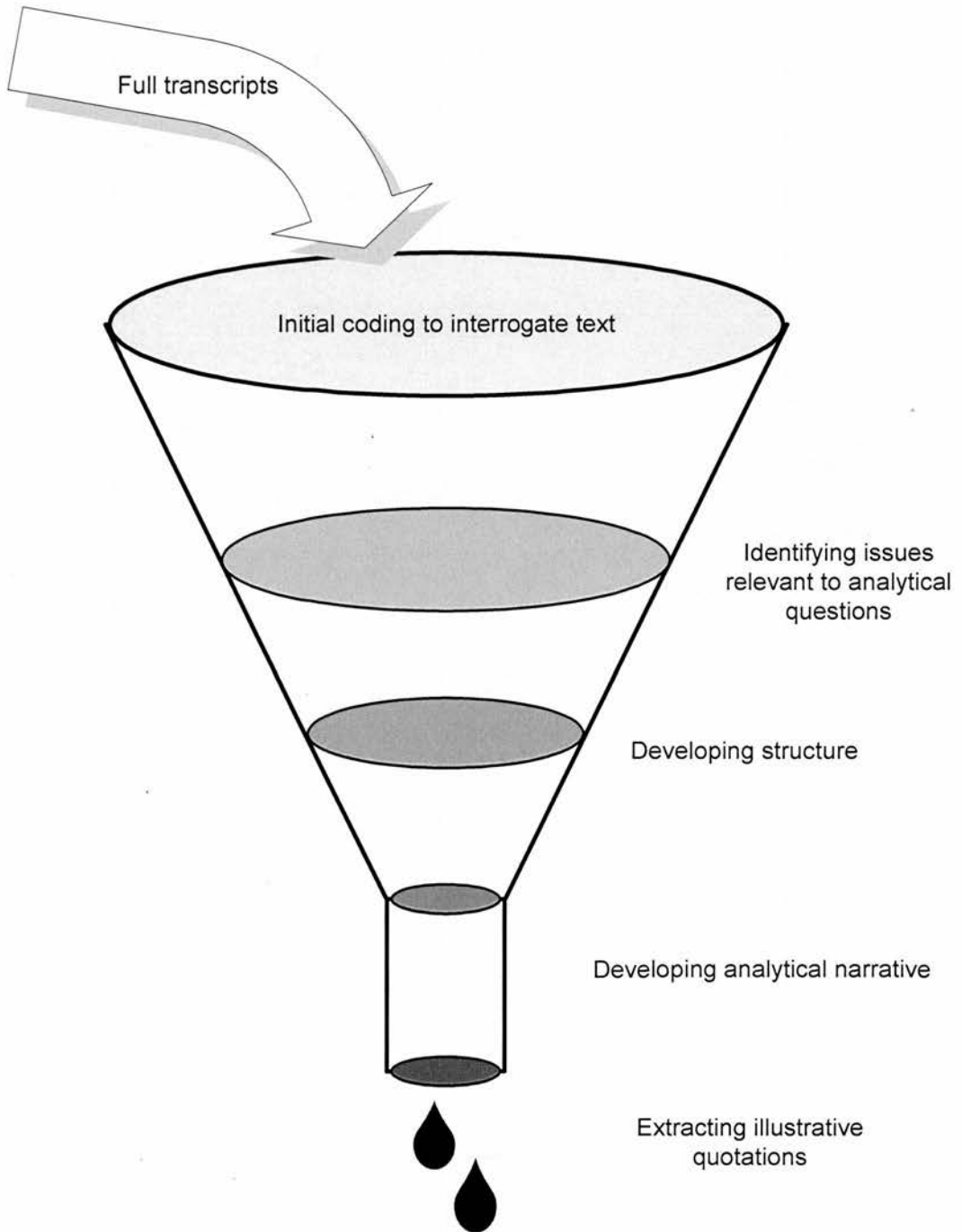


depicted here in Figure A.4, the content coding was structured according to chapter headings. In this way, as discussed in Section 1.5, careful coding and analysis of the interviews was used to underpin the narrative structure of the thesis as well as generating a selection of illustrative quotations.

Each transcript was also assigned a series of base codes relating to location and type of respondent (see Figure A.6) which facilitated the development of a number of search strategies summarised in Figure A.7. The symbol “ $\cap$ ” used in Figure A.7 indicates the intersection of a base code (*e.g.* the type of respondent) with a content code so that the search strategies summarised in Figure A.7 reveal answers to comparative questions of the type “what did policy-makers say about the evolution of networks in comparison with SMEs’ views on this subject?”.

**Figure A.1 The Data Analysis Process**

**(Or how to condense 50 hours of interviews into a few apposite quotes)**



**Figure A.2 Initial N6 coding framework (to interrogate text)**

---

Free Nodes

Free Nodes/best of both worlds  
Free Nodes/cluster development  
Free Nodes/dependency culture  
Free Nodes/ERI  
Free Nodes/Europe  
Free Nodes/ERA  
Free Nodes/Japan  
Free Nodes/JOURNAL  
Free Nodes/knowledge flows  
Free Nodes/parliament  
Free Nodes/Proof of concept fund  
Free Nodes/regional policy  
Free Nodes/SHEFC  
Free Nodes/small country  
Free Nodes/SSAC  
Free Nodes/university role  
Free Nodes/virtuous circle  
Free Nodes/Wendy Alexander

Tree Nodes

devolution  
devolution/changes  
devolution/comparisons  
devolution/impact of MLG  
DTI  
DTI/activities in Scotland  
DTI/relations with Scottish govt  
interactions  
interactions/knowledge of levels  
interactions/type of contact  
interactions/which level  
interactions/which part  
joined up govt  
joined up govt/within SExec  
policy concerns  
policy concerns/animal testing  
policy networks  
policy net./evidence of impact  
policy net./evolving  
policy net./existing  
policy net./governance level  
policy net./key policy issue  
policy net./lobbying or dialogue  
policy net./membership  
policy net./policy learning  
representative bodies  
representative bodies/activities  
representative bodies/BIA Scotland  
representative bodies/development  
representative bodies/educating companies  
representative bodies/rationalisation  
representative bodies/role in policy making  
Scottish Executive  
Scottish Executive/Buffer  
Scottish Exec/relations with SEnt  
Scottish Executive/role of SEnt  
Organisational/Case  
Organisational/Case/England  
Organisational/Case/Europe  
Organisational/Case/Scotland  
Organisational/Case/UK  
Organisational/Type of respondent  
Organisational/Type of respondent/Firm  
Organisational/Type of respondent/Firm/MNE  
Organisational/Type of respondent/Firm/SME  
Organisational/Type of resp./Policy maker  
Organisational/Type of  
respondent/Representative body  
Organisational/Type of respondent/Research  
Organisational/Type of resp./Research/Institute  
Organisational/Type of resp./Research/univ.

---

**Figure A.3 Interim N6 coding framework (to identify analytical issues)**

---

representative bodies	policy networks
representative bodies/role in policy making	policy networks/existing
representative bodies/rationalisation	policy networks/evolving
representative bodies/BIA	policy networks/membership
representative bodies/development	policy networks/Involving "stars"
representative bodies/activities	policy networks/advice to govt
representative bodies/educating companies	policy networks/Leadership
Intro & background	policy networks/Leadership/Wendy Alexander
Intro & background/animal testing	policy networks/Bioindustry SG
Intro & background/skills related	policy networks/knowledge flows
Intro & background/start up companies	policy networks/governance level
Intro & background/policy approaches	policy networks/ITIs
Intro & background/commercialisation	policy networks/Self organising
Intro & background/Foresight	policy networks/key policy issue
Intro & background/policy concerns	policy networks/Involving industry
Intro & background/cluster development	Policy learning
Intro & background/Proof of concept fund	Chapter 5
Impact	Chapter 5/science cross-cutting group
Impact/evidence of impact	Chapter 5/Science Strategy
Impact/lobbying or dialogue	Chapter 5/SSAC
Policy integration	devolution
Policy integration/within SExec	devolution/changes
Policy integration/Joined up govt	devolution/impact of MLG
interactions	devolution/impact of MLG/Research Council
interactions/type of contact	funding
interactions/which part	devolution/impact of MLG/proximity
interactions/which level	devolution/comparisons
interactions/which level/Europe	devolution/small country
interactions/which level/Scottish Parliament	devolution/best of both worlds
interactions/pharma vs biotech	ZZ Organisational
Role of govt and agencies	ZZ Organisational/Case
Role of govt and agencies/dependency culture	ZZ Organisational/Case/Scotland
Role of govt & agencies/relations SExec & SEnt	ZZ Organisational/Case/England
Role of govt and agencies/Buffer	ZZ Organisational/Case/UK
Role of govt and agencies/Scottish Enterprise	ZZ Organisational/Case/Europe
Role of govt and agencies/Scottish Executive	ZZ Organisational/Case/US
Role of govt and agencies/Scotland Office	ZZ Organisational/Type of respondent
Role of govt&agencies/Smart Successful Scot'	ZZ Organisational/Type of resp./Policy maker
Role of govt and agencies/role of govt	ZZ Organisational/Type of resp./Rep. body
Role of govt and agencies/DTI	ZZ Organisational/Type of respondent/Firm
Role of govt and agencies/SHEFC	ZZ Organisational/Type of resp./Firm/SME
Comparative networks	ZZ Organisational/Type of resp./Firm/MNE
Comparative networks/BIGT	ZZ Organisational/Type of respondent/Research
Comparative networks/PICTF	ZZ Organisational/Type of resp./Research/univ.
Comparative networks/CST	ZZ Organisational/Type of resp./Res./Institute
Comparative networks/Japan	ZZ Organisational/Type of respondent/Other
Comparative networks/Cambridge	
Comparative networks/Manchester	
Comparative networks/Germany	

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**Figure A.4 Final N6 coding framework (to develop structure)**

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Chapter 4

Introduction to chapter 4/policy concerns  
Question 1/pharma vs biotech  
Question 1/type of contact  
Question 1/which level  
Question 1/which level/Europe  
Question 1/which level/Scottish Parliament  
Question 1/which part  
Question 2/best of both worlds  
Question 2/changes  
Question 2/comparisons  
Question 2/impact of MLG  
Question 2/impact of MLG/proximity  
Question 2/impact of MLG/Res Council funding  
Question 2/small country  
Question 3/advice to govt  
Question 3/Bioindustry SG  
Question 3/evolving  
Question 3/existing  
Question 3/governance level  
Question 3/Involving "stars"  
Question 3/Involving industry  
Question 3/key policy issue  
Question 3/key policy issue/it is  
Question 3/key policy issue/POC fund  
Question 3/knowledge flows  
Question 3/membership  
Question 4/evidence of impact  
Question 4/lobbying or dialogue  
Question 5/Policy learning

Chapter 5

Chapter 5/science cross-cutting group  
Chapter 5/Science Strategy  
Chapter 5/SSAC

Chapter 6

Chapter 6/BIGT  
Chapter 6/Cambridge  
Chapter 6/Germany  
Chapter 6/PICTF

Chapter 7

Chapter 7/Joined up government  
Chapter 7/Joined up government/Joined up govt  
Chapter 7/Joined up government/within SExec  
Chapter 7/Role of govt and agencies  
Chapter 7/.../dependency culture  
Chapter 7/.../DTI  
Chapter 7/.../Gatekeeper  
Chapter 7/.../relations SExec & SEnt  
Chapter 7/.../role of govt  
Chapter 7/.../Scotland Office  
Chapter 7/.../Scottish Enterprise  
Chapter 7/.../Scottish Executive  
Chapter 7/.../SHEFC  
Chapter 7/.../Smart Successful Scotland

Background issues

Background issues/animal testing  
Background issues/cluster development  
Background issues/commercialisation  
Background issues/skills related  
Background issues/start up companies

Theme A Leadership

Theme A Leadership/Self organising  
Theme A Leadership/Wendy Alexander

Theme B Role of representative bodies

Theme B .../activities  
Theme B .../BIA  
Theme B .../development  
Theme B .../educating companies  
Theme B .../rationalisation  
Theme B .../role in policy making

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## Figure A.5 Analytical questions

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1. Who participates in policy-making at the regional level in Scotland and through what mechanisms are policy targets engaging in the policy process in Scotland?
  2. Has participation in the policy-making process been facilitated by the establishment of the Scottish Parliament?
  3. Is there evidence that this engagement is leading to the formation of a distinct Scottish policy network for STI?
  4. Is there any evidence of changes in practice or outcomes (“policy learning”) as a result of this dialogue between policy-makers and policy targets?
- 

## Figure A.6 Base codes

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<u>Case</u>	<u>Type of respondent</u>
Base data/Case/England	Base data/.../Firm
Base data/Case/Europe	Base data/.../Firm/MNE
Base data/Case/Scotland	Base data/.../Firm/SME
Base data/Case/UK	Base data/.../Other
Base data/Case/US	Base data/.../Policy-maker
	Base data/.../Representative body
	Base data/.../Research
	Base data/.../Research/Institute
	Base data/.../Research/university

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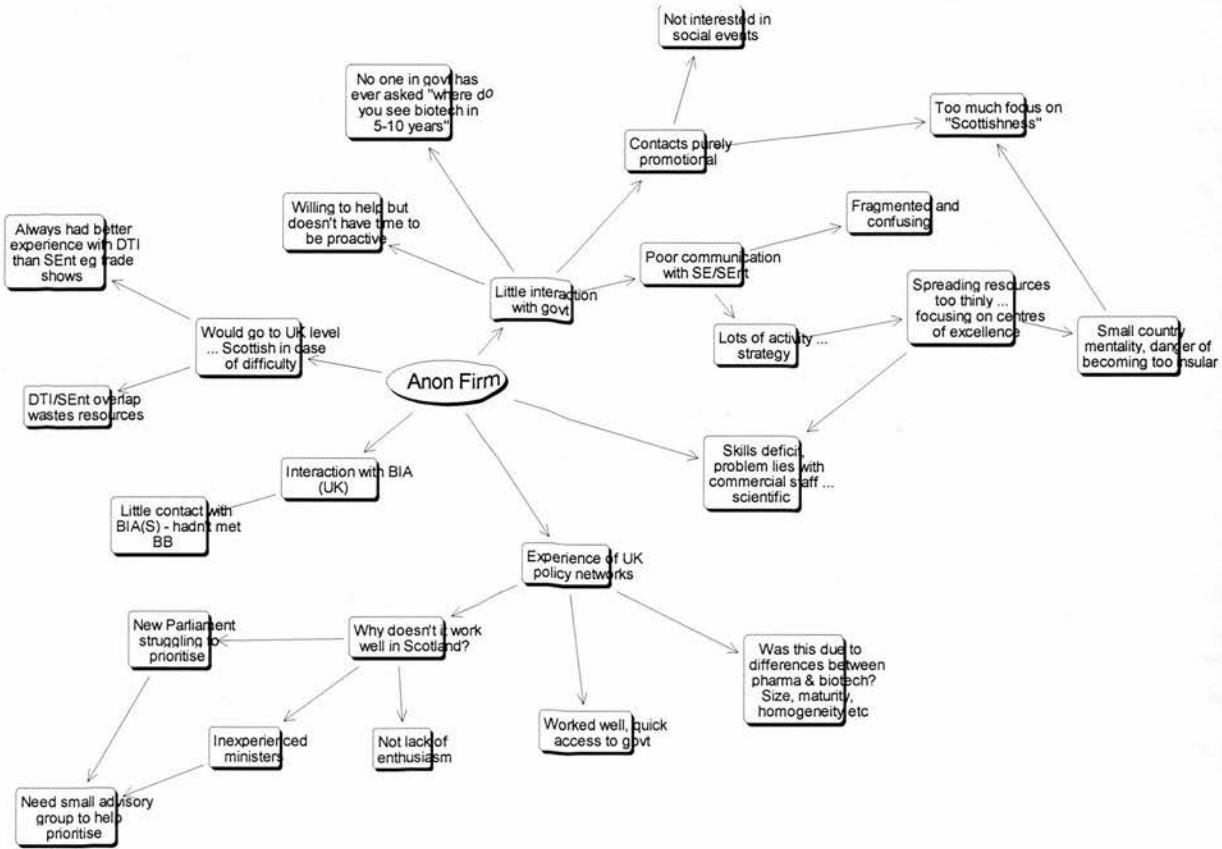
## Figure A.7 N6 search strategies

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Policy-makers $\cap$ Scottish Enterprise	Policy-makers $\cap$ evolving networks
Representative bodies $\cap$ Scottish Enterprise	Representative bodies $\cap$ evolving networks
SMEs $\cap$ Scottish Enterprise	SMEs $\cap$ evolving networks
Universities $\cap$ Scottish Enterprise	Universities $\cap$ evolving networks
Policy-makers $\cap$ devolution	Policy-makers on policy impact
Representative bodies $\cap$ devolution	Representative bodies $\cap$ policy impact
SMEs $\cap$ devolution	SMEs $\cap$ policy impact
Universities $\cap$ devolution	Universities $\cap$ policy impact
Policy-makers $\cap$ MLG	Policy-makers $\cap$ policy learning
Representative bodies $\cap$ MLG	SMEs $\cap$ policy learning
SMEs $\cap$ MLG	Universities $\cap$ policy learning
Universities $\cap$ MLG	Representative bodies $\cap$ policy learning
	SME $\cap$ Gate-keeper $\cap$ Scottish Enterprise

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**Figure A.8 Sample cognitive map (prepared using Banxia Explorer software)**



The concepts in the original maps were colour coded to represent different themes (e.g. interactions with government, MLG issues, policy concerns, issues related to policy networks).

