Developing a Regional Innovation Strategy for Northern Ireland

A Statement by the Economic Council on research conducted by Philip Cooke, Stephen Roper and Peter Wylie
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and Peter Wylie

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# CONTENTS

**FOREWORD**

1 **INTRODUCTION**
 Government Views on Innovation 1
 Aim of Research Monograph 2

2 **INNOVATION IN A KNOWLEDGE DRIVEN ECONOMY**
   – SOME DEFINITIONS 4

3 **WHAT IS A REGIONAL INNOVATION SYSTEM?**
   Definition 5
   Key Dimensions within a Regional Innovation System 5
      Business Innovation Systems 5
      Public Governance of Innovation Systems 6
      Variances in Regional Innovation Systems 6
   Characteristics of Successful Regional Innovation Systems 6
   Why is a Regional Innovation System Important for Northern Ireland? 7
   Current Status of Northern Ireland’s Regional Innovation System 10
   Northern Ireland’s Regional Innovation System Relative to Other Regions 12

4 **RECOMMENDATIONS**
 Improvement of the Business Innovation System 15
 Improvement of the Public Governance of Innovation 18
 Interaction of Business Innovation with the Public Governance of Innovation 22

5 **THE WAY FORWARD**
 Challenges for Policy-Makers 26
 Challenges for the Private Sector 26
 Conclusions 26

**REFERENCES** 29
LIST OF TABLES, FIGURES AND BOXES

Table

3.1 Shares of GDP in Knowledge-Based and Non-Knowledge-Based Sectors in the UK Regions, 1997 8
3.2 Shares of GVA within Manufacturing Sub-sectors in the UK Regions, 1997 9
3.3 Civil R&D Activity by Northern Ireland Business, 1993-99 11

Figure

3A Regional Innovation Systems 13

Box

1 Improvement of the Business Innovation System 14
2 Improvement of the Public Governance of Innovation 14
3 Interaction of Business Innovation with the Public Governance of Innovation 15
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>DETI</td>
<td>Department of Enterprise, Trade and Investment</td>
</tr>
<tr>
<td>DiEE</td>
<td>Department for Education and Employment</td>
</tr>
<tr>
<td>DFHETE</td>
<td>Department of Further and Higher Education, Training and Employment</td>
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<td>DTI</td>
<td>Department of Trade and Industry</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<td>FE</td>
<td>Further Education</td>
</tr>
<tr>
<td>FSPC</td>
<td>Finnish Special Parliamentary Committee for the Future</td>
</tr>
<tr>
<td>GB</td>
<td>Great Britain</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GVA</td>
<td>Gross Value Added</td>
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<td>HE</td>
<td>Higher Education</td>
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<td>High Tech</td>
<td>High Technology</td>
</tr>
<tr>
<td>IAI</td>
<td>Information Age Initiative</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
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<td>IDB</td>
<td>Industrial Development Board</td>
</tr>
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<td>INI</td>
<td>Invest Northern Ireland</td>
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<td>IRTU</td>
<td>Industrial Research and Technology Unit</td>
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<td>Low Tech</td>
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<td>MTC</td>
<td>Massachusetts Technology Collaborative</td>
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<td>NIEC</td>
<td>Northern Ireland Economic Council</td>
</tr>
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<td>OFMDFM</td>
<td>Office of the First Minister and Deputy First Minister</td>
</tr>
<tr>
<td>ONS</td>
<td>Office for National Statistics</td>
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</table>
Abbreviations Used

R&D  Research and Development
RIS  Regional Innovation Strategy
RITTS  Regional Innovation and Technology Transfer Strategies and Infrastructures Scheme
RoI  Republic of Ireland
SMEs  Small and Medium Sized Enterprises
UK  United Kingdom
USA  United States of America
FOREWORD

For many years now, the Council has recognised the pressing need to promote and encourage research and development (R&D) activity within the Northern Ireland economy. Previous research by the Council has clearly demonstrated how important these activities are in promoting economic growth and development within regional economies. Unfortunately, little such activity has been undertaken within the local economy. The reasons for this are deep-rooted and cultural. It is clear, however, that bringing about change will require collaborative action by public and private sector interests working together within the framework of a strategic vision.

In seeking to advise on how this strategic vision might be formalised, the Council (working closely with the Industrial Research and Technology Unit (IRTU)) commissioned research from three leading academics in this area - Philip Cooke (Cardiff University), Stephen Roper (The Queen’s University, Belfast) and Peter Wylie (Okanagan University College, Canada). The research brief was to consider international best practice in regional innovation systems, benchmarked against the current environment within the Northern Ireland economy, and to suggest how a local Regional Innovation Strategy (RIS) might be formulated and operationalised.

The timing of this commissioned research has been opportune given the devolved Executive’s acknowledgment of the need to develop a RIS. Indeed, this has been formally incorporated into the priorities set by the Executive in its Programme for Government.