#### **A.4 Events attended**

30 March 2001	<i>Good Governance - the place of research in informing public policy and scrutiny in Scotland</i> , Scottish Parliament (SPICE)
09 May 2001	<i>Biotechnology in Scotland – Achieving its Potential</i> , Bio-Dundee
16 May 2001	<i>European Life Science 2001- an Industry Review</i> , Glenn Crocker, Ernst & Young
20 June 2001	<i>RSA and ESRC Urban and Regional Economics Group seminar on clusters policy</i> , University of Paisley
27 August 2001	<i>Launch of Science Strategy for Scotland</i> , Glasgow Science Centre
05 September 2001	<i>Does Scotland need its own science policy?</i> Seminar at BA annual meeting, University of Glasgow
23 October 2001	<i>Does Scotland have the skills to support a knowledge economy?</i> Foundation for Science and Technology/Royal Society of Edinburgh discussion
29 October 2001	<i>Stateless Nations in the 21<sup>st</sup> Century – The Case of Scotland</i> , lecture by Professor Dave McCrone at RSE
01 November 2001	<i>Inquiry into SHEFC reviews of teaching and research funding</i> , Enterprise and Lifelong Learning Committee Debate, Scottish Parliament
15 November 2001	<i>Science and the Parliament</i> , Information day for MSPs organised by RSC
21 November 2001	<i>Regionalising the Knowledge Economy</i> , Regional Studies Association seminar, London
16 January 2002	<i>ER – Operational Activities of the Scottish Executive</i> , lecture by Barbara Doig, Head of Europe and International Affairs Division, Scottish Executive. University of Edinburgh Politics Department seminar
20 February 2002	<i>Biotechnology Scotland Beyond 2002</i> , Scottish Enterprise, Biotechnology Strategy day facilitated by Richard Seline of NES
25 February 2002	<i>The Regulation of Science</i> , Hazards Forum and Better Regulation Task Force, Royal Society, London
21-23 March 2002	<i>Rethinking Science Policy Conference</i> , SPRU, University of Sussex
24-25 September 2002	<i>Mobilising Regional Foresight</i> , HLEG /STRATA, EC, Brussels



- 23 October 2002 *QSR N6 training workshop*, University of Surrey
- 24 October 2002 *A Science Strategy for Scotland*, Foundation for Science and Technology discussion dinner at RSE
- 06 November 2002 *Science and the Parliament*, Information day for MSPs organised by RSC
- 14-15 November 2002 *New Governance of Innovation – The need for horizontal and systemic policy co-ordination*, Fraunhofer ISI, Karlsruhe, Germany
- 22 November 2002 *Modernising Governance*, lecture by Janet Newman, OU. University of Edinburgh, Social Policy Seminar
- 29 November 2002 *The Cambridge Phenomena – Can Midlothian be the Cambridge of the North*. SEEL Seminar, Edinburgh
- 16-17 December 2002 *Doing regional research in a devolving state: methodological development and research strategy in the post devolution UK*. ESRC PG training workshop, CURDS, Newcastle
- 16 January 2003 *Asia Pacific: Emerging Markets*, Scottish Enterprise/Scottish Development International Seminar, Stirling, School of Management
- 06 February 2003 *CBI Holyrood Election 2003 Business Breakfast*, Carlton Highland Hotel, Edinburgh
- 13-14 February 2003 *Thistle Bioscience Forum*, BIA Scotland Annual Meeting, Crowne Plaza Hotel, Edinburgh
- 12 May 2003 *Science and the UK Regions: Towards Regionalisation?* Science and Society seminar, University of Salford
- 16-20 June 2003 *ESRC Residential Summer School on Evidence Based Policy Research*. ESRC Centre for Evidence Based Policy, Queen Mary, University of London
- 30 August 2003 *The Scottish Parliament, Politics and the People*. Centre for Scottish Public Policy Conference, Edinburgh
- 08 September 2003 *Who's in charge? The challenges of science and governance in the 21<sup>st</sup> century*. BA Festival of Science, University of Salford
- 09 September 2003 *Regional governance and science policy*. BA Festival of Science, University of Salford
- 22 October 2003 *Briefing on ITI Life Sciences*, Norton House, Edinburgh
- 11 November 2003 *Science and the Parliament*, Information day for MSPs organised by RSC

- 13-15 November 2003 *“What Do We Know About Innovation?”* Conference in recognition of the lifetime contribution of Professor Keith Pavitt to the study of innovation, SPRU, Freeman Centre, University of Sussex
- 21 November 2003 *Economic Governance Post-Devolution: Differentiation or Convergence?*, Regional Studies Association Conference, London
- 25 November 2003 *Participation Summit*, Scottish Civic Forum at the Scottish Parliament
- 05 December 2003 *Does the Scottish Parliament Matter?* Mark Shephard, University of Strathclyde. University of Edinburgh, Social Policy Seminar
- 9 December 2003 *What next for UK science policy?*, Royal Society of Edinburgh seminar, Edinburgh
- 13 January 2004 Launch of SSAC report *Science Matters: Making the Right Connections for Scotland*, Glasgow
- 22-23 March 2004 *What is the Scottish Strategy for (and what are its key values)?* Wilson Sibbett, Chair, Scottish Science Advisory Committee. Contribution to ESRC Innogen Centre’s workshop on Values, Policy and Innovation
- 13 April 2004 *Regions and European Union Governance: Lessons from Scotland?* Professor Andrew G. Scott, Chair of European Union Studies, University of Edinburgh
- 19-20 May 2004 *PRIME Doctoral Conference*, SPRU, University of Sussex
- 2 September 2004 *Fifth International Strategies in Qualitative Research Conference*, University of Durham

## **A.5 Publications**

\*Bruce A., Lyall C., Tait J. and Williams, R. (2004) "Interdisciplinary Integration in the Fifth Framework Programme", *Futures*, 36(4): 457- 470.

Bruce, A., Lyall, C. and Laurie, G. (in preparation). "What is the role of values in policy learning?", to be submitted to *Science and Public Policy*.

\*Lyall C., Bruce A., Firm J., Firm M., and Tait J. (2004) "Assessing end-use relevance of public sector research organisations", *Research Policy*, 33(1): 73-87.

\*Lyall C. and Tait J. (2004) "Foresight in a Multi-level Governance Structure: Policy Integration and Communication", *Science and Public Policy*, 31(1): 27-37.

Lyall C. and Tait, J. (forthcoming 2005) "Shifting Policy Debates and the Implications for Governance" in Lyall C. and Tait, J. (Eds.) *New Modes of Governance: Developing an Integrated Policy Approach to Science, Technology, Risk and the Environment*, Ashgate, Aldershot.

Lyall C. (in preparation) "Scotland's Science Strategy: An Exercise in Concurrent Power?", to be submitted to *Scottish Affairs*

**\* Offprints of these three published articles are bound in with this thesis**



# Interdisciplinary integration in Europe: the case of the Fifth Framework programme

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## Abstract

This paper describes an investigation into the experience of researchers and research managers involved in the European Union Fifth Framework Programme (FP5) with its ambitious encouragement of more integrated problem-oriented approaches to research. We used a series of workshops, a questionnaire survey, individual telephone interviews and six detailed case studies to examine the extent to which these ambitions for 'interdisciplinary integration' were being met and the issues involved. Various models of disciplinary integration were identified, which may be appropriate in particular settings. Whilst we found disappointingly few projects that seemed by our criteria to be clearly interdisciplinary, particularly in crossing the boundary between natural and social sciences, we did find a great deal of learning taking place about how to conduct interdisciplinary research and how to overcome some of the difficulties experienced. Researchers emphasised in particular the importance of careful consortium development and team building as a basis for effective interdisciplinary research, and the time and effort needed to establish effective communication between different specialisms. The paper identifies barriers to collaboration between disciplines and some strategies and measures through which closer integration, and its associated benefits, might best be secured.

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## 1. Introduction

Increasingly, there are calls for more interdisciplinary approaches to problems, along with encouragement for greater collaboration and networking among institutions and researchers [1]. Such encouragement is often based on the assumption

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that the research will contribute to more effective innovation and enhanced competitiveness. Pressure to encourage interdisciplinary research also comes from the need to solve complex socio-scientific problems, where one discipline on its own cannot provide an answer. However, this perceived need for interdisciplinary research, despite considerable financial encouragement and verbal exhortation is not being met by the research community, particularly when it comes to research which crosses the boundaries between natural sciences and social sciences [2] and there are few studies available on which to base policy recommendations for the support and management of interdisciplinary research.

The European Union's centralised research activities during the period 1998–2002 were set out in the European Commission's (EC's) Fifth Framework Programme (FP5). This was a conscious attempt to direct research into selected areas with the objectives of increasing industrial competitiveness and improving the quality of life for European citizens. The programme was divided into four main thematic sub-programmes: Quality of Life and Management of Living Resources (QoL), User-friendly Information Society (IST), Competitive and Sustainable Growth (Growth), and Energy Environment and Sustainable Development (EESD). Research consortia consisted of multinational teams of researchers, often involving several sectors: academia, industry, government and civic society. A key feature of FP5 was an integrated approach to research and its exploitation. FP5 aimed towards more effective European policymaking in relation to complex societal problems, as well as increasing the success of technological innovation and economic competitiveness in major industry sectors such as information and communication technology and life sciences [3]. It was seen as involving closer collaboration and interaction, on the one hand, between researchers and practitioners (e.g. policymakers, industrialists) and on the other, between disciplines both within and between the social and natural sciences. FP5 instituted a major departure from previous Framework Programmes (in addition to bringing forward best practice from within them) in its strong focus on interdisciplinary integration, particularly bringing socio-economic research perspectives into the major science and technology-based Research and Technological Development (RTD) Programmes in a much more explicit way than had previously been the case.<sup>1</sup>

## 2. Definitions and types of interdisciplinary research

Disciplines themselves have been described as stable systemic communities within which researchers concentrate their experience into a particular worldview. This has benefits in terms of the efficiency of communication and interaction within the disciplines (including, for example, assessment of quality or the verification of

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<sup>1</sup> This paper is based on an EC-funded Accompanying Measure 'Interdisciplinary Integration in the Fifth Framework Programme (II-FP5)'. The full Report, Executive Summary, Guidelines and Case Studies from this project are available on the SUPRA website (<http://www.supra.ed.ac.uk>).

knowledge claims) but puts limits on the kinds of questions they can ask about their material, the methods and concepts they use, the answers they believe and their criteria for truth and validity [4].

Pressures to cross disciplinary boundaries in conducting research can arise for a variety of reasons and the resulting models and approaches have been subject to a wide range of concepts and definitions. However, discussion of this subject has shown little consistency of definition or, more usually, no definitions are provided.

In the course of a series of projects studying interdisciplinary research processes, [5–7] we have found that the following basic set of definitions covers the most important categories and makes useful distinctions:

*Transdisciplinary* research focuses on the organisation of knowledge around complex heterogeneous domains, rather than the disciplines and subjects into which knowledge seems inevitably to become organised in academic settings [8], ‘transcending’ the academic disciplinary structure. In the context of problem solving, soft systems analysis has many parallels with transdisciplinary research and attempts to devise approaches which are tailored specifically to the problem context and do not rely on any pre-determined disciplinary bias [9]. References to academic disciplines rarely feature in the literature from soft systems analysis and these trans-disciplinary approaches specifically set themselves apart from discipline-based academic structures. Such approaches may also seek to break down the distinction within research programmes between researchers and stakeholders from industry or civil society.

*Multidisciplinary research* approaches an issue from the perspectives of a range of disciplines, but each discipline works in a self-contained manner with little cross-fertilisation among disciplines, or synergy in the outcomes.

*Interdisciplinary research* similarly approaches an issue from a range of disciplinary perspectives but in this case the contributions of the various disciplines are integrated to provide a holistic or systemic outcome.

Multidisciplinary research involves low levels of collaboration, does not challenge the structure or functioning of academic communities and does not require any changes in the academic worldviews of the researchers themselves. Effective interdisciplinary research, on the other hand, requires new modes of thinking by researchers and cuts across the traditional discipline-based academic structures and systems of reward and resource allocation that are found in most universities and many research institutes. Despite its important benefits in advancing and applying knowledge, the work of interdisciplinary integration involves intellectual and practical challenges and may thus be more difficult to achieve and hence less common than multidisciplinary research.

The focus of the research described here is on interdisciplinary research. However, among the researchers and projects we studied, we found many examples of multidisciplinary research and also some examples of transdisciplinary research. Within the category of interdisciplinary research, in the course of our studies of interdisciplinarity, we have identified two fundamentally different motivations for

conducting interdisciplinary research. Gibbons et al. 1994 [10] developed a typology contrasting Mode 1 and Mode 2 research; the former corresponding broadly to traditional disciplinary specialisms, and the latter referring to a 'new production of knowledge' that cuts across disciplinary boundaries in order to resolve complex societal problems. We have adapted this well-known terminology to draw a parallel distinction, within interdisciplinary research, between:

*Mode 1 Interdisciplinary Research* brings together researchers from different disciplines in order to overcome a blockage to further development within a discipline, or to enable the discipline to move into new and productive areas of research. In the long run, it furthers the expertise and competence of academic disciplines, for example through developments in methodology and instrumentation, and may even lead to the formation of new disciplines or sub-disciplines. Mode 1 interdisciplinary research is thus one of the primary engines of the evolution of disciplines. Although in this sense, it supports rather than challenges the discipline-based structure of academic and research institutions, in the short-term (e.g. the timescale of an individual project) it can meet resistance from existing academic structures just as much as Mode 2 interdisciplinary research. Overall, the academic barriers to Mode 1 interdisciplinary research are not so strong as for Mode 2 and there are fewer difficulties in evaluating and administering projects.

*Mode 2 Interdisciplinary Research* addresses issues of social, technical and/or policy relevance where the primary aim is problem-oriented and discipline-related outputs are less central to the project design. The relevant mix of disciplines tends to be project specific. Researchers who develop a career working on such projects build up expertise on the integration of disciplines in a range of contexts and the management of other researchers from different disciplines working together, skills not highly valued in an academic context. Mode 2 interdisciplinary research is thus often regarded as undermining academic research, taking its evolution in a direction with which many academics are uncomfortable and is often seen by discipline based researchers as at best irrelevant and at worst threatening. The barriers to this type of interdisciplinary research are correspondingly greater, as are the difficulties of evaluating and managing it.

The requirements for interdisciplinary approaches vary across different research areas. In some cases, Mode 1 interdisciplinary research will be appropriate and, in others, the focus should be on Mode 2. Sometimes there will be little justification to go beyond a mono-disciplinary or multidisciplinary approach. It would promote the overall quality of research and the effectiveness of research programmes if clearer distinctions were made between projects where interdisciplinary work is really valuable and where it is not so important for the outcomes and if consideration was also given to the different requirements of Mode 1 and Mode 2 approaches. There is thus a need to distinguish in programme specifications where interdisciplinary research is most valuable and where single or multi-disciplinary research would be more appropriate.

### 3. Experience of research in the fifth framework programme

Our project (Interdisciplinary Integration in the Fifth Framework Programme [II-FP5]) investigated the experience of researchers and others involved in FP5 in responding to the European Commission's aim to introduce a greater degree of interdisciplinary integration into its major Research and Technological Development (RTD) Programmes. The project aimed to create a better understanding of the issues at the European level in integrating socio-economic research into the major FP5 RTD programmes, and of how we can emulate and build upon success. It had four major components:

1. Preliminary discussions and workshop;
2. A questionnaire-based survey and follow-up telephone interviews of FP5 project co-ordinators;
3. Six detailed case studies;
4. Meetings to discuss project findings with groups of European experts in interdisciplinary research.

The preliminary discussions and workshop identified a number of issues to be explored, which were incorporated into the questionnaire. The questionnaire was brief and was intended to give a quantitative assessment of the issues affecting interdisciplinary integration in the FP5 research programmes, including integration of socio-economic and natural science disciplines.

Questions related to:

- The interdisciplinary nature of the project;
- The respondent's experience of working in interdisciplinary projects;
- Development of the research consortium;
- Project management;
- Issues concerned with career development for interdisciplinary researchers;
- User/stakeholder involvement in the project;
- General experience of running cross-disciplinary projects.

The questionnaires were emailed to co-ordinators of FP5 projects in selected Key Actions within the Thematic Programmes: QoL, IST, Growth, EESD.<sup>2</sup> Co-ordinators were asked to self-categorise their project as interdisciplinary, multi-disciplinary or monodisciplinary (in terms of our definitions as given above). Sixty six percent classified themselves as interdisciplinary and a further 22% as multi-disciplinary. Of the interdisciplinary projects, 30% (32 projects) included both natural and social sciences, 61% included only natural sciences and 3% included only

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<sup>2</sup> One hundred and sixty responses were obtained from 754 questionnaires delivered (the survey was also extended to a sample of projects under the 4th Framework Programme, though the low levels of interdisciplinarity found provided little scope for comparative analysis).



Table 1  
Percentage of co-ordinators in each type of institution in the four FP5 thematic sub-programmes

	EESD	Growth	IST	QoL
Industry	36	53	60	10
Research institute	36	22	13	41
University	29	16	23	42
Other <sup>a</sup>		9	5	8
Total	100	100	100	100

<sup>a</sup> 'Other' category included: development support organisations, national food administrations, charitable foundations, local government research organisations.

social sciences. Feedback from those who notified us that they chose not to complete the questionnaire on the basis that their project was monodisciplinary suggests that those who understood their project to be interdisciplinary were more likely to reply. Therefore, respondents cannot be considered to be randomly distributed across the survey population. However, the aim of the project was not to carry out a random survey but to learn from the experiences of the interdisciplinary projects.

The research consortia varied in size and in composition, with co-ordinators coming from a range of institutions, including both industry and public sector research. Table 1 summarises the percentage of co-ordinators from each type of institution.

Follow-up telephone interviews were carried out with 21 co-ordinators who had responded to the questionnaire, selected on the basis of the interdisciplinary nature of the project or because their responses elicited some information which we wanted to understand in more detail. A further six projects across the four thematic programmes were selected for detailed case studies on the basis of apparent strong interdisciplinary content. In practice, we found the degree of interdisciplinarity varied enormously among the projects rating themselves as interdisciplinary, with very few projects fully integrating disciplines.

### 3.1. *Why do interdisciplinary research?*

Table 2 summarises researchers' motivations for developing an interdisciplinary project, together with examples of perceived benefits.

There was strong agreement among respondents that collaborative research involving several disciplines is interesting and stimulating. One respondent said:

You have always something new to learn. There are several points in common in different disciplines which are not conceived at the beginning of the research work. Sometimes results in a given discipline would be much better if another point of view (discipline) was involved from the very beginning.

Of the reasons given in Table 2, only the last is in the category of Mode 1 interdisciplinary research; the rest are Mode 2, reflecting the importance of contributing

Table 2  
 Motivations for developing an interdisciplinary project and examples of perceived benefits

Motivations	Benefits
The nature of the subject is interdisciplinary (e.g. transport, environment)	Bringing together parallel sets of knowledge to achieve synergy between them
Researchers were transferring information from the laboratory to the real world	Better technology transfer in IT related industries
The research was user driven (not necessarily commercial) and heavily applied	More accurate understanding of markets and opportunities
The research was particularly relevant to policy and many strategic issues can only be effectively addressed by interdisciplinary approaches	More effective research on complex application areas, e.g. in regional development, health or transport, where an interdisciplinary approach is needed to cope with complexity
Single discipline research had encountered a bottleneck and more than one discipline was needed to make a breakthrough	Overcoming bottlenecks in technological process development

to improved quality of life for Europe's citizens and greater competitiveness for its industries as aims of FP5.

Those taking part in a Mode 1 interdisciplinary project are likely to find themselves in a more long-term association of disciplines tackling a specific knowledge generation problem which is relatively clearly defined, even if the solution is elusive over quite a long period. Successful Mode 1 research can lead to the establishment of a new direction for an existing academic discipline or even a new discipline, supported by a departmental structure, a suite of academic journals and a readily recognisable academic peer group. Recent examples of this process are the development of bio-informatics as a new discipline, in response to the new problem of dealing with very large biological datasets emerging from genomics-related research, and the emergence of genetic veterinary epidemiology as a new subject area. There are obvious career risks for those involved in unsuccessful Mode 1 collaborations but where they are successful, there are real academic rewards.

Mode 2 interdisciplinary research, on the other hand, offers greater risks and fewer rewards in academic career terms. Groupings and partnerships are often more fluid and short term, and many researchers are forced to return to a discipline base rather than pursuing an interdisciplinary research career, even if they do so reluctantly.

### 3.2. *Perceived successes and problems in interdisciplinary research*

In this study, the best collaborations were regarded as those which build on existing consortia, contacts and links, supplemented by 'word of mouth' suggestions, informal contacts and meeting people at conferences.

Difficulties had arisen in some projects when taking on board participants whose capabilities and track record were not known, e.g. through partner search services. The problems of consortium building increased with the size of the consortium, although there were cases where large consortia had been successfully developed

(e.g. with more than 20 partners). Consortium building could be a slow process requiring a significant investment of resources which could be wasted if a proposal was unsuccessful, a risk which could be reduced by multi-stage funding models.

While these points would apply to any research project involving partnerships and consortia, where an interdisciplinary research project (Mode 1 or Mode 2) is closely integrated, consortium-related problems may be particularly important because of the difficulties of identifying suitable partners and establishing patterns of collaboration.

Perceived problems in conducting interdisciplinary research included language/terminology and communication issues within the consortium, research institution structures and problems in mutual attitudes across disciplines.

These difficulties are exemplified by the following quotes:

inside the same country, technical/specialised vocabulary that was not the same among different disciplines, together with the consequent gap between participants' technical cultures [was a problem].

different tempo in industry and certain university institutions, different ambitions and accuracy of results.

Table 3 summarises factors which discourage interdisciplinary research and outlines the ideal qualities of an interdisciplinary researcher. Some of the requirements would be relevant to success in any collaborative project, even if mono-disciplinary, but all become even more important in the context of interdisciplinary research.

Having an interdisciplinary background could be seen by researchers as either an advantage or a disadvantage in career terms. In universities, it was more often seen as a disadvantage while in industry and many research institutes, it was an advantage. The combination of disciplines was also seen as relevant, some being more

Table 3  
Factors which discourage interdisciplinary research and ideal qualities of an interdisciplinary researcher

Factors which discourage interdisciplinary research	Ideal qualities of an interdisciplinary researcher
Poor career structures for academic interdisciplinary researchers	Curiosity about, and willingness to learn from, other disciplines
Low esteem of interdisciplinary research by mono-disciplinary colleagues	Flexibility and adaptability
Lack of opportunities to publish research results in high ranking refereed journals	An open mind to ideas coming from other disciplines and experiences
Discrimination by referees against interdisciplinary research proposals and publications	Creativity
	Good communication and listening skills
	Ability to absorb information and its implications rapidly
	A good team worker

marketable professional skills than others (for example in the progression from industrial engineer to project manager). The impact on a person's career may have an impact on their willingness to continue with interdisciplinary research and to build on experience gained in an interdisciplinary project.

For both Mode 1 and Mode 2 interdisciplinary research, there was a common view among survey respondents that personality and attitudes are at least as important as discipline base and specialisation for the successful conduct (and especially co-ordination) of interdisciplinary research. This was well expressed by one respondent:

It is always a question of the personalities of the researchers who are involved if they are willing to understand and to accept other methods than that of [their] own field.

A good interdisciplinary researcher will also have a high tolerance for ambiguity. This means not prematurely reducing a problem to a limited set of dimensions, but taking time to explore a range of dimensions, to test several potential boundaries to a problem (each of which may imply the involvement of different sets of relevant disciplines) until the apparently optimum boundary and set of dimensions has been identified. These explorations should be part of the teamwork conducted by the project co-ordinator and the ability of team members to engage productively in this process is very important to the project's success.

Researchers who have skills and knowledge in more than one discipline were seen as particularly valuable members of interdisciplinary teams, but a mono-disciplinary researcher with most of the above attributes should be capable of learning rapidly to operate in an interdisciplinary environment.

Table 4  
Qualities of good interdisciplinary co-ordinators/managers

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A good understanding, not necessarily in depth knowledge, across the project's main discipline domains, aided by a varied career trajectory and broad range of interests
A good understanding of the application areas, in industry or the public sphere, for the project's outcomes (particularly for Mode 2 research)
An ability to plan effective division of responsibilities related to disciplinary and organisational roles of participants
A focus on work in teams and on practical results, to overcome differences in disciplinary orientation and differences between, say, participants from public and private sectors
Respect for other disciplines, which in turn calls for an interest in these disciplines and some understanding of the general principles that underpin them, as well as a recognition of the depth of knowledge that exists in other fields
A good level of expertise in their own discipline, although not necessarily a burning ambition to pursue a career in that discipline which would inhibit willingness to invest attention outside that discipline
Ability to balance openness to new ideas and maintaining the progress of the project
A good team leader which includes skills in building relationships, trusting the judgement of others, good interpersonal and diplomatic skills and a pro-active approach to partners
A clear vision of the project and what it is trying to achieve

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Other characteristics which would be added for Mode 2 interdisciplinary research include:

- An interest in real world problems.
- An ability to bridge the gap between theory and practice.

In addition to the qualities already identified as relevant to individual researchers, good research co-ordinators and managers need additional qualities as summarised in Table 4.

### *3.3. The role of stakeholders and users*

Stakeholders can play an important role in Mode 2 interdisciplinary research, focusing attention on the need for relevance to real world problems and encouraging the uptake of research results by industry or other end-users. User engagement is often perceived as a way of reinforcing the interdisciplinary nature of research projects and can be seen as a way of ‘broadening the mind’ since users’ needs are rarely demarcated along disciplinary lines. Strong interdisciplinary proposals are often seen to be those that are designed in close collaboration with potential users, not least because this can permit access to research data, research subjects or additional funds.

However, it would be wrong to assume that users will automatically have a better understanding than academics of the ‘real world’ nature of problems. On the contrary, user communities might have only a partial understanding of what their problem is and, in certain cases, might compromise the quality of the research and even lead it in unproductive directions. Though user involvement was seen by some as an alternative to social science inputs in technical research and development projects, the latter offered tools and concepts not necessarily possessed by users. Interactions with stakeholders can be problematic and a clear plan for stakeholder and user engagement is needed given the different exigencies and concerns of stakeholders and researchers. For example:

- ‘User participants’ from industry and policy circles may move posts and lose engagement with or be unable to continue for the full length of the project;
- The desire for commercialisation of research or the implementation of policy may lead to pressures to deliver outputs prematurely;
- Delays in delivery of project outputs may jeopardise commercial applications.

Users may also lack a longer-term interest in the development of knowledge and its broader application.

## **4. The process of integrating disciplines**

Our research on this and other studies has given us some insights into the processes involved in successful interdisciplinary integration. An active strategy is nee-

ded to provide for integration among different disciplines and different strategies will be needed for different projects. Disciplines have survived for so long in the academic world because they serve the very useful function of constraining what the researcher has to think about. They set a boundary on the parameters of interest (what to include and what to leave out) and dictate the range of methodological approaches that are relevant. They thus provide a clearly defined starting point for a research project but they also pre-determine to a large extent what the outcomes of the research will be. If this framework is removed, as is the case in interdisciplinary research, inexperienced researchers can be overwhelmed by complexity.

In the early stages of an interdisciplinary research project, it is thus very important to set a boundary around the areas of concern which should be dictated by the needs of the project and the issues it raises, rather than the discipline-based experience of the researchers. Useful techniques for supporting such decisions can be found in systems analysis [11]. A deficiency in some of these systemic approaches, in common with other work which also comes into the category of transdisciplinary research, is that, having creatively reconstructed a boundary around a complex project, they do not then re-engage with relevant discipline-based expertise that could contribute to a better understanding of the issues and more useful outcomes for the project. Effective interdisciplinary research demands a greater understanding of the methods and outcomes of different disciplinary components of the research programme, to work out how they relate to one another and how they should be combined to deliver an overall integrated outcome.

Interdisciplinary research does not occur automatically simply by bringing together several disciplines in a research project. Hollaender et al. [12], in a survey of research practices in Germany, Austria and Switzerland, found that whilst it was easy to make a team member responsible for their own project, it was much more difficult to make team members feel responsible for the group as a whole, particularly when members of the team were evaluated at the level of their individual results rather than the team's results. In our survey, co-ordinators indicated that extra effort was needed to promote the formation of a cohesive research team involving researchers from different disciplines, combining expertise from several knowledge domains and overcoming communication problems among researchers from different disciplines.

Many in our survey stressed problems of language and communication caused by a range of factors. Different disciplines use different 'languages' and the same word may mean different things in different disciplines, resulting in a great deal of frustration until this is clarified. Communication problems were found in all types of interdisciplinary collaboration: within the natural sciences; between natural and social sciences, and between quantitative and qualitative social sciences. Differences in research methods also caused problems in mutual understanding. All these factors mean that it takes longer to bring together an effective interdisciplinary team, the start-up phase of a project will take longer and the demands on the project co-ordinator will be greater than usual.

A related point made by some researchers concerned problems that might arise where there was a failure to recognise or value contributions from other disciplines.

This included cases where social scientists were unhappy about their token involvement in a science-led project and, on the other hand, a view among some scientists that social science methods are inferior.

It can be time-consuming for people to develop an understanding of the contribution of other disciplines. As one project coordinator observed:

At first it took several meetings to synchronise people coming from different disciplines. Some tend to see only their own position. As co-ordinator you have to do a lot of communication to bring all partners to a common understanding of the problem and a position where everybody accepts everybody without knowing in full detail, what the other partner has to do. Also definition of interfaces between partners and their work is highly time consuming.

Approaches that have been used successfully to cope with these challenges include developing a commonly agreed glossary of terms and their meanings and using a greater than usual number of exchange visits and meetings to improve integration and including space for 'social time'. One particularly interesting tactic for achieving integration was to ensure that each report or publication from the research programme involved most members of the research team. Each such output was thus regarded as a whole group publication, authorship and overall content being advised by the co-ordinator.

## 5. Conclusions

We found disappointingly few projects among those funded in the early calls of the FP5 Programme that seemed by our criteria to be clearly interdisciplinary, particularly in terms of crossing the boundary between natural and social sciences. Although FP5 set ambitious targets for a step change in the amount and quality of interdisciplinary research, there have been formidable constraints to the delivery of these targets. Even where projects were interdisciplinary, the degree of interdisciplinarity varied. It tended to increase with time and with learning among the partners. In addition, even where the adoption of genuinely interdisciplinary approaches was relatively limited, the stimulus in this direction from the EC has led to a great deal of learning about how to conduct interdisciplinary research and how to overcome some of the difficulties experienced. Given continuity of these aims in Framework Six and future programmes, as experience of interdisciplinarity in the research community grows, it will become easier to set up interdisciplinary consortia and the quality of synergistic outputs will increase.

However, the EC alone cannot deliver such an outcome. As we noted above, many of the constraints operating against interdisciplinary research emanate from academic systems in European universities, which still discriminate against interdisciplinary research. In the UK, the Research Assessment Exercise is frequently cited as an important driver of such discrimination [7]. The demonstrated success of interdisciplinary research in the life sciences, and also in information and com-

munications technologies, has reduced discrimination against Mode 1 interdisciplinary research.

These conflicting pressures can lead researchers to claim that they or their proposals are more interdisciplinary than is actually the case, raising problems for the evaluators of research proposals and for EC research managers who are often not themselves experienced in interdisciplinary research, in discriminating between projects that are genuinely interdisciplinary and those which only claim to be so.

Given that interdisciplinary research requires more time and effort to be put into integrating disciplines, additional resources are needed for interdisciplinary projects compared to those involving only a single discipline. Interdisciplinary projects should therefore be selected with care, concentrating on areas where the additional resources can be put to best use.

There should be corresponding requirements of those developing interdisciplinary research proposals to specify clearly why an interdisciplinary approach is needed, which type of interdisciplinary approach is envisaged, which disciplines should be involved, how they will be integrated and how the whole will contribute in a synergistic manner to the project outcomes.

Evaluation by peer review of proposals and publications is one of the most contentious areas in interdisciplinary research. There were continuing concerns among many of those taking part in this project that evaluators lacked the breadth of expertise needed to assess the contribution of proposals with very different disciplinary backgrounds, particularly where both natural and social sciences are involved. While it would be unrealistic to expect every relevant discipline to be represented on evaluation panels, greater attention to the range of expertise may be needed. More important than the range of disciplines represented is the need to involve evaluators who themselves have interdisciplinary experience and who can judge the validity of decisions on discipline choice and the effectiveness of the integration processes proposed. However, such a shift towards more effective consideration of the needs of interdisciplinary research should not be at the expense of mono-disciplinary research where this is recognised as the most effective approach to a particular research problem.

In the course of FP5, important experience has been acquired in the promotion and running of cross-disciplinary research, applying different integration models in different contexts. We have been able to identify ways in which interdisciplinary collaboration could be enhanced with consequent benefits from greater interdisciplinary interactions and synergies, given continuity in the goal of supporting interdisciplinary research in the Sixth Framework Programme.

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## References

- [1] D.M. Hicks, J.S. Katz, Where is science going? *Science, Technology & Human Values* 21 (1996) 379–406.
- [2] The Royal Society, *Interdisciplinarity—Transport and the Environment*, The Royal Society, London, 1996.
- [3] J. Tait, R. Williams, Policy approaches to research and development: Foresight, framework and competitiveness, *Science and Public Policy* 26 (2) (1999) 101–112.
- [4] J. Thomson Klein, *Interdisciplinarity—History, Theory and Practice*, Wayne State University Press, Detroit, 1990.
- [5] *Interdisciplinary Research: Process, Structures and Evaluation*, The Scottish Universities Research Policy Consortium, c/o The University of Edinburgh, Edinburgh, 1997.
- [6] R. Williams, J. Tait, *Socio-economic Research in the Fifth Framework Programme: Programme 3 Competitive and Sustainable Growth*. Report to Economic and Social Research Council and European Commission DGXII of Workshop, Brussels, 24–25 September 1998.
- [7] J. Tait, C. Lyall, *Investigation into ESRC Funded Interdisciplinary Research: Report to ESRC*. SUPRA Paper no 26, 2001, <http://www.supra.ed.ac.uk/NewWeb/Publications>.
- [8] H. Nowotny, P. Scott, M. Gibbons, *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*, Polity Press, Cambridge, UK, 2001.
- [9] P. Checkland, J. Scholes, *Soft Systems Methodology in Action*, Wiley, Chichester, 1990.
- [10] M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, M. Trow, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Sage, London, 1994.
- [11] R.L. Flood, M.C. Jackson, *Creative Problem Solving: Total Systems Intervention*, John Wiley and Sons, Chichester, 1991.
- [12] K. Hollaender, M.C. Loibl, A. Wilts, Management of transdisciplinary research in unity of knowledge, in: G.H. Hadorn (Ed.), *Transdisciplinary Research for Sustainability in Encyclopaedia of Life Support Systems*, Eolss Publishers Co., Oxford, 2002.



## Assessing end-use relevance of public sector research organisations

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### Abstract

Measuring the effective impact of research and its relevance to society is a difficult undertaking but one that the public sector is keen to embrace. Identifying end-users of research and capturing their views of research relevance are challenging tasks and not something that has been extensively reported. The evaluation of end-use relevance demands a shift in organisational mindset and performance indicators away from readily quantifiable outputs towards a consideration of more qualitative end-user outcomes that are less amenable to measurement, requiring both a greater tolerance of ambiguity and a willingness to learn from the evaluation process.

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### 1. Introduction

Policy makers are increasingly under pressure to make sure that taxpayers' money is spent well and produces useful and relevant research that represents good "value for money" (NAO Comptroller and Auditor General, 2000, 2001; HM Treasury, 2002). This is not solely a UK concern and is being addressed on the international science policy scene (Natural Resources and Environment, 2001a,b; Spaapen and Wamelink, 1999). However, it is perhaps a particular consideration in the UK where our reputation for excellent science and poor application gives an added impetus to ensuring that research is relevant and con-

tributes both to the UK's economic competitiveness and the quality of life of its citizens.