Government has now initiated a public consultation exercise, under the auspices of the IRTU, on how a strategy might be formulated and implemented. The Council therefore thought it appropriate, indeed essential, to issue this Statement in advance of the full research monograph to further this public debate on the way forward. While the Statement details a comprehensive list of some 22 recommendations aimed at providing a framework upon which a RIS should be built, the primary underlying finding is the importance of co-operation and collaboration at many levels, ie:

- Co-operation between firms.
- Co-operation between firms and university research institutions.
- Co-ordination of policy by government agencies.

The Council will publish the full, extensive research findings in the near future but would like to take this opportunity to thank all those who contributed to this project, in particular the staff of the IRTU, for their advice and assistance.

Janet M Trewsdale OBE
Chairman
1 INTRODUCTION

1.1 The Council has had a long-standing interest in R&D. In 1993, it published a report on R&D Activity in Northern Ireland (NIEC, 1993). The Council revisited the subject in December 1999 in its report Publicly Funded R&D and Economic Development in Northern Ireland (NIEC, 1999). In many ways, the findings and recommendations in the 1999 report echo those of the Council’s earlier report. However, one important new recommendation that came out of the 1999 report was on the development of a co-ordinated R&D and Innovation Strategy for Northern Ireland:

the Council recommends that a co-ordinated R&D and Innovation Strategy should be developed for Northern Ireland with phased and balanced targets for both public and private R&D and innovation (NIEC, 1999, p.156).

1.2 A recent research monograph, commissioned by the Council from Professor Michael Best of the University of Massachusetts Lowell (Best, 2000), also stresses the importance of developing for Northern Ireland a new type of innovation strategy, which places emphasis on business capabilities and promotes the role of innovation and the regional innovation system. Best’s monograph highlights the specific weaknesses within the regional innovation system that currently operates in Northern Ireland, particularly with respect to the utilisation of, what he regards as, a world class R&D infrastructure.

1.3 Furthermore, the recent Council report on knowledge driven economy indicators for Northern Ireland (NIEC, 2001) emphasises the need for increased innovation and an innovation strategy in Northern Ireland. That report claims that an innovation strategy is essential if the Northern Ireland economy is to maximise the value of science and technology as well as diffuse skills and capabilities throughout society.

Government Views on Innovation

1.4 The importance of innovation has been identified by all levels of government:

• the European Union (EU), at its March 2000 European Council in Lisbon, set the strategic goal of becoming “the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”;

• in 2000, the United Kingdom (UK) Government launched its White Paper on Science and Innovation in which it asserts “Innovation is the motor of the modern economy, turning ideas and knowledge into products and services” (Department of Trade and Industry (DTI), 2000, p.3);

• the need for a RIS has since been recognised in the Northern Ireland Executive, Programme for Government 2001-2004 – Making a Difference (The Office of the

First Minister and Deputy First Minister (OFMDFM), 2001, p.51), which specifically proposes that a Northern Ireland RIS should be published by March 2002. In addition, the *Programme for Government* calls for separate departmental R&D/Innovation strategies to be published (OFMDFM, 2001, p.51). Furthermore, a recent announcement by the Minister for Enterprise, Trade and Investment, Sir Reg Empey, indicated that the focus of Northern Ireland’s new “super-agency” – Invest Northern Ireland – will be on innovation:

The mainstay of the Agency’s focus will be on the promotion of and support for innovation and entrepreneurship in the economy. Indeed, I am keen to ensure that the golden thread of innovation should be woven through the entire fabric of the new Agency (December, 2000).

### Aim of Research Monograph

1.5 In light of past research findings, the Council, supported by the IRTU, decided to commission research which would seek to:

- establish where Northern Ireland currently stands, relative to other regions, in terms of regional innovation and its regional innovation system;
- make recommendations regarding the development and effectiveness of a RIS;
- focus policy on the challenges that face Northern Ireland in undertaking the building of a RIS, as outlined in the *Programme for Government*; and
- suggest ways forward for RIS and policy, based on best practice elsewhere and on the nature of the local economy.

This study has proved to be particularly timely, given the current emphasis by the Northern Ireland Executive on the need for a RIS.

1.6 Three leading academics in this area, Professor Philip Cooke of Cardiff University, Dr Stephen Roper of The Queen’s University, Belfast and Dr Peter Wylie of Okanagan University College, Kelowna, Canada, were chosen to carry out the study.

1.7 In this Statement, the Council summarises the findings of the research monograph (Cooke, Roper and Wylie, 2001) and, from these, draws out the implications for the structures of private and public support that are needed to underpin regional innovation activity in Northern Ireland. In addressing these issues, the Council’s Statement considers what is meant by a regional innovation system, assesses the characteristics of such a system, and comments on how Northern Ireland currently conforms.

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1.8 In conclusion, the Statement highlights the key challenges that arise from the research findings and makes appropriate recommendations for economic policy. It should be noted that this research does not provide policy-makers with a ready-made RIS. The Statement does, however, provide key principles and guidelines to shape the detail of the RIS for Northern Ireland, and should be used to help direct the focus of the new single economic development agency in this regard.
2 INNOVATION IN A KNOWLEDGE DRIVEN ECONOMY – SOME DEFINITIONS

2.1 Terms like “innovation”, “innovation policy” or “knowledge driven economy” are increasingly used (and sometimes misused) although their exact meanings are seldom dealt with. In order to clarify these concepts, the following definitions are presented:

2.2 *Innovation* can be defined as:

the commercial application of knowledge or techniques in new ways or for new ends. It may involve radical innovation or incremental innovation. In each case the innovator achieves a competitive advantage, at least until another company catches up or goes one better (Roper and Anderson, 2000, p.1).

2.3 *Innovation* can also be viewed as:

the development of new ways of thinking, the creation of new ways of doing things, experimenting with them, accepting them and using them in human economic and social activities (Finnish Special Parliamentary Committee for the Future (FSPC), 1997).

2.4 The “things” referred to by FSPC include products, processes or services and so *innovation policy* may be defined as:

a set of policy actions to raise the quantity and efficiency of innovative activities, whereby ‘innovative activities’ refers to the creation, adaptation and adoption of new or improved products, processes, or services (European Commission (EC), 2000, p.4).

2.5 The processes of “creation”, “adaptation” (which includes experimentation) and “adoption” transform information into knowledge. Thus, an innovative economy is based upon – and driven by – knowledge. In other words, knowledge becomes the most dynamic factor of economic growth.

2.6 A *knowledge driven economy* is, therefore:

one in which the generation and the exploitation of knowledge has come to play a predominant role in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the more effective use and exploitation of all types of knowledge in all manner of economic activity (DTI, 1998, p.2)

2.7 A recent report by the Council (NIEC, 2001) examines the economic implications of innovation and knowledge in more depth.

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3 WHAT IS A REGIONAL INNOVATION SYSTEM?

Definition

3.1 A regional innovation system refers to how firms, institutions and government – jointly and individually – contribute to promote the innovation process within a regional context. A regional innovation system exists when all, or many, innovative firms undertake innovation within a regional network. Such regional networks must include, for example, firms; research and technology organisations; innovation support agencies; venture capitalists and local/central government bodies. Linkages between these various bodies are essential for turning knowledge into competitive economic advantage.

Key Dimensions within a Regional Innovation System

3.2 Many diverse factors can influence a regional innovation system and the literature concludes that both public and private sectors have an important role to play in embedding it in the economy. Nonetheless, the two key dimensions of regional innovation activity within the regional innovation system are:

• the business innovation system (largely in the private sector); and
• the governance of innovation system (largely in the public sector).

Business Innovation Systems

3.3 There are basically three varieties of business innovation system. These can be characterised as:

(i) Localist and Associative. This is a business innovation system based on small and medium sized firms – indigenous or foreign-owned – undertaking small scale R&D and innovation, in association with other local small and medium sized firms, but with little dependence on external sources of R&D and innovation outside the various firms within the region, and with little dependence on regional public R&D and innovation resources.

(ii) Globalised and Non-Associative. This type of business innovation system is dominated by large multinational firms in the region, with R&D and innovation carried out internally and privately within these hierarchical corporations (ie not through markets), and little interaction with regional public R&D. It is highly specialised and fundamentally non-associative.

(iii) Fully Interactive and Associative. This variety of business innovation system involves a balanced mix of R&D and innovation carried out by the full range of small, medium sized and large firms in the region – both indigenous and foreign-owned. These firms work in close and interactive association with each other, and in interactive association with public R&D and innovation in the region. The firms are highly networked locally, regionally, nationally and globally.
Public Governance of Innovation Systems

3.4 Mirroring the three kinds of business innovation system, there are also three different varieties of public governance of innovation system. These can be characterised as follows:

(i) Grassroots and Bottom-up. This public governance of innovation system is driven at the sub-regional civic level. It is largely unco-ordinated between the various civic authorities and involves pragmatic and localised interventions by local, rather than by regional or national, levels of government, with innovation occurring close to the market and the firm.

(ii) Centralist and Top-down. This type of public governance of innovation system is driven by central government. It mainly comprises preferred and specialised regional R&D and innovation activity co-ordinated at the national level. R&D and innovation is planned in line with national objectives and is largely centred on ‘mission-driven’ projects, with large firms and public research institutions acting as anchors.