This paper reports on some of the methodological issues raised by a study of end-use relevance conducted in Scotland on behalf of the Scottish Executive Environment and Rural Affairs Department (SEERAD). In autumn 2001 the Agricultural and Biological Research Group (ABRG) within SEERAD began a major research organisation assessment exercise of seven Scottish agricultural and biological research organisations<sup>1</sup> using a system of peer review by Visiting Groups. The research organisation assessment exercise covered the period 1996–2001 and included an assessment of each organisation's quality

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<sup>1</sup> These research organisations are: Biomathematics and Statistics Scotland, Hannah Research Institute, Macaulay Land Use Research Institute, Moredun Research Institute, Rowett Research Institute, Scottish Agricultural College, Scottish Crop Research Institute.

of science and knowledge transfer and exploitation as well as the end-use relevance assessment.

The remit of the end-use relevance assessment, reported here, was to provide the Visiting Group with a briefing on the end-user interactions at the institute level, investigating the impacts and benefits of the research programmes in seven of the ABRG supported organisations. The study focused on a wide range of end-users and clients and the relevance to their needs of the research undertaken by the research organisations (ROs), reflecting SEERAD's requirements to promote engagement with as wide a range of end-users as possible.

Although the outcomes of this evaluation for each RO were confidential to SEERAD and are not reported here, the study raised a number of methodological issues pertinent to the wider assessment of end-use relevance and the societal impact of research and may offer some lessons for future development in performance measurement.

Section 2 of this paper considers good practice in end-user relevance assessment through a short literature review; Section 3 outlines the assessment goals and Section 4 describes the research methodology in more detail. Section 5 reflects on the research methodology and outcomes, offering some insights on issues such as sampling processes, concerns about confidentiality, evaluation timescales, and the application of policy learning in the public sector. The final section draws some conclusions from these reflections that we hope will be useful in future evaluations of public sector research, particularly with respect to end-use relevance.

## 2. Good practice in end-user relevance assessment: a literature review

### 2.1. *Qualitative or quantitative approach?*

In 1988 the UK Department of Health and Social Security commissioned a report on how to improve and assess the use and dissemination of research funded by the department (Richardson et al., 1990). Richardson et al. adopted a largely qualitative approach and sought to collect ideas about problems and possible solutions rather than to collect data about research use and dissemination. Their concept of re-

search use was broadly defined. It included "gaining information, clarification and illumination" as well as translating research directly into policy or practice and recognised indirect and long-term changes as a result of research as well as more immediate use. These authors recommended further studies of the ways in which research is used in order to learn more about how people find out about research, how they use it and what can be done to increase such use. They suggested that these studies might involve quantitative *and* qualitative methods and that case studies of individual programmes might be particularly useful.

Richardson et al. (1990) note that measuring the use and dissemination of research is not a simple issue. They contrast the ideal with what can realistically be measured, stating that there is no single measure, nor any combination of measures, which can begin to address all these needs, however sensitively designed and implemented. However, they do suggest that valuable information can be derived from a range of measures and propose some strategies including surveys of users, researchers or research managers and case studies of individual projects or programmes to create a better understanding of the nature and constraints of research use. These authors suggest that surveys can be qualitative, quantitative, or a mix of the two, noting that the quantitative approach can inform on the extent of use while the qualitative approach may explain why research is used or not. They do however urge that any survey should include some qualitative measures as this can help to give meaning to statistics. They note that considerable methodological development work on questionnaires is essential and voice some serious concerns about reliability of any survey data collected especially from research users, as the recall of people may not be good if time has elapsed.

In reporting the outcome from a workshop organised by ARCISS<sup>2</sup> on measuring value added in research, Solesbury (2002) concludes that any such indicators (whether qualitative or quantitative) must derive from and express an individual organisation's purpose and should be set by the organisation itself not imposed upon it by others, while recognising

<sup>2</sup> Association of Research Centres in the Social Sciences.

that different indicators will have value for different stakeholders.

## 2.2. *The subjectivity of utilisation*

While supporting the notion that the institution's involvement in setting performance measures is key, we believe that some form of independent, external evaluation is nevertheless valuable. In the related field of research impact assessment, the medical research community seems to be leading the way and a recent report from the Royal Netherlands Academy of Arts and Sciences (2002) seeks to broaden the criteria for assessing the impact of research on society, suggesting performance indicators that highlight interactions between researchers and stakeholders (van Weel, 2002). This report suggests that feedback from stakeholders and users of research output can make essential contributions to the evaluation but that self-evaluation and external audits are also important elements in the assessment.

As part of an ongoing assessment process, Richardson et al. (1990) also proposed some degree of self-assessment by researchers who might be asked to specify objectives related to the ways in which their work will meet customers' requirements. While proposing that issues relating to dissemination and use should be explicitly considered by external assessors these authors urge that we should not go too far in promoting the use of hard indicators for this aspect of research performance and conclude that there is a continuing need for some subjective judgements by experienced personnel.

Caulil et al. (1996) propose the use of just this type of subjective evaluation of end-use relevance. They note that, while several methods for determining quality of scientific research exist, there is no satisfactory method known that can measure research utilisation. They ascribe this omission to the existence of a diversity in meanings of "use" and therefore a lack of any consensus on criteria for assessing use.

The disadvantage of using quantitative measures is that it is very difficult to formulate what is meant by "relevance" (Caulil et al., 1996). The use of research (and hence its relevance) depends on many unpredictable factors outwith the control of the RO, possibly reflecting the inadequacy of the linear model with its

oversimplified view of the innovation process which implies that new technology based products derive from the straightforward technology transfer of results generated by scientific research (Tait and Williams, 1999).

Caulil et al. describe a semi-quantitative, four dimensional model where research results are judged on (1) the availability of transferable product; (2) the involvement of the potential user of research results; and (3) the commercial benefits resulting from the research results. Each project being assessed is then scored on a four-point scale. The fourth dimension in the matrix is the volume of the spheres that represent the number of projects that achieved the same score. The authors conclude that it is hard to score the utilisation dimension because it is not possible to assess whether utilisation in one project was greater than in another.

They then propose an alternative "jury model" where research utilisation was first described by the researchers using precise and standard descriptions to a jury, which then judges the utilisation results of the projects numerically. The authors believe that this jury judgement is less subjective than judgement by one person and conclude that "the construction of the concept of utilization is a very subjective matter and therefore qualitative indicators should be used".

Researchers at the Science and Technology Policy Research Unit (SPRU) (Molas-Gallart et al., 2002) have recently advised the UK university sector on methods for measuring third stream activities,<sup>3</sup> which has some parallels with our own attempts to measure end-user relevance in research institutes. Molas-Gallart et al. (2002) discuss the main strengths and weaknesses of a range of indicators for both the exploitation and use of knowledge capabilities and research activities. They conclude that collecting indicators is difficult as many third stream activities are based on personal connections between individuals, a point confirmed by Faulkner and Senker (1995). Such relationships are not well understood by the parent organisation which therefore finds it difficult to develop indicators for activities that involve the transfer of tacit knowledge.

<sup>3</sup> "Third stream" is a term used to describe the generation, use, application and exploitation of knowledge and other university capabilities outside the usual academic teaching and research activities.

### 2.3. *The indirect nature of impact*

Molas-Gallart et al. (2002) also emphasise the indirect and non-linear nature of research impacts and distinguish two main sets of indicators that can be used to measure third stream activities: indicators of activity and indicators of impact. They note that it is possible to measure the effort that organisations invest in engaging with non-academic users, or the results of such efforts in terms of societal or economic impact, but warn that attempting to measure the impact of third stream activities is very difficult for three reasons:

1. *Additionality*: would the “effects” we are trying to measure have occurred anyway, especially when attempting to assess the impact of advisory and consultancy activities?
2. *Timing*: it is generally recognised that the impact of academic research is long-term and often indirect, so when is it a good time to measure impact?
3. *Serendipity*: the outcomes, and therefore the impact, of research activities are by their very nature unpredictable, and serendipity is an important element, for example, when attempting to develop new products. Given this uncertainty research may not result in impact despite its inherent high quality.

Bechhofer et al. (2001) argue that the user’s capacity to exploit public sector research depends partly on the user’s readiness and ability to absorb externally generated knowledge—it is a two-way process. Users are not passive recipients of research output; they use the knowledge in combination with their existing technical and social knowledge. Bechhofer et al. (2001) cite Faulkner and Senker (1995) who stress the relative importance of informal over formal channels for knowledge transfer. Earlier work by Molas-Gallart et al. (1999) to assess research impact on non-academic audiences also points out that the outputs of research may not be taken up, not because of any shortcomings in the research results or dissemination strategy, but because potential users are unwilling or unable to exploit the opportunities presented to them. Moreover, they caution that the transformation of research into successful innovations is not simply a function of the technical merits of the research but

depends on the absorptive capacity of firms with an interest in this knowledge.

While Richardson et al. (1990) accept that some research may prove of no immediate or direct use, they argue that it is still appropriate to look for ways of making all research as fully useful and utilised as possible, particularly where funded by a government department. They do nevertheless stress that it is very difficult to identify the use of research partly because its effect is long term and indirect, and partly because those using the research are often unaware of the source of their ideas. As research generally adds to the broad pool of knowledge and accumulates over time, they note that the assumption of immediate traceable impact from research to practice is misplaced.

Molas-Gallart et al. (1999) also acknowledge the indirect nature of impact and the problem of attribution of research outputs as discussed in detail by Weiss (for example, Weiss, 1980, 1982), but believe that direct questioning and discussion can help to tease out an assessment of the research impact. They also note that such assessments will “always be qualitative and based on qualified statements”.

### 2.4. *Users or beneficiaries*

In discussing the general methodological difficulties associated with assessing impact, Molas-Gallart et al. (1999) consider the differences between “users” and “beneficiaries”. In their definition “users” will directly utilise the output of research, although they do not necessarily have to recognise its origin while the term “beneficiaries” refers to the much broader (and difficult to specify) social groups that can be directly or indirectly affected by the results of a study (Caswill, 1994). They reflect on the debate as to whether it is feasible to make a distinction between “users” and “beneficiaries”, and whether this distinction accounts for different forms of “impact”, e.g. direct utilisation of research results by “users” versus indirect impact on a broader range of “beneficiaries”. Molas-Gallart et al. (1999) conclude that it is more fruitful to focus on the channels of diffusion and on the forms of research utilisation, rather than attempting to distinguish the effects on “users” from the effects on “beneficiaries” especially as these two groups are not mutually exclusive.

### 2.5. *Contacting users*

Molas-Gallart et al.'s (1999) discussion of techniques for the selection of interviewees is also relevant to our study. These authors suggest that the use of standard sampling techniques (random or stratified sampling) is not to be recommended when trying to assess the impact of research programmes and initiatives because studies on the outcomes of research and innovation efforts show that most impact is attributable to a very small number of individuals or projects.

Their recommended approach is a qualitative one based on telephone surveys. Although basic quantitative data can provide insights if the population displays uniform characteristics they note that such data are of limited value when the potential user population is diverse (as was the case in our own study). Molas-Gallart et al. (1999) do not favour a mail questionnaire (despite the fact that this might be a cheaper option) as this might not provide the clarity required and prevents any dialogue between interviewer and interviewee. These authors believe that face-to-face interviews might be the optimal solution but are expensive both in time and money, and they report no discernible differences between the data obtained through telephone interviews and the results of face-to-face interviews.

### 2.6. *Moving from outputs to outcomes*

There is an increasing acceptance that performance evaluation should be seen primarily as a learning tool (Natural Resources and Environment, 2001a). In these circumstances, fear of evaluation and the culture of blame must be minimised to enable those being assessed to respond positively to the evaluation and learn from the experience. However, in order to learn, those being evaluated need specific, timely feedback which may be difficult to achieve in terms of end-user relevance because of the time lag factor already discussed.

This move towards a learning environment in turn requires a shift in emphasis away from measuring simplistic, quantifiable and controllable (from the RO's view) outputs towards a culture that seeks to assess user-relevant and desirable outcomes from research. Outcomes are often outwith the organisation's control and may not be amenable to ready quantification. Mayne (Natural Resources and Environment, 2001a)

develops this idea further into a 'results chain' where the RO has activities and outputs aimed at a specific target and an idea of what is supposed to happen as a result.

Spaapen and Wamelink (1999) adopted a broadly similar approach to our own methodology (see Section 4). Their methodology included profiling the research programme, a user analysis of stakeholders and interviews with users. Spaapen and Wamelink emphasised some of the same things as our approach such as the need for specific criteria directed towards the specific context of each research programme (rather than the same criteria across all). They also divided the research into (1) an evaluation from the researchers' point of view and (2) an evaluation from the stakeholders' point of view and then bringing the two together. However, there were some significant differences in that Spaapen and Wamelink were looking at individual university research programmes and included a third stage of comparative feedback to stimulate discussion with the research groups about their activities in relation to their mission. Their interest in the learning approach to evaluation is epitomised by the quote: "the road from research to practice is paved by the mutual education of all interested parties".

While the issues of research impact, research utility and research exploitation are regular topics for discussion in both the academic and more policy oriented literature, very little appears to have been reported to date on good practice in the assessment of the end-user relevance of publicly funded research especially with a practical focus on which approaches might work successfully.

## 3. **Assessment goals**

With this in mind, our assessment attempted to gain a more structured understanding of a number of inter-related issues of strategic relevance to agricultural and biological research in Scotland including:

- the priorities that the research organisations give to understanding the research needs of their end-user groups, the mechanisms and activities used to build end-user engagement and the impact that such engagement has on the content and nature of the ROs' research activities; and

- the perceptions by end-user groups and clients of how well their commercial and other interests are being served through the research programmes and dissemination activities of the ROs and the effectiveness of the ROs in learning of end-user needs and incorporating these in their research.

As specified by the client (SEERAD), the assessment work programme was undertaken in two sequential phases: phase 1, assessment methodology scoping study and phase 2, assessment of research organisation end-use relevance. Phase 1 was particularly important as it devised the methodology upon which the rest of the study was based and also provided the baseline information against which subsequent questionnaire and telephone interviews were evaluated.

Our approach aimed to be:

- relevant to the agricultural and biological contexts within which the research organisations operate;
- capable of identifying the scale, nature and sustainability of the impacts and benefits within key end-user groups;

and sought to address:

- the main areas of applied research undertaken in each research organisation;
- end-user groups targeted by the RO;
- the nature of the end-use benefits expected by the research organisations;
- benefits and impacts perceived by end-users, focusing mainly on Scotland and, to a limited extent, the rest of the UK and internationally; and
- both qualitative and quantitative aspects of evaluation of the end-user benefits and impacts of research organisation research.

#### 4. Research methodology

Our assessment methodology therefore employed:

- desk and on-line research;
- structured personal and telephone interviews with senior managers and researchers in each RO;
- a series of focus groups conducted with selected end-users;
- a major postal survey of end-users, followed by a number of telephone calls to a sample of respondents who had completed questionnaires; and

- regular discussions with SEERAD and the Assessment Steering Group.

We sought to involve a sample of existing and potential end-users of each RO's research and development to evaluate their perceptions of the relevance, impact and benefits of RO research, their views on the effectiveness of its communications and their priorities for the future. End-user groups were considered on the basis of research priorities devised by SEERAD, namely, Sustainable Agriculture; Environment and Natural Heritage; Nutrition and Human Health; Food and Bioindustries; Rural Communities and Development, and categorised according to their type of interaction with the RO.

This study team was not required to assess individual research programmes and their effects but instead to look at output and outcomes at an institutional level. There is currently little information on the size, structure and nature of the prime end-user groups of the ROs and thus it was impossible to construct the evaluation around surveys based on random or stratified samples.

##### 4.1. Structuring end-user groups

We classified end-users according to their different types of engagement with the RO and identified four main end-user categories: upstream end-users, collaborators, intermediaries, and downstream end-users (described in more detail below). It is possible for the same end-user organisation to interact with a research organisation under more than one category, depending on the purposes and outcomes of the engagement. This general model covers all types of end-user engagement relevant to this group of ROs with the exception of their engagement with the public as this exercise did not extend to evaluating the general public as stakeholders or "beneficiaries" of the research.

The pattern of engagement will be different for each RO with some more focused on interactions with public bodies and some with private bodies; for some upstream end-users will be more important than downstream and vice versa; and for others a large proportion of their engagement will be with collaborators. These differences, outlined below, may reflect legitimate differences in the function of the different ROs as well as different ways of understanding the end-user profile.

#### 4.1.1. Upstream end-users

The upstream category of end-user includes those who have formal channels to influence the strategies and programmes of a RO through:

- core or infrastructure funding;
- funding of individual projects or programmes;
- the creation of research needs or opportunities through regulatory developments; and
- the production of government or other policy documents indicating new areas of concern to be addressed by research.

We distinguish two types of end-user in the upstream category. First, Public Upstream which includes bodies acting in the public interest, for example, SEERAD itself, Scottish Enterprise, Local Authorities, Scottish Natural Heritage (SNH), Scottish Environmental Protection Agency (SEPA), and the Food Standards Agencies (FSAs); and secondly *private upstream* such as commercial companies and other bodies acting on behalf of private or commercial interests, including both multinational companies and small and medium sized enterprises, and the trade associations that represent them, e.g. Maltsters Association, Dairy Groups, and the Meat and Livestock Commission.

#### 4.1.2. Collaborators

Collaborators in the UK and internationally are increasingly providing research organisations with access to upstream and downstream sources of income and will also enhance the organisation's ability to influence both sets of end-users. Such collaborators could be in the public or private sector and might overlap with end-users in other categories (e.g. SEPA, SNH). University collaborators and other research institutes can also enable research organisations to work on research funded by UK research councils<sup>4</sup> and European collaborators are needed for access to EC Framework Programme funds. Collaborators in the UK and in other countries might also lead to new downstream markets for a RO's knowledge and other outputs or products.