(iii) Fully Networked and Balanced. In this type of public governance system, there is multilevel governance of regional R&D and innovation encompassing a balanced and co-ordinated mix of local, regional, national and supra-national initiatives, in pure and applied R&D, and in near and at market innovation. Widely represented regional innovation fora are often involved, including both public and private sector institutions in regional partnership.

Variances in Regional Innovation Systems

3.5 The business (private sector) and public sector governance dimensions can both display various degrees of systematic behaviour. By exploring the range of systematic behaviour across these two dimensions, it becomes possible to construct a conceptual framework within which Northern Ireland can be placed for comparison with other regions.

3.6 Regional innovation systems can also vary with respect to how they are driven or, alternatively, how they are led. For example, a system could be policy-driven, as opposed to market-driven, or it could be a firm-led, as opposed to a university-led, system.

Characteristics of Successful Regional Innovation Systems

3.7 Having looked at a number of best practice systems, Cooke, Roper and Wylie (2001) suggest that, although the nature of regional innovation systems can vary, successful systems tend to display a number of common characteristics. These include: intensive co-operation
What is a Regional Innovation System?

among firms; high quality workforces; flexible work structures; dense infrastructures of supporting institutions and organisations; innovative regional cultures, and activist regional governments.

3.8 Typically, for successful innovation systems, most innovative transactions will occur within the supply chain, that is, between the firm and its customers and suppliers. However, a successful innovation system will also demonstrate a small amount of critical innovation transactions which will occur within the research community of universities and within the public sector. Furthermore, successful systems tend to display a strong role for regional governance regarding innovation. Such governance is carried out in both the public and private sectors, within market place transactions, in networks and within innovative regional cultures.

3.9 Examples of “best practice” systems are to be found in Massachusetts; Cambridge (UK); the Thames Valley; Baden-Wurtemburg in Germany and Bavaria. Cooke, Roper and Wylie (2001) cite these systems as exemplary because, first of all, they are fully inclusive in business; secondly, they are fully networked in public policy, and thirdly, they are all fully associative across both public and private sectors.

Why is a Regional Innovation System Important for Northern Ireland?

3.10 There are a number of reasons why Northern Ireland should wish to strengthen and develop its profile as an innovative economy:

(i) in comparison to the UK as a whole, Northern Ireland has an under-representation of knowledge-based industries (Table 3.1). The same applies when the comparison is made across the UK regions. This is readily identified when the proportions of Gross Domestic Product (GDP) in ‘knowledge-based’ and ‘non-knowledge-based’ sectors in Northern Ireland and the UK are compared. In 1997, knowledge-based sectors accounted for 56 per cent of UK GDP, while the non-knowledge-based sector accounted for 44 per cent. The equivalent figures for Northern Ireland are 44.7 per cent and 55.3 per cent respectively. Of particular importance are the relatively low levels of financial and business services activity in Northern Ireland (a source of many new jobs in recent years) and the low share of GDP accounted for by high and medium-high technology (high tech) manufacturing. Both these sectors are important elements of any regional innovation system – as initiators of innovation and as users of innovations produced in other sectors.

(ii) manufacturing activity in Northern Ireland is concentrated in low and medium-low technology (low tech) sectors (Table 3.2). In 1997, 64.3 per cent of manufacturing Gross Value Added (GVA) in Northern Ireland was derived from low and medium-low tech sectors, compared to only 56.8 per cent in the UK as a whole. This concentration on low tech industries could weaken Northern Ireland’s innovation system by lowering overall levels of R&D investment and reducing local demand for innovative machinery, equipment and business services and for people with higher qualifications and skills.
Table 3.1
Shares of GDP in Knowledge-Based and Non-Knowledge-Based Sectors\(^1\) in the UK Regions, 1997

<table>
<thead>
<tr>
<th></th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>NI</th>
<th>UK</th>
<th>Location Quotient(^2)</th>
</tr>
</thead>
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<tr>
<td>Knowledge-Based Sectors(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. High and Medium-High Tech Manufacturing(^3)</td>
<td>9.2</td>
<td>10.5</td>
<td>9.0</td>
<td>7.2</td>
<td>9.2</td>
<td>0.78</td>
</tr>
<tr>
<td>2. Transport and Communications</td>
<td>8.6</td>
<td>6.1</td>
<td>7.3</td>
<td>5.7</td>
<td>8.3</td>
<td>0.69</td>
</tr>
<tr>
<td>3. Financial and Business Services</td>
<td>27.6</td>
<td>18.2</td>
<td>20.6</td>
<td>14.9</td>
<td>26.3</td>
<td>0.57</td>
</tr>
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<td>Total of Knowledge-Based Sectors</td>
<td>57.1</td>
<td>49.6</td>
<td>51.1</td>
<td>44.7</td>
<td>56.0</td>
<td>0.80</td>
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<td>Non-Knowledge-Based Sectors(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1. Agriculture</td>
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<td>1.8</td>
<td>2.3</td>
<td>4.8</td>
<td>1.5</td>
<td>3.17</td>
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<td>2. Primary and Energy</td>
<td>2.6</td>
<td>2.8</td>
<td>5.4</td>
<td>3.4</td>
<td>2.9</td>
<td>1.16</td>
</tr>
<tr>
<td>3. Low and Medium-Low Tech Manufacturing(^3)</td>
<td>11.7</td>
<td>17.4</td>
<td>12.9</td>
<td>12.9</td>
<td>12.1</td>
<td>1.07</td>
</tr>
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<td>4. Retail and Distribution</td>
<td>12.5</td>
<td>10.5</td>
<td>11.1</td>
<td>12.5</td>
<td>12.3</td>
<td>1.02</td>
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<td>5. Construction</td>
<td>5.2</td>
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<td>5.7</td>
<td>6.2</td>
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<td>1.18</td>
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<td>6. Public Administration &amp; Defence</td>
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<td>6.4</td>
<td>6.6</td>
<td>10.5</td>
<td>5.5</td>
<td>1.92</td>
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<td>7. Other Services(^4)</td>
<td>8.2</td>
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<td>8.4</td>
<td>7.2</td>
<td>8.2</td>
<td>0.89</td>
</tr>
<tr>
<td>Adjustment for Financial Services</td>
<td>-3.8</td>
<td>-2.2</td>
<td>-3.4</td>
<td>-2.3</td>
<td>-3.7</td>
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<tr>
<td>Total of Non-Knowledge-Based Sectors</td>
<td>42.9</td>
<td>50.4</td>
<td>48.9</td>
<td>55.3</td>
<td>44.0</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Notes:

1. The sectors were arbitrarily split between the two categories based on likely degrees, rather than absolute magnitudes, of knowledge intensity.

2. The location quotient is the ratio of the NI percentage to the UK percentage. A value greater than 1 implies a relatively larger representation of a particular sector in Northern Ireland compared to the UK.

3. The manufacturing sub-sectors were arbitrarily split between the two categories based on likely degrees, rather than absolute magnitudes, of technological intensity.

4. Includes Hotels and Restaurants.

Figures subject to rounding errors.

Source: Office for National Statistics (ONS) (2000, Table 12.4, pp.163-5); ONS (1999)
### Table 3.2
Shares of GVA within Manufacturing Sub-sectors\(^1\) in the UK Regions, 1997

<table>
<thead>
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<th>England</th>
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<th>Scotland</th>
<th>NI</th>
<th>UK</th>
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</thead>
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<tr>
<td><strong>High and Medium-High Tech Sub-sectors(^1)</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>DM</td>
<td>11.5</td>
<td>13.2</td>
<td>5.6</td>
<td>11.7</td>
<td>11.1</td>
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<tr>
<td>DL</td>
<td>11.3</td>
<td>14.9</td>
<td>24.2</td>
<td>9.4</td>
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<tr>
<td>DG</td>
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<td>3.8</td>
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<tr>
<td>DK</td>
<td>9.8</td>
<td>5.6</td>
<td>7.8</td>
<td>7.1</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>Total High and Medium-High Tech</strong></td>
<td><strong>44.0</strong></td>
<td><strong>37.6</strong></td>
<td><strong>41.1</strong></td>
<td><strong>35.7</strong></td>
<td><strong>43.2</strong></td>
</tr>
<tr>
<td><strong>Low and Medium-Low Tech Sub-sectors(^1)</strong></td>
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<td></td>
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<tr>
<td>DA</td>
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<td>11.1</td>
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<tr>
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<td>DC</td>
<td>0.6</td>
<td>0.2</td>
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<td>–(^2)</td>
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<td>1.3</td>
<td>2.1</td>
<td>2.1</td>
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<td>DE</td>
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<tr>
<td>DF</td>
<td>1.6</td>
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<td>DH</td>
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<td>DI</td>
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<tr>
<td>DJ</td>
<td>10.4</td>
<td>22.9</td>
<td>9.0</td>
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<td>DN</td>
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<td>4.8</td>
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<td>2.9</td>
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<tr>
<td><strong>Total Low and Medium-Low Tech</strong></td>
<td><strong>56.0</strong></td>
<td><strong>62.4</strong></td>
<td><strong>58.9</strong></td>
<td><strong>64.3</strong></td>
<td><strong>56.8</strong></td>
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</tbody>
</table>

**Notes:**

1. The manufacturing sub-sectors were arbitrarily split between the two categories based on likely degrees, rather than absolute magnitudes, of technological intensity.

2. – = Negligible (less than half last digit shown).