Excellence in research will make an institute an increasingly attractive partner in research collaborations and enhance its direct and indirect influence in the UK

<sup>4</sup> In most cases the ROs are excluded from applying for Research Council funding directly themselves.

and internationally. Academic communities are also major users of the knowledge generated by ROs as part of the free exchange of scientific information, but with little direct benefit to the ROs themselves.

#### 4.1.3. Intermediaries

Intermediaries provide channels to transfer knowledge to and from downstream end-users. They thus include groups and organisations that transfer knowledge and advice generated by research organisations to end-users further downstream and/or that transmit back information about downstream end-user needs to research organisations and to public or private upstream end-users. They include farm advisers, animal breeding organisations, National Institute of Agricultural Botany, National Farmers Union, British Nutrition Foundation, health visitors, the medical profession, environmental groups, SNH and SEPA.

#### 4.1.4. Downstream end-users

Downstream end-users are distinguished from upstream in that the motivation for making links usually comes from the sponsored bodies, as a means to encourage knowledge transfer and application of its research outputs or, increasingly, to get an additional commercial return from its research outputs. Downstream end-users (by definition) do not directly commission research or influence the organisation's research programme: if they do either they are also included in the upstream category. However, they may approach the sponsored body directly seeking advice based on the research done by the sponsored body.

We included in the *public downstream* category members of the public acting in a variety of roles, as recipients of knowledge generated by research organisations related, for example, to health, environmental and educational issues. In the *private downstream* category we included business users of information and services provided by research organisations, e.g. farmers and other land managers, and users of diagnostic and other RO services.

#### 4.1.5. Modelling end-user engagement

The generic model described in Fig. 1 summarises potential relationships between research organisations and the seven categories of end-user identified above. All links are of equal weight in the generic diagram but when customised for individual (anonymous) ROs



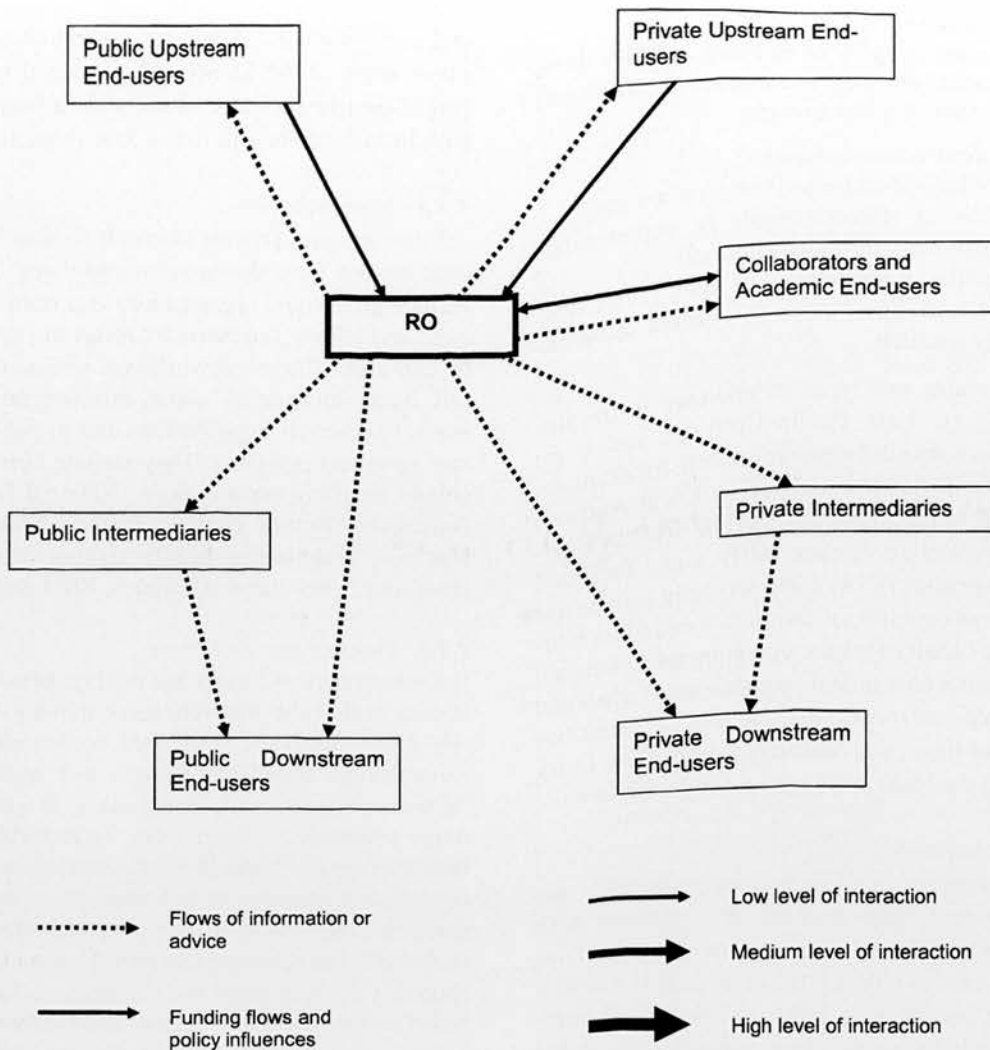


Fig. 1. Generic model of research organisation end-user interactions.

(Figs. 2 and 3), some links are missing and those that exist are of different weights.<sup>5</sup> Considering first the policy influences and funding flows, the solid arrows show the influences from upstream end-users to the research organisations, in the form of direct funding of infrastructure and research programmes or projects and also guidance delivered directly or through policy documents and government papers.

<sup>5</sup> In order to facilitate comparisons, in the final versions of the RO end-user interaction diagrams we adopted a standardised convention to represent low, medium and high levels of interaction.

There is also a two-way flow of influence between research organisations and collaborators and academic end-users related to generating funding opportunities from upstream end-users.

The broken arrows indicate the flows of information, knowledge and advice arising from the research programme to the various categories of end-users. In evaluating the quality of these outputs, upstream end-users will be seeking evidence that they conform to the guidance given at the research commissioning stage and provide the expected outputs; collaborators and academic end-users will be looking for

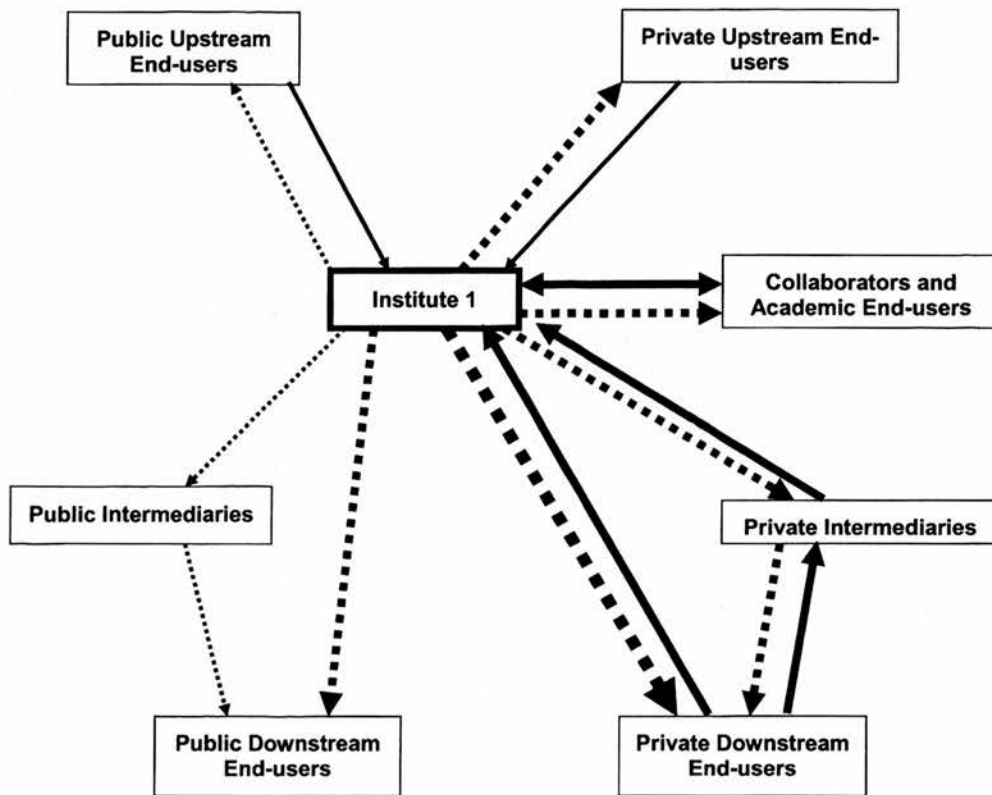


Fig. 2. Model of research organisation end-user interactions for institute 1.

evidence of research quality and relevance to their areas of interest; and downstream intermediaries and end-users will be looking for relevance to their needs and applicability in practice. The multidimensional nature of the end-user terrain, and hence of the concept of “relevance” and the corresponding end-user engagement strategies of the research organisations, thus constitute a complex and demanding set of requirements.

For the exemplar RO shown in Fig. 2 we see a high level of end-user interaction with private downstream end-users in the form of flows of advice or information from the RO to the users. There is a medium level of interaction in the opposite direction from private downstream end-users to the RO and between the RO and the private intermediary group of users. Interaction with upstream end-users is less of a focus of this RO’s current work. In contrast, the sample RO modelled in Fig. 3 has a much greater focus on interaction with upstream end-users than with users in the

public and private downstream categories and its dominant interactions are with collaborators and academic end-users.

The models show the major interactions that operate through the research organisations which they experience directly and may be able to influence. There is also a complex web of interactions among all the end-user groups identified that is not shown here. For example, public and private downstream end-users and intermediaries will influence policy makers and/or politicians in the public upstream category about issues that are relevant to the RO’s research programmes: an example of such influence is the switch from agricultural research to food and health-related research topics. There will also be cross-linking interactions relevant to the research organisations between public and private downstream end-users and intermediaries. Some research organisations will also take advice on research needs from downstream end-users and transmit this to public (and

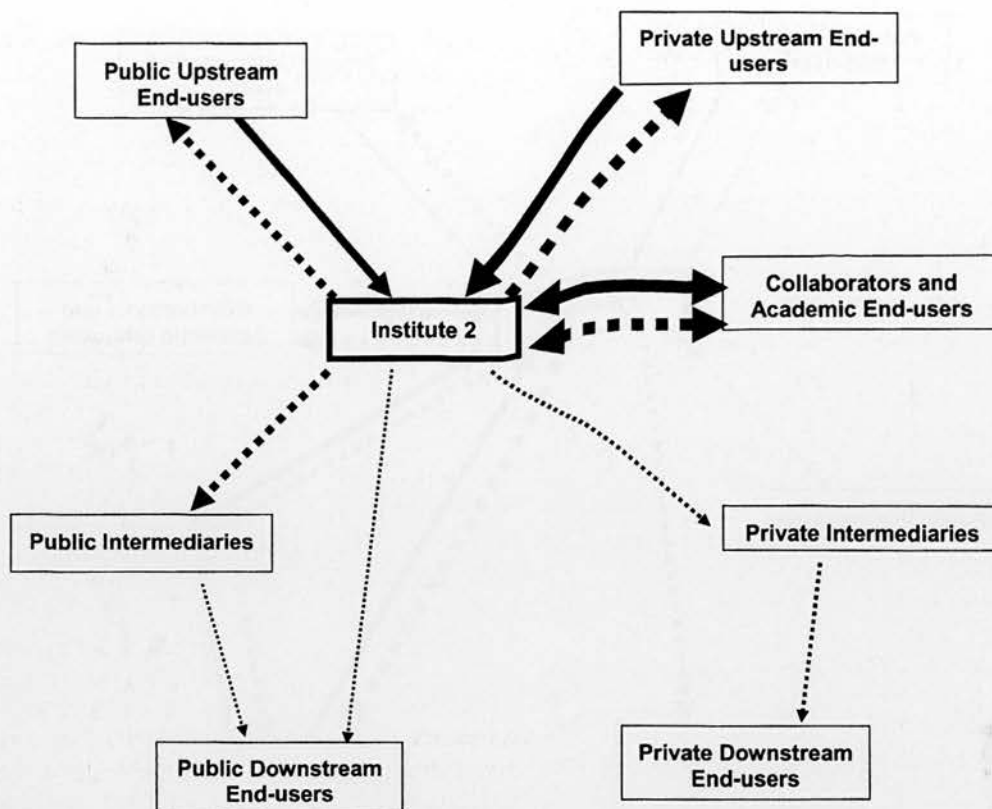


Fig. 3. Model of research organisation end-user interactions for institute 2.

perhaps also private) upstream end-users in proposals for funding of research programmes and projects.

#### 4.2. Research phase 1: analysis of ROs' end-use strategies

Our understanding of the end-user engagement policies and activities of the ROs and their recognition of emerging end-user needs drew on information gathered from desk research on documents provided by the ROs (including their annual reports, corporate plans, newsletters, website, etc.) and interviews with RO staff. This phase generated a stakeholder analysis and examined the scientific, technological, organisational and end-user base of the organisation; reviewed its research programmes to determine its goals in relation to end-users; and identified its research dissemination strategies and communication activities, user engagement networks, policy translation roles and academic dissemination.

Information from desk research formed the basis for a structured series of questions for personal discussion with the RO directors and other senior staff, particularly those with an identified role in end-user engagement. The interview transcripts were analysed and information used to supplement our analysis of the RO's end-use strategies. The issues covered in the RO interviews are outlined in Table 1.

At the end of phase 1, utilising the information provided by all seven ROs, a series of focus group meetings was held to explore and identify issues relevant to end-users in order to inform the subsequent development of the survey questionnaire used in phase 2. These were not peer review groups as their purpose was not to provide evaluations or judgements on the ROs' performance. The key objective of the focus groups was to allow end-users to define what was important to them so that these issues could be reflected in the questionnaire, rather than impose a

Table 1

## Assessment criteria

## End-use sector

Are the research organisations correctly identifying and specifying their end-use sectors?

## Communication and influence

How well do the sponsored bodies communicate with end-users about their needs?

Is there an ongoing strategic relationship by which the end-users feel they are influencing the sponsored bodies' programme?

How well do the sponsored bodies deliver their outputs to the end-users?

## End-user needs

For the end-use sectors identified within criterion 1, are needs being met by the research organisation?

Are there specific areas of need that are not being met?

## Uptake of results

Have end-users made use of the outputs from the research organisation (some sub division into types of outputs should be possible)?

Does this differ for different types of end-users?

## General relevance of the research

Is the work carried out in the research organisation *generally* relevant to the end-users?

Do the end-users see a need for the sponsored body to continue working in their current research areas?

- what end-users were looking for from the ROs;
- how end-users recognised when they had obtained what they were looking for;
- how end-users communicated their needs and priorities to the ROs; and
- how end-users provided feedback on the performance of the RO.

Four or five end-users attended each event (a total of 17 end-users were involved in the process). The discussion in each group was facilitated by one member of the assessment team while another team member took notes. Participants engaged very well with the subject and the focus groups were very successful at identifying relevant end-use assessment issues.

#### 4.3. Research phase 2: the end-users' perspective on the ROs' research

The main end-user engagement issues identified by the assessment team from focus groups and RO interviews were then used to develop a questionnaire to be mailed to a sample of end-users and clients selected by each RO. Translating these findings into survey questions was mostly straightforward but occasionally required some ingenuity. In some cases the focus groups raised more strategic issues than the questionnaire could address and these more generic points were reported to SEERAD as an adjunct to the final report.

The ROs were asked to identify individuals for survey in each of the five SEERAD end-use areas relevant to their end-user profile. We were concerned that the ROs' involvement in the sample selection might lead to bias, so to minimise this all surveyed end-users were also given the opportunity to complete a second questionnaire for a RO of their own choice although only a small number of respondents opted to do so.

Questionnaires (2631) were mailed in early June 2002. The resulting database (810 responses) was closed to responses by late July; and the survey analyses and tabulations were completed by late August 2002. We then identified respondents who had indicated that they would be prepared to give a follow up telephone interview and where qualitative comments on the questionnaire suggested that such an interview would yield interesting additional information. We conducted 42 telephone interviews.

priori assumptions from the assessment team in the survey instrument.

Focus group participants were selected from nominations made by the individual ROs and we attempted to group together participants who would have a broadly similar interest and relationship with the institutes. The aim was to run a focus group for each of the end-user categories identified in Section 4.1. However, in the end, the private upstream group had to be replaced by a series of one-to-one telephone interviews as it was not possible to recruit a sufficient number of people for the focus group in the time available. We surmised from this experience that commercial end-users might have been reluctant to discuss their experiences in an open forum with, potentially, other competitors present.

Targeted end-users were invited to take part in the focus group at the University of Edinburgh's premises by means of a letter which also gave some background to the study and an indication of the types of questions which the focus group would address. The questions broadly explored:

An individual confidential report was produced for each of the seven research organisations under review. These reports compared the outcomes from phases 1 and 2 of the project for each RO and set out our assessment conclusions in relation to their end-user engagement using criteria stipulated by the client, SEERAD (see Table 1). Our individual institute reports also made recommendations on how end-user engagement and end-use relevance could be further strengthened by the ROs.

## 5. Reflections on research methodology and outcomes

### 5.1. *Piloting a new approach*

An assessment of end-user relevance was a new element of the quinquennial review of the ABRG-funded research organisations, and the assessment criteria (Table 1) emerged during the course of the project. The conduct of this evaluation therefore represented a learning process for the assessment team, the Scottish Executive and its research organisations. We are confident that our assessment style and methodology afford a sensible approach to a difficult subject and can provide a useful baseline for future evaluations. Our research findings went beyond a simple assessment of end-user engagement and clearly identified significant differences in the ROs' strategies.

### 5.2. *Equal weight to all users*

The questionnaire methodology gave equal weighting to the judgements and views of all responding end-users. For example, the views of a key policy maker in a government agency were given the same weight and consideration as an overseas research collaborator, someone who had contact with the RO in the past, those who rated their research peripheral to their interests, or even in extreme cases those whose interests the RO might not wish to support. With hindsight, our methodology could have been improved by identifying a larger number of key policy people (this is a limited group in Scotland so could have been achieved) and extending the interviews we conducted with them on their requirements from research outputs while using the questionnaire approach for other users.

Our evaluation also did not fully access stakeholders in the wider community—the beneficiaries of RO outcomes rather than the users. The public downstream group could not be reached effectively by this methodology, for example, members of the public who might have attended public events or exhibitions hosted by the ROs and this would need to be evaluated in a separate exercise.

### 5.3. *Sampling issues and survey outcomes*

In general, the classification process adopted to categorise different types of end-users, and the stakeholder analyses for each RO based on this classification, were satisfactory in the sense that we were able to classify all of the stakeholders we identified within this framework. However, having identified end-user groups we then had to rely on each RO to provide contact details for individuals within these groups so that we could mail them the questionnaire. This demonstrated some interesting variations in the level of sophistication of the ROs' databases with some able to provide contact details promptly for a wide range of end-users and others providing only very limited datasets.

Of greater concern, however, was the self-selecting nature of our survey sample where the ROs being evaluated effectively controlled the sampling process by providing the assessment team with contact details for those individuals whom they considered to be their end-users. Although we had no evidence that the ROs were using this as an opportunity to introduce bias by, for example, only giving us contact details for those individuals whom they believed would give them a good review, we nevertheless recognise that this could be a criticism of our approach. To overcome this potential weakness in our methodology SEERAD identified an additional group of end-users which were included in the survey, and we also asked surveyed end-users to complete a second questionnaire for a RO of their choice.

An alternative approach to sample selection would have been to use the "snowballing" technique adopted by Molas-Gallart et al. However, this method would have been more time consuming in an already time constrained study and may not have affected the outcome significantly as the Scottish RO community is a much smaller world than the UK research context

described by Molas-Gallart et al. and hence we believe that we probably reached the majority of the key end-users using the methodology adopted. This would however be a consideration in larger research communities.

The limited number of telephone interviews conducted with users (42) was also a cause for reflection and we recognise that our findings may give undue prominence to these interviews, especially as we had selected for interview those questionnaire respondents who had made generally critical comments. Our rationale for this approach was pragmatic in that we usually learn more from our critics than from our supporters.

Richardson et al. (1990) suggest the use of case studies of individual projects or programmes to create a better understanding of the nature and constraints of research use and, in retrospect, this might have improved our understanding. We did however find that our initial desk research and in-depth interviews with key staff in the ROs provided valuable background information on which to base the second phase of the assessment. We strongly concur with Richardson et al.'s comment on the considerable methodological development work required when producing end-user questionnaires.

Mention should also be made of the need to ensure consistency when a team of researchers is working on the evaluation of a number institutes. Some consistency and validation was achieved by virtue of the fact that one assessment team member facilitated all of the focus groups and conducted the majority of the telephone interviews, and the team leader acted as moderator by reading and commenting on all draft reports. An agreed coding schema might have aided consistency when analysing interview and free text survey data but each institute under review was sufficiently different to necessitate a flexible, customised analytic approach.

There was some evidence that questionnaire responses were biased in different ways. For example, there was a higher response rate from farmers than from users in industry but this could just reflect the fact that the different ROs target different sets of end-users leading to differential response rates from different categories of users. There was also anecdotal evidence that the response rate from research collaborators was high perhaps suggesting that they might be seeking to protect their academic collaborations with the ROs.

One of our overall recommendations was therefore that the seven ROs as a group should improve their databases of end-users in the longer term so that future evaluators could not only sample end-users in a more independent and systematic way, allowing stratified sampling from different user categories and hence more sophisticated statistical analysis of questionnaire responses, but also to provide evaluators with quantitative evaluation data from the databases themselves in terms of categories and numbers of users across the spectrum of ROs and research programmes.

The strength of our approach lay in combining the quantitative questionnaire data with information gathered via the more qualitative interviews and focus groups. The former provided a breadth of information about experiences across the spectrum of users and identified issues which we were then able to probe more deeply in some of the follow up telephone interviews. Those of a more quantitative disposition might query the robustness of such an approach since, in some cases, the questionnaire returns for any one institute from any particular group of end-users (e.g. research funders) were small for the reasons discussed above (in some cases only single figures). In response to this criticism we reiterate that this was essentially a qualitative study and that our methodology did provide useful and useable performance measurements.

#### *5.4. Lags in end-user impacts*

We recognise that our period of coverage (1996–2001) will not be sufficient to identify some end-user impacts and outcomes, particularly from the ROs' more recent R&D outputs and activities. This is an evaluation issue already identified in the literature review, and it is now accepted that most R&D requires a lengthy period for full diffusion and adoption. This is particularly the case for those ROs that adopted new end-user strategies during the review period. We do, however, consider that the results from our study will provide SEERAD with a baseline for future evaluations of end-user engagement and impact.

#### *5.5. A two-way process*

It was clear from our study that many users, particularly those in the upstream category, recognised

that end-user relevance was a two-way process where they themselves, as an end-user, had a proactive role in specifying their needs and priorities to the RO. Our methodology sought to address this in the questionnaire and follow up interviews by seeking information about who initiated contact with the RO; whether RO feedback was provided; how such feedback was received; and what impact the end-users felt they had on shaping the ROs' research programmes. However, we did not have an opportunity within this study to consider fully the capability of end-users—in particular those in the downstream categories—to define clearly their research priorities and needs and to ensure the consideration of these by research organisations.

Our findings reinforce the emphasis placed by Bechhofer et al. (2001) and Faulkner and Senker (1995) on the relative importance of informal over formal channels for knowledge transfer as our survey results highlight the importance of personal contacts between users and staff in the ROs. This indicates that trying to measure communication by quantitative methods such as counting hits on websites or the extent of circulation of the annual report may not be so useful. As Bechhofer et al. (2001) note, exploitation of research is typically an interactive process which requires some kind of dialogue directly or indirectly between researchers and users, and our survey confirmed the value of longer-term relationships between users and ROs to ensure mutual understanding.

### 5.6. Confidentiality

Bechhofer et al. (2001) also make reference to the difficulty of obtaining end-user feedback because of the fear of compromising relationships and/or confidentiality. This was certainly the case in our research, especially in the scheduling of focus groups which required sensitive handling and in some cases personal telephone interviews with individuals who did not feel able to share their views in a more public forum. One institute under review also refused to disclose its commercial end-users and preferred to send out the questionnaire to this group which again raises issues about the robustness of the sampling process. However, our interviews with RO staff were facilitated by the use of confidentiality agreements signed by the assessment team and RO directors.

### 5.7. A learning tool

As discussed above, many commentators refute the value of quantitative measures of research relevance, pointing out that organisations may artificially adjust their activities to the indicators being used. This has the potential to generate unintended consequences by focussing performance on the selected indicators rather than developing strategies to address issues of research relevance that need real improvement.

A key concern is how we move away from one-off performance evaluation based on outputs and move toward impact assessment of outcomes and use this as a continuous learning experience. The public sector is beginning to recognise that it needs to apply policy learning so that lessons about performance are addressed and applied in future policy design and implementation, and that government departments and agencies need to draw together and act on the common lessons and good practice from a range of evaluations (NAO Comptroller and Auditor General, 2000). However, it takes a step change to move away from post hoc evaluation of outputs towards an embedded and continuous process that focuses on outcomes whereby the results of the evaluation of end-use assessment, together with the results of the evaluation of scientific quality, form the basis for improvements in research quality and guide the ongoing development of institutional research strategies.

## 6. Conclusions

The Royal Netherlands Academy of Arts and Sciences (2002) makes the case for a single, widely accepted methodology for the evaluation of societal impact (in applied health research). Our experience in assessing the end-use relevance of public sector research organisations in Scotland leaves us less convinced that it is possible, or desirable, to produce a standardised approach that yields an "off the shelf" toolkit for end-use relevance assessment.

We believe that our methodology, which combines a range of qualitative and quantitative evaluation tools, including interviews, focus groups and a questionnaire survey in conjunction with desk research, documentary analysis and a stakeholder analysis, does provide an effective insight into both an institute's

end-use strategy and the perspective of the end-users on the institute's performance. It is not, however, a "one size fits all approach" and has to be guided by the institute's research mission and tailored to the individual institute's circumstances. This flexible approach can lead to criticisms on the grounds of consistency, reproducibility and robustness. Nevertheless, the overall approach was regarded as helpful by the client and it did allow us to draw meaningful conclusions for each institute; to discriminate between the different end-user engagement strategies of the different ROs; and to evaluate the different end-users' experiences of these strategies.

The evaluation of research relevance is undoubtedly a challenging endeavour and we would caution against raising unrealistic expectations amongst end-users. Having started down the path of end-user engagement, how you meet and manage the future expectations of your users are crucial issues. Although the process critiqued in this paper provides a useful baseline evaluation, its application within the research institutes will be the true test of its worth. Only by embedding end-user relevance in their strategic research planning and by using the assessment process as a learning tool will the institutes and their end-users gain the real benefit of such evaluations. This requires ownership of the process by those being evaluated rather than regarding it as a peripheral activity required by a funder once every 5 years.

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## References

- Bechhofer, F., Rayman-Bacchus, L., et al., 2001. The dynamics of social science research exploitation. *Scottish Affairs* 36, 124–155.
- Caswill, C., 1994. Users and beneficiaries—a discussion paper. ESRC Mimeo.
- Caulil, G.F.V., Momers, C.A.M., et al., 1996. *Scientometrics* 37 (3), 433–444.
- Faulkner, W., Senker, J., 1995. *Knowledge Frontiers: Public Sector Research in Industrial Innovation in Biotechnology, Engineering Ceramics and Parallel Computing*. Clarendon Press, Oxford.
- HM Treasury, 2002. *Improving performance information*. HM Treasury, London.
- Molas-Gallart, J., Tang, P., et al., 1999. *Assessing research impact on non-academic audiences*. ESRC, Swindon.
- Molas-Gallart, J., Salter, A., et al., 2002. *Measuring third stream activities*. SPRU, Brighton.
- NAO Comptroller and Auditor General, 2000. *Good practice in performance reporting in executive agencies and non-departmental public bodies*. House of Commons, London.
- NAO Comptroller and Auditor General, 2001. *Modern policy-making: ensuring policies deliver value for money*. National Audit Office, London.
- Natural Resources and Environment, 2001a. *Evaluation seminar series. Evaluation seminar. 1. Performance measurement, a seminar with John Mayne, Principal, Office of the Auditor-General, Canada. The State of Victoria, Department of Natural Resources and Environment, Agriculture Division*.
- Natural Resources and Environment, 2001b. *Science, technology and innovation in NRE. The State of Victoria, Department of Natural Resources and Environment*.
- Richardson, A., Jackson, C., et al., 1990. *Taking research seriously. Means of improving and assessing the use and dissemination of research*. HMSO, London.
- Royal Netherlands Academy of Arts and Sciences, 2002. *The societal impact of applied health research—towards a quality assessment system*. Council for Medical Sciences, Amsterdam.
- Solesbury, W., 2002. *Measuring value added in research*. ARCISS, London.
- Spaapen, J., Wamelink, F., 1999. *The evaluation of university research: a method for the incorporation of the societal value of research*. sci\_Quest, Amsterdam.
- Tait, J., Williams, R., 1999. *Linear-plus model. Policy approaches to research and development: foresight, framework and competitiveness*. *Science and Public Policy* 26 (2), 101–112.
- van Weel, C., 2002. *Biomedical science matters for people—so its impact should be better assessed*. *The Lancet* 360, 1034–1035.
- Weiss, C.B., 1980. *knowledge creep and decision accretion*. *Knowledge: creation, diffusion, utilization* 1 (3), 381–404.
- Weiss, C.B., 1982. *Policy research in the context of diffuse decision making*. *Journal of Higher Education* 53 (6), 619–639.



# Foresight

## Foresight in a multi-level governance structure: policy integration and communication

Catherine Lyall and Joyce Tait

*Foresight is widely interpreted as the process of fostering scientific research to support technological innovation and hence regional and national competitiveness. Policy integration, across administrative levels, is seen as crucial to achieving these goals. Our analysis looks at policies and their integration in the contexts of science, Foresight and governance at regional, national, European and global levels and we draw some conclusions relevant to their implementation, particularly at the regional level. We use Scotland as an illustrative example, where the recent devolution settlement has, at least in some areas, allowed greater freedom of action.*

**A**T ALL INSTITUTIONAL LEVELS, Foresight responds to a wide range of societal concerns including:

- risks and their regulation;
- prosperity and national wealth and how they are generated;
- public health;
- education and training;
- employment;
- social inclusion; and
- public perceptions and acceptance of technological innovation.

To be effective, regional Foresight should ideally be embedded in national and European Union (EU) level systems. It should also take account of global developments, with smooth interactions across levels. Within each level there should be horizontal policy integration, particularly linking Foresight policies to science, innovation and regional development strategies.

Foresight is often planned and organised at the national level but implementation of Foresight policies can take place at the regional level. Effective implementation, with its attendant societal benefits, will thus depend on good communications within and across governance levels and also on ensuring that interactions among policies are mutually supportive and not antagonistic.

Many of these issues are being addressed by the development of new governance structures, for example, in the UK under the 'Modernising Government' agenda (Cabinet Office, 1999) and, logically, one would expect Foresight to be a crucial component of these structures. Yet despite frequent references to

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the need for more integrated approaches to policy development, new governance initiatives are largely socially-oriented and ignore science and Foresight-related issues. Equally, Foresight policies fail to recognise governance initiatives being developed in other policy contexts (OST, 2000; Commission of the European Communities, 2001; Scottish Executive, 2001).

This paper builds on earlier research on policy integration and Foresight in the context of the development and implementation of science strategies and policies at regional, national and EU levels (Tait and Williams, 1999; Tait *et al*, 2001b) and also on studies for an European Commission (EC)-funded project.<sup>1</sup> We are exploring the nature and extent of the linkages and perceived gaps in decision-making structures in these areas and the implications this has for the regional development of Foresight. These regional aspects are influenced by interactions at all policy levels, up to and including the global level, and can either promote or frustrate regional Foresight initiatives.

We draw particularly on experience in Scotland as a case study, where the recent devolution settlement and the re-opening of the Scottish Parliament have, at least in some areas, allowed greater freedom of action at the regional level. In the context of Foresight, this example raises interesting questions about the relative importance of the size of the political unit and its ability to act autonomously. For example, Scotland, a constitutional region of the UK, is similar in size to Eire, Denmark and Finland but has less political autonomy than these nation states. Similar issues may arise in other European states, such as Germany or Spain, where there is also considerable devolution to the regional level but some reservation of political powers to the national level.

Foresight is widely interpreted to be about the processes of fostering scientific research in order to support technological innovation and hence regional

and national competitiveness, and in many cases can be seen as reinforcing the much criticised linear model of innovation (Tait and Williams, 1999). Policy initiatives thus focus on:

- supporting science and fundamental research, including deciding which areas of scientific research are most likely to reward investment; and
- deciding how to encourage the commercialisation of the fundamental knowledge gained and tailoring the policy environment to support commercialisation.

Given the broad potential coverage of this paper, we have structured it on the basis of the boundaries relevant to key Foresight-related actors operating at various administrative levels. We thus envisage a hierarchical series of systems, some of which overlap, vertically or horizontally. Each of these interacting systems can facilitate the work of others or impose constraints on them. In the Foresight area this is usually as a result of policy initiatives rather than formal regulation.

## New governance approaches and Foresight

In the most common current usage of the term, 'governance' is seen as implying a move away from the previous *government* approach (a top-down legislative approach that attempts to regulate the behaviour of people and institutions in quite detailed and compartmentalised ways) to *governance* (which attempts to set the parameters of the system within which people and institutions behave so that self regulation achieves the desired outcomes), or, put more simply, the replacement of traditional "powers over" with contextual "powers to" (Pierre and Peters, 2000). In such a governance system, permeable and flexible system boundaries will facilitate communication and support the achievement of higher-level goals. These assumptions underline the switch from government to governance in debates about the modernisation of policy systems, implying a switch from constraining to enabling types of policy or regulation (that is, from 'sticks' to 'carrots').

New approaches to governance are being developed under a variety of labels at different institutional levels in many European countries. In the UK, this on-going policy revolution has been referred to as the "Third Way" (Giddens, 1998),<sup>2</sup> with a strong commitment to more integrated or 'joined up' approaches to policy.

Over the past 30 years, there has been a steady shift in the emphasis of research policies at national and European levels, to obtain better value for money from public investment in research, by ensuring that both curiosity-driven, fundamental research and applied research contribute as much as possible to improving competitiveness at national, European and international levels.

Effective policy integration would imply that science and Foresight-related policies ought to be crucial components of new governance initiatives but, in our investigation of the relevant documents concerned with science, technology and innovation, we found little evidence of their inclusion. The modernising government agenda concentrates almost entirely on the social-policy arena covering social welfare, crime, health and education, these being the areas that focus groups tell government ministers are of most concern to voters. Science, technology, and innovation are apparently of lesser concern to voters in Europe. They are not linked in the public mind, and hence are less likely to be linked by governments, to national competitiveness, which generates the wealth to support the other functions.

### *Governance and science policy in the UK*

Unlike many other countries, the UK did not begin to expand state expenditure on R&D in the 1980s and was the only one of 19 major OECD (Organisation for Economic Co-operation and Development) countries during the period 1981–1985 where the growth in R&D expenditure was lower than growth in gross domestic product (GDP) (Nicholson *et al*, 1991, page 6). Priorities determined and choices made in this period have shaped many of the current weaknesses and strengths of the national system of innovation.