Figures subject to rounding errors

*Source: ONS (1999)*

(iii) venture capital investments in Northern Ireland are disproportionately low relative to other UK regions. The research suggests that, in 1999, only £35m of venture capital investments.
What is a Regional Innovation System?

was invested in Northern Ireland, representing around 0.6 per cent of total venture capital investment in the UK. This level of investment is disappointing but should not be taken on its own to suggest either an unwillingness to invest in Northern Ireland, or insufficient availability of venture capital. It may simply be that in Northern Ireland there is less demand for venture capital investment than elsewhere – an argument reinforced by the availability of public support for innovation and R&D, and the relatively low level of high tech activity in Northern Ireland.

(iv) Northern Ireland lags well behind the UK average when compared using other recently developed indicators designed to reflect the economy’s participation in innovation and the knowledge-based economy. For example, using methodology developed by the Massachusetts Technology Collaborative (MTC) (1999), NIEC (2001) examines the competitive position of Northern Ireland using a competitiveness index based on 33 individual indicators. Overall, Northern Ireland is shown to have a Competitiveness Index score of 81.7 per cent of the UK average. However, in terms of factors related to innovation (including business spend on innovation; international patents per capita; university research funded by business; new firm creation and growth, and the use of venture capital), Northern Ireland lags much further behind, with an Index score of only 66.8 per cent of the UK average (NIEC, 2001, Table 3.1, p.21).

(v) although innovation need not involve a firm conducting R&D either in-house or externally, strong links do remain between the two activities. Earlier NIEC reports have focused on the poor overall level of R&D activity in Northern Ireland (eg NIEC, 1993; NIEC, 1999).

3.11 Since NIEC (1999), new benchmark figures for business R&D in Northern Ireland have become available. These are outlined in Table 3.3. Historically, Northern Ireland businesses have under-invested in R&D relative to their UK counterparts and, in particular, in comparison to their competitors elsewhere in Europe. The new benchmark R&D figures suggest that, from 1996 to 1999, some welcome progress was made in closing the gap in R&D investments. By 1999, the level of civil R&D in Northern Ireland, in constant 1995 prices, had increased to £88.2m, up 6.2 per cent in real terms from its 1996 level.

3.12 One less satisfactory aspect of Northern Ireland’s R&D profile is that business R&D remains strongly concentrated in a small number of larger companies – in fact, the concentration in large companies has increased marginally since 1996 (Table 3.3). Government funding of business R&D also remains significant, although the proportion of public funding has fallen consistently since 1993, to 11 per cent in 1999.

Current Status of Northern Ireland’s Regional Innovation System

3.13 Based upon a case study approach with key firms and institutions, the research monograph (Cooke, Roper and Wylie, 2001) portrays Northern Ireland’s current regional innovation system as having a fragmented nature and a pyramidal structure. The pyramidal structure is used to describe a system which is coming from central, as opposed to regional,
government and which is heavily dependent upon top-down public intervention (in the form of grants). The fragmented aspect of the system reflects the fact that, at present, government agencies concerned with innovation are not well networked, with only one – the IRTU – promoting innovation as one of its primary remits.

<table>
<thead>
<tr>
<th>TABLE 3.3</th>
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<tr>
<td>Civil R&amp;D Activity by Northern Ireland Business, 1993-99</td>
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<td></td>
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<tr>
<td>Civil R&amp;D Spending (£m, 1995 prices)</td>
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<tr>
<td>Civil R&amp;D Employment</td>
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<tr>
<td>Memo Items:</td>
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<tr>
<td>Funded by Government or EU (%)</td>
</tr>
<tr>
<td>Top 10 Companies (% of civil expenditure)</td>
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</tbody>
</table>

*Source: Department of Enterprise, Trade and Investment (DETI) (2001)*

3.14 There is a small number of firms in Northern Ireland participating in innovation activity, but these firms tend to be large in scale and to use national and global innovation linkages rather than regional linkages and support. Furthermore, these participating companies rely heavily on public funding for their innovation endeavours. Cooke, Roper and Wylie (2001) found that innovation underachievers occupy a substantial proportion of the industrial structure and, in addition, where limited innovation is taking place, it is not based upon local linkages.

3.15 The fragmented picture highlights the crucial strategic role of future regional development policy: to promote clusters and not isolated firms. As Best notes, “clusters are the missing link between the present poor-performing economy and a rapidly growing economy” (Best, 2000, p.57).

3.16 The following observations can be made from the research monograph by Cooke, Roper and Wylie (2001) regarding Northern Ireland’s regional innovation system:

- in general, Northern Ireland has a globalised, hierarchical and largely publicly-led innovation system which is not well networked. There are a few highly innovative
What is a Regional Innovation System?

non-indigenous investors. However, a large share of firms are not very seriously engaged in the pursuit of internationally competitive innovation practices;

- within this structure, there are a number of smaller sub-systems involving public and private participants who are engaged in, on a small scale, practices that are comparable to those of far more accomplished networked and interactive innovation systems elsewhere;

- in parallel with the above, there are exemplar firms, often indigenous in origin, which have reached positions of global competitiveness through innovation in traditional industries. These may perform a ‘lighthouse’ function for other indigenous, and possibly non-indigenous, firms in more traditional sectors, but they could also benefit themselves from a more effective regional innovation system.