To give just one example, in the 1980s and early 1990s the Conservative Government withdrew all funding to universities and public-sector research establishments (PSREs) for any research that could be construed as “near market”, this being seen as the function of industry or commercial organisations. On the positive side, this has led to a much leaner and more competitive public-sector research environment in the UK. On the other hand, the policy failed to encourage more effective transfer of knowledge from public-sector research to commercial exploitation. More recently there has been a complete reversal of this policy, with much of science policy being directed towards encouraging, and also funding, universities and PSREs to engage actively in downstream development of the outputs of their research programmes.

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**Some believed that the creation of the UK Office of Science and Technology was a recognition of the inadequacies of the market mechanism, with its inability to deal satisfactorily with the competing claims for resources for research and development**

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In a surprise move in April 1992, the last Conservative Government established the Office of Science and Technology (OST) and gave the UK a minister of Cabinet rank with responsibility for science for the first time since 1959. In creating the OST, the Government was seen to be proclaiming a new obligation to science and technology; some believed that this move was a recognition of the inadequacies of the market mechanism, with its inability to deal satisfactorily with the competing claims for resources for research and development (Goldsmith, 1992).

This new-found interest in science policy was confirmed in 1993 with the publication of the first UK White Paper on science and technology for over 20 years (OST, 1993). The White Paper's failure to co-ordinate UK science, technology and innovation (STI policy) sufficiently (Lyall, 1993) should be seen in the context of Ronayne's (1984, page 141) analysis that intra-departmental, rather than overall, co-ordination would seem to be the preferred policy mechanism in the UK, where individual agencies are allowed self-determination while trying to avoid undue duplication of effort or pursuit of conflicting goals in different parts of Government. In practice, co-ordination in Britain tends to mean cross-membership of committees: an ‘insider's world’ where a relatively small group of senior civil servants, elite scientists, and influential industrialists move from committee to committee (Ince, 1986).

In the 1990s, governments began to focus on their country's specific strengths, and the clusters approach to innovation, developed by Porter (1990), became increasingly influential on policy. Thus UK policy directed towards industry has been designed to be delivered at the local level and a clear trend, even before the devolution agenda, has been towards giving greater responsibility to agencies closer to the target audience. Decentralisation should encourage heterogeneity in national and regional technological capabilities and create opportunities for closer contact with firms, but it can bring with it a loss of control and potential loss of learning as feedback to the centre may be lost (Dodgson and Bessant, 1996).

In the UK, the focus on modernising the processes of government, as outlined in the *Modernising Government White Paper* (Cabinet Office, 1999), includes a complete framework for excellence in policy-making and a strong emphasis on learning lessons from policy experience in other countries. The over-arching ethos is ‘what matters is what works’ with, at least in theory, a much freer flow of ideas across governments and government departments and from one level of government to another, focusing on ideas that can contribute to an effective system of governance, rather than on the ideology that generated the ideas.

The *cri de coeur* of the current Labour Government for ‘joined up’ policy is reflected in the goal of the Modernising Government initiative to develop a more integrated approach to policy-making, and a series

of Cabinet Office publications (Better Regulation Task Force, 2003; Cabinet Office Performance Innovation Unit, 2000; Cabinet Office Strategic Policy Making Team, 1999) aims to improve policy formulation and implementation in areas that cut across the policy boundaries of traditional government departments. Some parameters of the new governance-based policy-making systems are relevant to science strategy, including initiatives on:

- policy integration;
- evidence-based policy;
- the use of standards and guidelines linked to policy evaluation;
- encouragement of openness;
- stakeholder involvement and consultation; and
- avoidance of unnecessary regulatory burdens.

However, this integrated approach has not yet been extended to cover science and innovation policies *per se* and is not, for example, linked to the Department of Trade and Industry (DTI) White Paper on *A Science and Innovation Policy for the 21st Century* (OST, 2000). Nevertheless, a Ministerial Committee was set up to consider UK Government policies in relation to scientific advances and public acceptance of them.

To varying degrees, at all institutional levels, science policy should cover a wide range of societal concerns but, although science is seen in some quarters as a passport to the worlds of innovation, quality of life and globalisation and an important component of competitive advantage, the policy framework does not yet reflect this vision.

Charles and Benneworth (2001) highlight the limitations of a governance system in which central departments are reluctant to cede powers to regions, as in the UK. They describe how the current UK system was established by the White Paper (OST, 1993) whose "central rationale ... was to create a system of scientific governance which generated excellence in UK science to boost the competitiveness of UK business". However, these authors point out that a House of Commons inquiry (House of Commons Science and Technology Committee, 2000) found that there was little coherence of research activity among government departments.

They find that the problem with the system of scientific governance in the UK is that changes in science and technology policy do not fit well with other changes in the policy environment. Their claim that "... a top down scientific governance system weakens UK economic performance if it cannot direct scientific policy to create capacity for growth and development throughout its constituent regions" finds particular resonance in the context of devolution, in a situation where science policy is dominated by the DTI and the top-down approach to science policy can have negative regional impacts leading to a concentration of STI activity in southeast England (Charles and Benneworth, 2001).

### Evolution of UK Foresight

Against this background, the UK has been in the forefront of developing national approaches to Foresight since the first initiative was launched in 1994. In evaluating the first phase, the Parliamentary Office of Science and Technology (POST, 1997) highlighted some key issues for OST to take on board. Their report noted that, although barriers had been reduced between academics and industrialists and also between different disciplines and different companies, much remained to be done to reduce the cultural barriers among academe, industry, Government and financial institutions. POST also pointed to concerns that Government departments were not responding sufficiently to Foresight, thus losing the opportunity to implement a more co-ordinated science policy across Government.

An analysis of the first round of UK Foresight (Scottish Universities Research Policy Consortium, 1997) noted the need for more effective interdisciplinary interactions, given that the programme was structured around 16 technology sectors that did not map naturally onto academic disciplines.

Foresight programmes were initially largely controlled by industry and the science community. Commentators noted that they tended to yield discipline-based projections and that traditional panel reviews are less appropriate for assessing prospects for the interdisciplinary areas covered in many programmes (Martin and Irvine, 1989, page 339). Martin and Johnston (1998) also noted that the successful development of technology policy requires the development of effective links among science and technology and the financial and legal systems and that "... the development of such links is becoming more crucial".

The OST addressed many of these issues in the second round of Foresight, broadening the composition of panels to include a range of public as well as private interests, and focusing on broad themes (such as 'ageing population' and 'sustainable development') as well as more conventional business and technology sectors. However, it was assumed (OST, 1998b) that Foresight II would not be fundamentally different from Foresight I but would concentrate on achieving its objectives more effectively, with its more inclusive and global approach, allowing systematic analysis of key issues and exploration of themes in a visionary manner (OST, 1998c, pages 3 and 12).

A paper on the evaluation of Foresight II (Tait *et al*, 2000) considered that, to be effective in meeting its own terms of reference, it should succeed in setting up a new "social contract" which emerges through discussion and engagement among diverse actors (policy-makers, scientists, industry, publics). To this extent, it is necessary for Foresight to mean different things to different people and a diversity of goals can be seen as an indicator of flexibility and successful adaptation.

Foresight in the UK thus developed from its origins as a technically focused programme, geared towards research policy and the nexus between research and industry. Foresight II took on board criticisms that this involved a 'linear' technically-centred model of innovation and it pursued a broader societal approach, reflected in its emphasis on interdisciplinary working and interactivity. It sought to promote new kinds of thinking and changes in social relationships and networks across a wide range of players. However, the difficulties in pursuing such ambitious goals should not be underestimated.

A more targeted approach is now being promoted with the range of topics to be considered reduced to around four areas regarded by top thinkers from industry and the sciences as vital to the future economy. The idea of socio-economic integration into Foresight and indeed, in some cases, of incorporating panels dealing with social Foresight *per se*, has not been abandoned but the focus has been moved from the OST to other Government departments more accustomed to dealing with such issues. It may be premature to conclude that the experiment of integrating a broader range of societal themes into Foresight processes, alongside scientific and technological concerns, has been abandoned, but current indications would suggest that this may be the case.

#### *Science policy and Foresight at the EU level*

Similar trends are also beginning to emerge at the EU level with important documents being published on European Governance, the European Research Area (ERA), and developments in the Sixth Framework Programme (FP6). As in the UK, there is evidence of difficulty in integrating policies and particularly in spanning the divide between science/technology and society.

#### *European governance*

The gap between innovative thinking on governance in general and developments in science and technology related policies is also apparent at the EU level. The White Paper on European Governance (Commission of the European Communities, 2001)

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**The impression is that science-related issues are of only peripheral interest in European governance, coming into the picture downstream, as a part of policy implementation but not being integrated at a high level into overall governance and policy development**

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has only one brief reference to the word 'science' in the context of managing "... the challenges, risks and ethical questions thrown up by science and technology". There are no references to 'evidence', and for 'research' there is one mention of "research centres" and one to the ERA, although there are references to scientific committees and the need for their advice to be made publicly available.

The overall impression is that science-related issues are of only peripheral interest in the context of European governance. They come into the picture downstream, as a part of policy implementation but are not being integrated at a high level into the overall governance and policy development process.

However, this early reading of the Governance White Paper does not take account of more recent developments as indicated by the EC Science and Society Action Plan (European Commission, 2002).

#### *European science policy*

There is a strong connection between the promotion of industry-academia links and the requirement for more interdisciplinary approaches to research in order to integrate the more complex array of issues that comes into play when a wider range of actors and stakeholders is involved in Foresight.

The document on the ERA is the main focus of innovative EU thinking on science- and research-related issues. One of its main policy planks is the forging of closer links between the EU Framework Research Programmes and the research systems of EU member states. The ERA will be implemented partly through FP6, involving also major changes in the organisation of research in Europe.

Prior to the development of ideas on the ERA, and influenced to some extent by UK thinking on the development of Foresight, the Fifth Framework Programme (FP5) took a new direction by giving a strong emphasis to interdisciplinary integration, particularly between the natural and social sciences. FP5 targeted Key Actions to socio-economic needs and guided research collaboration among EU nations in a manner that increasingly included socio-economic components.

It would be unrealistic to expect such a major change in research orientation and management to bear fruit within the timescale of a single Programme and it is unfortunate that FP6 has largely abandoned the innovative approach on interdisciplinary research pioneered by FP5. Although essential if Europe is to compete effectively in a global economy, integrative approaches challenge many vested interests in both academic and policy spheres and, as we have noted, there have been strong reactions against it from several directions.

#### *Global governance issues*

As outlined by Tait and Bruce (2004, in press), the increasingly rapid pace of technological innovation

and the increasing size and power of multinational companies are leading to globalisation of production and trading systems accompanied by pressures for further trade liberalisation.

In the context of one of the main themes of this paper, the rapid pace of technological change, supported in many cases by effective Foresight, poses enormous challenges for European nations to be internationally competitive with other major trading blocks in the global economy. Such questions are amplified for regional Foresight in considering what actions are appropriate and likely to deliver benefits at the regional level.

The emerging system of global governance is being mediated through international organisations such as the World Trade Organisation. However, such changes diminish the sense of power and influence of individual citizens and appear to negate local and national democratic processes, raising fundamental questions of sovereignty and governance at national and regional levels. They are also being opposed by increasingly vocal and well organised public groups acting against globalisation and the pressures that are driving it. In the context of developments in genetically modified crops, Tait and Bruce (2004, in press) referred to the internationally organised consumer boycott as “a new instrument of global governance”.

Giddens (1999) noted this tension between pro- and anti-globalisation forces. He referred on the one hand to “... the mobilising dynamic of a society bent on change, that wants to determine its own future...”, and, on the other hand, he noted that we now live in a world where innovation and technological change has generated hazards that are regarded as more threatening than so-called natural hazards.

Regional and national Foresight can no longer operate effectively without considering the pressures and constraints imposed at the global level. These include:

- international trading relationships;
- intellectual property rights;
- the relevance of regionally-based technology clusters in the context of modern information and communication networks;
- public support for, or opposition to, individual innovations.

### **Multi-level governance of STI in Scotland**

The development or influencing of science policy is one of the main instruments open to those engaged in Foresight to encourage and foster the future outcomes that they identify as most desirable.

STI policy today is no longer just a matter of resource allocation for research, as it was in the early days of UK science policy. It is now a complex process involving multi-level governance at the national, sub-national and supra-national levels,

which requires careful co-ordination to ensure effective policy integration. While discussions of competitiveness policy preoccupy national governments, as much, or more, attention is necessary at the regional level in areas such as university education, infrastructure and local research initiatives.

Today the role of regional government is potentially as great as, or greater than, the role of national government in ensuring competitive advantage (Porter, 1990, page 622). Policies pursued by regional governments can give a distinctive identity to the regions in question, particularly where these regions are new and, in some cases, “even somewhat artificial administrative units” (Cooke, 1998). These points are borne out by our case study of the Scottish system of innovation.

Small countries or regions like Scotland face major challenges in developing their own approaches to successful technological innovation, international competitiveness and economic growth (Walsh, 1988) and may struggle to make a significant contribution to new developments in world science and technology. They have less money to spend on R&D and fewer trained personnel but are faced with the same breadth of possible research areas as large economies. Small countries therefore face hard choices — they must either spread their resources more thinly or specialise; this issue must lie at the heart of their Foresight strategies.

#### *Scottish science strategy*

The opportunities for a specifically Scottish system of innovation are being influenced to some extent by the re-establishment of the Scottish Parliament in 1999. Key areas of responsibility devolved to the Scottish Parliament include: health; education; economic development; agriculture; and environment. Many aspects of technology and innovation policy are covered by Scottish economic development policy; and some aspects of science policy, related to education, public understanding of science, universities and other higher-education institutes may be covered by education policy. Science itself is a ‘concurrent power’, meaning that responsibility is shared between the Scottish and UK Parliaments.

The split between devolved and reserved powers illustrates the highly complex situation of STI policy, with many of the key policy-makers remaining at the UK level. Policy links between the UK and EU levels are well defined and have been smoothed by long familiarity and regular use. Links between the UK and Scottish levels are still in their formative stages. The role of government is particularly important in the Scottish system of innovation, given this multi-level nature of governance, with policy emanating from local, national and supra-national levels where many of the key drivers for science and innovation are external to the Scottish system.

Devolution may thus be unintentionally reinforcing traditional tendencies to develop policy in

separate compartments, rather than the more integrated approaches described above as desirable. This multi-level dimension of the Scottish system of innovation presents a considerable co-ordination and communication challenge.

There are limits to what a 'region-state' such as Scotland can achieve when it seeks to use STI policy to foster regional economic growth. Maskell and Tornquist (1999, page 50) describe regional development policy as mainly a process of "making do" with the historical legacy of institutions and routines, maintaining that economic processes are so strongly path dependent that we can never build anything entirely new.

Politics can both enhance and constrain innovation and governance at the regional level. Although regional states are limited in their legislative and policy aspirations (Latouche, 1998), major political developments such as the re-establishment of the Scottish Parliament can create expectations and motivate individuals in ways that can circumvent long-standing constraints and create unexpected outcomes.

As one example of such an outcome, Scotland was one of the first regions in the EU to develop a formal science strategy (Scottish Executive, 2001). It takes as its starting point a vision of Scotland as a modern dynamic country and aims to meet the challenges of global competition, making the nation more prosperous and its economy more competitive. With clear connections to Foresight, it focuses on five key objectives:

- maintaining a strong science base;
- increasing the effective exploitation of scientific research;
- ensuring that enough people study science to meet the future needs of Scotland;
- promoting the awareness, appreciation and understanding of science across society;
- ensuring the effective use of scientific evidence in policy formulation and resource allocation by government.

Although promoted by the Scottish Executive as an "integrated" strategy (Scottish Executive News Release, 2001), the thrust of the strategy document is on supporting the science base in Scottish universities and encouraging them to commercialise their inventions in order to foster a vibrant high-tech small and medium-sized enterprise (SME) community in Scotland. Despite the claim that "science has been interpreted to encompass the development, understanding and application of the physical, life and social sciences", the imagery and language throughout the strategy document imply that science is what takes place in laboratories in universities and PSREs. A major role for the strategy is to hasten the transformation of this knowledge into new products, processes and services. Without wishing to downplay the value of what is included in the strategy document, this apparent adherence to the linear

model of innovation and the lack of recognition of a role for social and economic concerns is disappointing but not unexpected.

### *Scottish Foresight*

Pre-devolution, at the inception of the UK Foresight initiative, there was a strong uptake of Foresight in universities and research institutes in Scotland. Many PSREs, for example, began to restructure their research programmes to coincide with the research areas identified by Foresight as important. The Scottish Higher Education Funding Council (SHEFC) published and implemented a Foresight Action Plan in 1995 (SHEFC, 1995) and requires the higher-education institutions it supports to provide annual reports outlining their Foresight-related activity. The Royal Society of Edinburgh also had a prominent role in the promotion of Foresight and organised a series of Foresight seminars reflecting the issues identified as important by the national Foresight programme.

In Scotland, Foresight is co-ordinated by the Scottish Foresight Forum established in 1996 to develop Foresight awareness and understanding in Scotland and to ensure complementarity with related policies and programmes; it is chaired by the Scottish Executive. A Scottish Foresight Co-ordinator was appointed in January 2000, based at the regional development agency, Scottish Enterprise, to work with the Enterprise Network and other business intermediaries to encourage companies to be more proactive in anticipating future economic, technological and social change and in taking action to increase their long-term competitiveness (Scottish Executive, 2000).

According to the DTI (2000), Foresight activity in Scotland has led to innovative new measures that encourage companies and universities to be more forward-looking and is "... firmly rooted in collaboration between public and private sector partners, so that the Executive and its main Non-Departmental Public Bodies are happy to lead by example".