Northern Ireland’s Regional Innovation System Relative to Other Regions

3.17 Figure 3A depicts where Northern Ireland’s regional innovation system currently lies, relative to those within other regions (location of points). The figure also shows how the Northern Ireland system should try to move (direction of arrows) in order to improve its effectiveness.

3.18 Cooke, Roper and Wylie (2001) found that Northern Ireland’s innovation record is dominated by a few large firms, working individually in global markets, with weak regional interactions. As Best (2000) notes, this business model is an underlying cause of Northern Ireland’s poor performance in innovation and productivity. Furthermore, public support for R&D and innovation is largely government controlled and comes mainly from UK government, rather than regional, initiatives.

3.19 As a result of these findings, Northern Ireland is placed in the northeast of Figure 3A. However, regions with highly developed regional innovation systems typically lie in the centre of the diagram, at the intersection of the two dimensions – the business innovation system and the public governance system. The authors provide some specific recommendations on how Northern Ireland, by developing a RIS, might move from its current position towards the centre of the diagram.
What is a Regional Innovation System?

Figure 3A
Regional Innovation Systems

Globalist

Ontario, Canada

Republic of Ireland (RoI)

Catalonia, Spain

Localist

Tuscany, Italy

Bavaria, Germany

Massachusetts, USA

Republic of Ireland

Interactive

Seattle, United States of America (USA)

Cambridge, UK

Bavaria, Germany

Northern Ireland

Northen Ireland

Tuscany, Italy

Denmark

Quebec, Canada

Grassroots

Networked

Centralist

California, (USA)

Massachusetts, USA

Baden-Wurttemburg, Germany

Japan

Source: Cooke, Roper and Wylie (2001)
4 RECOMMENDATIONS

4.1 Changes are required in order to raise the levels of systemic interaction for innovation in Northern Ireland. These changes can be defined under three main headings:

(i) Improvement of the Business Innovation System;
(ii) Improvement of the Public Governance of Innovation System;
(iii) Interaction of Business Innovation with the Public Governance of Innovation.

Under these three headings, Cooke, Roper and Wylie (2001) make 22 specific recommendations aimed at providing the framework upon which a RIS for Northern Ireland should be built. These recommendations are laid out in Boxes 1 to 3 below and are expanded on in the subsequent text.

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**BOX 1**

**Improvement of the Business Innovation System**

R1. Removing the key barriers to and strengthening the key drivers of innovation within firms must be central to RIS
R2. There must be learning transfers from multinational and exemplar indigenous firms
R3. Regional business innovation networks and clusters must be strengthened
R4. A broader concept of innovation must be developed, especially involving finance
R5. Fora must be established for intra-cluster and cross-sectoral learning
R6. The regional innovation system must be viewed as open, not closed

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**BOX 2**

**Improvement of the Public Governance of Innovation**

R7. There must be fewer capital grants, more R&D and innovation grants/loans/equity
R8. Public venture capital should be used to pump-prime private venture capital
R9. Innovation promotion and mediating institutions must be supported
R10. A publicly-supported innovation management programme should be instituted
R11. Local innovation governance initiatives should be supported
R12. Skill formation and training provision must be fully integrated with innovation
R13. Innovation must dominate the agenda of the new economic development “super-agency”
R14. RIS must be driven from the highest authority level
Recommendations

BOX 3

Interaction of Business Innovation with the Public Governance of Innovation

R15. The research-industry interface at the local universities must be strengthened
R16. Commercially focused public and private R&D must be increased
R17. Public and private R&D strategy must be central to RIS
R18. An ICT strategy must be central to any RIS
R19. Sources of innovation in the RoI must be more fully exploited
R20. The development of RIS must be fully inclusive
R21. RIS must be led by actors of high capability and legitimacy
R22. There must be study, monitoring, benchmarking, evaluation and policy learning

Improvement of the Business Innovation System

RI. Removing the key barriers to and strengthening the key drivers of innovation within firms must be central to RIS

4.2 The regional innovation system and strategy in Northern Ireland are too fragmented. Government tends to dominate, and this must be radically overhauled. The main interactions in innovation appear in the value chain, not outside of it. Innovation is a firm-based process, driven by the market, and consequently the main problem is not to match innovation support with firms’ needs, but to improve the innovation management process within firms themselves. This is a key message of Best’s (2000) analysis, and is supported in the recent evaluation of the EU Regional Innovation and Technology Transfer Strategies and Infrastructures Scheme (RITTS) (EU, 2000). Therefore, the behaviour of Northern Ireland’s firms with respect to innovation must be analysed, to identify the key barriers to and drivers of innovation within firms, and then innovation strategy can be based on removing the barriers, strengthening the drivers, and developing the innovation management capabilities of firms. The question must always be: “How can innovation in firms be increased so that firms move away from price-led competition to innovation-led high growth?” A firm-centred innovation strategy should utilise key multinational and indigenous ‘leading’ firms as critical nodes in the regional innovation system from which other firms could learn and spin-off.