In Scotland, Foresight activities for business are being channelled through a wide range of business intermediaries including: industry and sectoral representative bodies; National Training Organisations; professional institutes and associations; and other business support bodies such as Local Enterprise Committees; and Chambers of Commerce. The stated objective (Mearns, 2001) was to influence business intermediaries by encouraging them "to adopt as part of their mainstream activities a stronger focus on future issues and challenges".

More recent activities of the Scottish Foresight Coordinator (Mearns, 2002) have been focused on continuing to connect Foresight panel outputs with relevant initiatives and interest groups in the context of the current transition of Foresight from a broad-based future change programme to one focused on a smaller number of science- and technology-related priorities.

Consideration is also being given to developing a stronger connection between Foresight and the strategic policy community in Scotland so that Foresight thinking can provide the longer-term perspective often missing in a political climate with a strong focus on short-term delivery (Mearns, 2002). Given the latest review of UK Foresight, which has resulted in a restructured, more narrowly focused approach with four main themes, as opposed to the 13 original panels, discussion is underway within the Scottish Executive and with the Scottish Foresight Forum to consider how best to take Foresight forward as Scotland begins to identify its own 'futures' priorities through the Scottish Science Advisory Committee and development of the Scottish Science Strategy.

Scottish Enterprise works in close partnership with those who are developing Foresight in Scotland, and indeed hosts the Foresight Co-ordinator in Scotland. The activities on which it has taken a lead, including the Proof of Concept Fund and the Clusters initiative, are described by Scottish Enterprise as being part of "regional development" rather than specifically Foresight-related. However, it is clear that they could equally be considered as part of a Foresight programme in other contexts.

## Regional Foresight and multi-level governance

Cooke *et al* (2000, pages 98-119) have analysed the multi-level governance (MLG) of regional innovation systems with examples from several different types of European region. Although not discussed by them, Scotland would come into the category of a "region with a high capacity for developing regional innovation systems". They conclude, among other things, that:

- in an MLG system, the ability to interact at all appropriate levels, upwards and downwards, is a distinct advantage;
- support from EU policies for regional innovation systems is needed, in preference to existing piecemeal policies;
- regional innovation requires a package of measures covering finance, management, training, marketing and competitiveness advice, as well as more conventional technology transfer;
- different regions have different innovation and MLG models and this may take time to change (if indeed change towards a European norm is seen as desirable);<sup>3</sup>
- each regional innovation system must have at its core a strong university-industry innovation and networking system.

Our analysis has looked at issues of MLG mainly from the perspective of policy integration. Horizontal integration of issues, policies and initiatives has in some cases been lacking altogether. Where it has been attempted, it is being modified because of difficulties

in its implementation. For example, at EU, UK and Scottish levels, there is so far a general lack of integration between the modern approaches to governance being developed in the social policy arena and policies for science, technology and innovation, which still seem to be driven by an old-fashioned, linear conception of innovation systems (Tait and Williams, 1999). Even within the area covered by STI policies, as demonstrated by Scotland's Science Strategy, these linear assumptions seem likely to discourage the flexible approach needed to encourage effective development of new knowledge.

However, our analysis of the approaches being adopted in Scotland could imply that the relative lack of integration between the strategy for science and research and similar initiatives being developed by the Scottish Executive and the regional innovation policies developed by Scottish Enterprise, has in fact allowed Scottish Enterprise to achieve greater success, for example, with their Clusters Initiative, than might otherwise have been the case. An analysis of Foresight in the USA claims that, of the range of Foresight-related initiatives adopted there, the most successful approaches have been those driven by business or trade associations with the strong unifying motivation of economic survival, which academic or government-run exercises lack (OST, 1998a).

Further research would be needed to elaborate such relationships but, if this interpretation is justified, care would be needed in attempting to integrate the top-down science-driven approach underlying much of Foresight and science policy with the bottom-up business- and industry-driven approach of organisations such as Scottish Enterprise. In the MLG agenda, this interface requires particularly careful and sensitive treatment.

Much has also been made of the difficulties facing regions in developing competitive innovation systems in a global economy. However, perhaps such difficulties have been exaggerated and seem more daunting if viewed from the perspective of the policy-maker who is focused on the superstructure of national and European policies and constraints that overlay regional structures. From the perspective of an innovative company, large or small, and also of regional development agencies such as Scottish Enterprise, both innovation systems and markets operate globally, and the route to these global networks is a direct one — it does not operate hierarchically through the national and EU levels.

## Policy integration and communication

Our analysis has covered two radically different types of policy integration — vertical and horizontal.

### *Vertical integration*

Policy integration across levels of governance, for example, from EU to UK to Scotland, depends mainly



on the ability to communicate effectively across system boundaries. The institutional structures determined by government policy-making at the highest levels have a major influence on the effectiveness of such communications. For example, we noted above that integration and communication across the EU/UK boundary are relatively effective, while the situation is much less satisfactory across the UK/Scotland boundary. The comments from Charles and Benneworth (2001) also emphasise this point.

Vertical integration is thus mainly a function of the institutional structures determined by policy-making at senior government levels and its most important constituents are effectiveness of communications across levels of government. Ideally, vertical communication across these boundaries should be a two-way process, leading to accommodation by higher levels to the needs of the lower levels as well as the reverse process.

However, human nature being what it is, effective vertical integration often implies top-down control with some form of sanction imposed where higher-level policies are ignored or flouted. In the context of Foresight initiatives, this raises questions about how effectively stakeholders at the regional level can engage in the Foresight process; the danger is that Foresight just becomes an activity of the public sector and does not include private business and other interested parties.

#### *Horizontal integration*

Horizontal integration takes place across departmental boundaries, for example, the ideal, but so far patchy, integration between science and technology policy and social and environmental policies in the UK in the development of new approaches to governance. Integration in this case poses similar challenges to that of interdisciplinary research in academic organisations (Tait *et al*, 2002; Bruce *et al*, 2004, in press).

Institutional structures are important here but they do not determine the effectiveness of integration. In the UK, there have been numerous examples of amalgamation of Government departments, with integration as one of the main aims, where the staff involved have continued to operate within their pre-existing boundaries, with little interaction across these old boundaries.

Communication is also important but the focus of the communication is different and it imposes different challenges. As with interdisciplinary research in academia, each policy area has its own specialist language and this leads to difficulties in effective communication across boundaries (Tait and Lyall, 2001). Likewise, career structures for public servants reward those who specialise and it is difficult to make a career by 'trespassing' across traditional boundaries.

Most important, the impact of effective horizontal integration is a loosening of control and the introduction of greater complexity into policy implementation processes.

Horizontal policy integration, despite the importance we would attach to it, is therefore much more difficult to achieve than vertical integration. It cuts across the career structures of public servants, raises communication difficulties and lessens the ability of individual departments to exercise control in their own spheres. However, that said, the case of Foresight in Scotland appears to demonstrate that the Foresight Forum has achieved a certain degree of integration across Scottish agencies but has been less successful at vertical integration with industry and other Foresight stakeholders.

#### **Conclusions**

The challenges exercised by horizontal policy integration in Foresight and by interdisciplinary research in academia are similar in many respects, and interdisciplinary research itself has an important role to play in Foresight processes at the level of STI policy. As recognised by FP5, integration of socio-economic research, where appropriate, into science- and technology-based research, technology and development (RTD) programmes makes an important contribution to the delivery of Foresight-related policy objectives where the pitfalls in implementation lie as much in the social sphere as in science and technology themselves.

To date, experience of interdisciplinary integration in FP5 has been mixed, but it is important that the EC learns from experience and adapts future programmes accordingly, rather than abandoning the experiment. Discussions with scientists who have worked in both Europe and the USA have led to the conclusion that America manages academic interdisciplinary integration much more effectively than we do in Europe, and this could be a significant component of their relative competitive advantage in many areas (Tait *et al*, 2002; Bruce *et al*, 2004, in press).

These difficulties are related to the linearity of the assumed model of innovation. Current assumptions see 'society' entering the picture as a market for the products of innovation at the end of the development pipeline, but not as a partner in their development. Innovative companies may engage in sophisticated market forecasting techniques, but they often have a very restricted understanding of what constitutes their market. Likewise, many of them fail to consider the policy environment into which their products will be launched. The current UK debate on the introduction of GM crops illustrates this point perfectly (Tait, 1993; Tait *et al*, 2001a).

Finally, in attempting to facilitate regional innovation, we should resist the tendency to place artificial boundaries around science and innovation. Such boundaries reinforce the 'linear model' and ignore the fact that innovation does not simply result from research undertaken in universities. The model of technology transfer adopted by the Scottish Science Strategy seems unduly focused on this 'treasure

trove' model. While the pharmaceutical and life science sectors most closely resemble this model, it is far from typical of innovation as a whole. Industrial R&D is a key knowledge source for new technical advances and the knowledge contributions of public-sector research are more often indirect (SUPRA, 2000; Bechhofer *et al*, 2001). What is needed is an integrated strategy for research and innovation not one that primarily focuses on the science base.

**Notes**

1. EC Fifth Framework STRATA Programme, Accompanying Measure "Integrating Technological and Social Aspects of Foresight in Europe" ITSAFE, see <<http://www.innogen.ac.uk>>.
2. The term 'Third Way' seems to have been dropped from the political lexicon in the UK recently, although the new governance approaches it described are continuing to be developed.
3. Our experience would reinforce this question whether such change is desirable. A diversity of regional approaches is likely to lead to the greater flexibility and resilience needed to cope with rapid technological advance in a global trading environment.

**References**

Bechhofer, F, L Rayman-Bacchus *et al* (2001), "The dynamics of social science research exploitation", *Scottish Affairs*, 36, Summer, pages 124–155.

Better Regulation Task Force (2003), *Scientific Research: Innovation with Controls* (Cabinet Office, London).

Braczyk, H-J, P Cooke and M Heidenreich (editors) (1998), *Regional Innovation Systems* (UCL Press, London).

Bruce, A, C Lyall, J Tait and R Williams (2004, in press), "Interdisciplinary integration in Europe: the case of the Fifth Framework Programme", *Futures*.

Cabinet Office (1999), *Modernising Government White Paper* (Cabinet Office, London).

Cabinet Office Performance Innovation Unit (2000), *Wiring it up. Whitehall's Management of Cross-cutting Policies and Services* (Cabinet Office, London).

Cabinet Office Strategic Policy Making Team (1999), *Professional Policy Making for the Twenty First Century* (Cabinet Office, London).

Charles, D, and P Bennenworth (2001), "Are we realizing our potential? Joined up science and technology policy in the English regions", *Regional Studies*, 35(1), pages 73–79.

Commission of the European Communities (2001), *European Governance: a White Paper* (Brussels, COM (2001) 428 Final).

Cooke, P (1998), "Introduction. Origins of the concept" in Braczyk *et al* (1998).

Cooke, P, P Boekholt and F Todtling (2000), *The Governance of Innovation in Europe: Regional Perspectives on Global Competitiveness* (Pinter, London).

Dodgson, M, and J Bessant (1996), *Effective Innovation Policy: A New Approach* (International Thomson Business Press, London).

DTI, Department of Trade and Industry (2000), *The Foresight Effect: how Foresight is helping the public sector to prepare for the future* (Department of Trade and Industry DTI/Pub 4997/1k/9/00/NP. URN 00/1001, London).

European Commission (2002), *Science and Society Action Plan* (Office for Official Publications of the European Communities, Luxembourg).

Giddens, A (1998), *The Third Way : the Renewal of Social Democracy* (Polity Press, Cambridge).

Giddens, A (1999), *BBC Reith Lectures* available at <[http://news.bbc.co.uk/hi/english/static/events/reith\\_99/](http://news.bbc.co.uk/hi/english/static/events/reith_99/)>, last accessed 5 September 2003.

Goldsmith, M (1992), "The OST: a new stage in S&T policy?", *Science in Parliament*, 49(3), page 1.

House of Commons Science and Technology Committee (2000), *Government Expenditure on Research and Development: the forward look, fifth report 1999–2000* (Stationery Office, London).

Ince, M (1986), *The Politics of British Science* (Wheatsheaf Books, Brighton).

Latouche, D (1998), "Do regions make a difference? The case of Quebec", in Braczyk *et al* (1998).

Lyall, C (1993), *The 1993 White Paper on Science and Technology: Realising Our Potential or Missed Opportunity?* (MSc Thesis SPRU, University of Sussex, Brighton).

Martin, B R, and J Irvine (1989), *Research Foresight. Priority Setting in Science* (Pinter, London and New York).

Martin, B R, and R Johnston (1998), "Technology Foresight for wiring up the national innovation system: experiences in Britain, Australia and New Zealand", SPRU Electronic Working Papers Series, Paper No 14 (University of Sussex, Brighton).

Maskell, P, and G Tornquist (1999), *Building a Cross-border Learning Region — emergence of the North European Oresund Region* (Copenhagen Business School Press, Copenhagen).

Mearns, E (2001), *An Overview of Foresight in Scotland* (Scottish Enterprise, Glasgow).

Mearns, E (2002), *Foresight Forum. Progress Report on Foresight Implementation* (Scottish Enterprise, Glasgow).

Nicholson, R, C M Cunningham *et al* (1991), *Science and Technology in the United Kingdom* (Longman, Harlow).

OST, Office of Science and Technology (1993), *Realising our Potential. A Strategy for Science, Engineering and Technology* (HMSO, London).

OST, Office of Science and Technology (1998a), *The Future in Focus: a summary of national Foresight programmes* (Department of Trade and Industry DTI/Pub 3333/4k/3/98/NP, London).

OST, Office of Science and Technology (1998b), *Foresight. Consultation on the next round of the Foresight Programme* (DTI, March 1998, DTI/Pub 3284/50k/3/98/NP.URN 98/628, London).

OST, Office of Science and Technology (1998c), *Blueprint for the Next Round of Foresight* (DTI, December 1998 DTI/Pub 3733/65k/12/98/NP.URN 98/1032, London).

OST, Office of Science and Technology (2000), *Excellence and Opportunity: a Science and Innovation Policy for the 21st Century* (HMSO, London).

Pierre, J, and B G Peters (2000), *Governance, Politics and the State* (Macmillan, Basingstoke).

Porter, M (1990), *The Competitive Advantage of Nations* (Macmillan, London).

POST, Parliamentary Office of Science and Technology (1997), *Science Shaping the Future* (POST Summary Report, June, London).

Ronayne, J (1984), *Science in Government* (Edward Arnold (Australia), Caulfield East Victoria).

Scottish Executive (2000), *Materials Futures: Report of the Foresight Consultation Seminar*, Stirling Management Centre 16 October, available at <<http://www.scotland.gov.uk/library3/enterprise/matf-00.asp>>, last accessed 5 September 2003.

Scottish Executive (2001), *A Science Strategy for Scotland* (The Stationery Office, Edinburgh).

Scottish Executive News Release (2001), *Wendy Alexander Launches First Ever Scottish Science Strategy* (Scottish Executive, Edinburgh).

Scottish Universities Research Policy Consortium (1997), *Interdisciplinary Research: Process, Structures and Evaluation* (SHEFC-funded Regional Strategic Initiative, Research Support Section, University of Edinburgh, Old College, Edinburgh EH8 9YL).

SHEFC, Scottish Higher Education Funding Council (1995), *Addressing Technology Foresight*, available at <<http://www.shefc.ac.uk/library/11854fc203db2fbd000000ed71adfe96>>, last accessed 5 September 2003.

SUPRA, Scottish Universities Policy Research and Advice (2000), *Response to Science Strategy Review Group* (SUPRA, Edinburgh).

Tait, J (1993), *Written evidence on behalf of ESRC to Report of House of Lords Select Committee on Science and Technology on Regulation of the United Kingdom Biotechnology Industry and Global Competitiveness, 7th Report, Session 1992/93* (HMSO, London) HL Paper 80-I, pages 187–196.

- Tait, J, and A Bruce (2004, in press), "Global change and trans-boundary risks" (commissioned by Society for Risk Analysis for the International Symposium on Risk and Governance, Warrenton, VA, USA, June 2000) to be published by Cambridge University Press, available at <<http://www.supra.ed.ac.uk>>, last accessed 30 January 2004.
- Tait, J, and C Lyall (2001), *Investigation into ESRC-funded Interdisciplinary Research*, report to ESRC, available at <<http://www.supra.ed.ac.uk>>, last accessed 30 January 2004.
- Tait, J, and R Williams (1999), "Policy approaches to research and development: foresight, framework and competitiveness", *Science and Public Policy*, 26(2), pages 101–112.
- Tait, J, R Williams and C Lyall (2000), *Roadmapping Foresight: Monitoring and Evaluation of Complex Programmes*, SUPRA Report to the Office of Science and Technology, May, available at <<http://www.supra.ed.ac.uk>>, last accessed 30 January 2004.
- Tait, J, J Chataway and D Wield (2001a), *PITA Project (Policy Influences on Technology for Agriculture: Chemicals, Biotechnology and Seeds) Final Report*, available at <<http://www.technology.open.ac.uk/cts/pita/FINAL%20REPORT.pdf>>, last accessed 30 January 2004.
- Tait, J, C Lyall and R Williams (2001b), "Does Scotland need its own science policy — strategy hierarchies in Scotland, the UK and Europe", paper presented to the British Association Science Festival, Glasgow, September.
- Tait, J, R Williams, A Bruce, C Lyall *et al* (2002), *Interdisciplinary Integration in the Fifth Framework Programme (II-FP5)*, report to EC (Accompanying Measure SEAC-1999-00034).
- Walsh, V (1988), "Technology and the competitiveness of small countries: review", in C Freeman and B-A Lundvall (editors), *Small Countries Facing the Technological Revolution* (Pinter, London).

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Umba, Mary, Patrick O'Jacobson and Abdul Hwang (1997), "Technology transfer versus local research: ships on Lake Titicaca", in I H Wraum (editor), *R&D Policy and Back-Packing* (Peruvian New Academic Press, Lima).

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