4.3 RIS should then focus, not only on attempting to develop the internal and external linkages in the regional innovation system, but also on attracting better and more innovative firms to the region, and on upgrading the internal innovation capabilities of existing firms (Love and Roper, 1999). The preference for a system-based RIS relative to a strategy based on increasing internal capabilities of firms (intrapreneurship – because the major part of innovation takes place inside firms) must be continually assessed. This is made all the more
Recommendations

urgent by Best’s recent key research finding (Best, 2000, p.40) that Northern Ireland particularly lacks a critical mass of ‘entrepreneurial firms’, ie ones that are constantly seeking out new opportunities through innovation. Previous industrial policy has, perhaps, contributed to a complacent and grant-dependent culture among firms that needs to be broken down by future industrial policy – otherwise it will present a serious obstacle to innovation-led growth.

R2. There must be learning transfers from multinational and exemplar indigenous firms

4.4 Local innovation linkages are developing from multinationals operating in Northern Ireland as they seek, not only to increase their in-house R&D and innovation capabilities, but also to externalise these operations – upstream to universities and start-up firms for fundamental R&D and innovation functions, and downstream to the supply chain for near-market applications. Large, global-reaching companies within Northern Ireland do have high innovation rates. Such rates must also be attained by smaller companies in Northern Ireland, most of which, at present, have low rates of R&D, innovation and adoption of best practice. These smaller companies will become major sources of job creation in the knowledge driven economy. They must learn from knowledge transfers into the wider business community by indigenous and externally-owned globalised firms. New inward investment from innovation driven companies is also needed. Recent research work on knowledge transfers from multinational enterprises in Northern Ireland (Crone and Roper, 1999) suggests that there is unexploited potential for local learning from these enterprises. Likewise, lessons must be learnt from exemplar and progressive indigenous large firms. There are also potential ‘lighthouse’ indigenous firms in Northern Ireland that display high levels of successful innovation. Learning from these firms will be a key building block in the design of a Northern Ireland RIS.

R3. Regional business innovation networks and clusters must be strengthened

4.5 It is clear from the research that innovation in Northern Ireland is an intra- and inter-firm process. Local firm networks must be strengthened. These are somewhat weak for both large and small firms in Northern Ireland due, probably, to the small size of the local economy relative to other comparator regions. With the emerging view of innovation being interactive; open; systemic; firm-based; linear; or trickle-down from the science support base, a cluster approach is called for – building the patchwork of firm-to-firm and science-industry relationships. Indeed, industrial development spending might be better targeted at improving sectoral competitiveness in networks and clusters (rather than at individual firms) in order to develop industrial support mechanisms to aid innovation and encourage structural change.

4.6 Clusters might be based around prominent multinationals, or around indigenous innovators, many of whom have developed strong global visions and innovation capacities but remain somewhat independent of systematic innovation with other players at the regional level. The Northern Ireland Science Park might play a leading role here. Moreover, there is unexploited scope for integration both within sectors (as demonstrated by examples such as the Northern Ireland Aerospace Consortium) and between sectors (as shown by synergies in
the complementary developing and marketing of ‘luxury’ niche products from Northern Ireland such as textiles, formwork, and possibly, luxury cruise liners).

**R4. A broader concept of innovation must be developed, especially involving finance**

4.7 Innovation is not just an economic mechanism or a technological process. It is, above all, a social phenomenon. Research and technology are just two (albeit important) aspects of innovation, but they are insufficient on their own to sustain an innovation-led economy. Organisational, management, marketing, financial and legal issues are equally important. Traditionally, innovation finance and rates of return have been prominent barriers perceived by Northern Ireland firms. However, Northern Ireland’s innovation economy is on a cusp. Until recently, firms have tended to be individualistic and not part of a regional system, but now a number of elements of a regional innovation system are being planned or put in place, such as incubators, spin-outs, venture capital funds, clusters, science parks, industry networks etc. As a result, there is a much-increased need in a RIS for venture capital and Business Angels and a prominent role for the public sector, not just in infrastructure, but also in finance. Certainly, part of the existing levels of capital grants from the Industrial Development Board (IDB) could be redirected towards venture capital loans so that industrial support could have less grant, and more equity, elements.

**R5. Fora must be established for intra-cluster and cross-sectoral learning**

4.8 In Northern Ireland, innovation links along the supply chain are primarily national and global, rather than local. This suggests that the experiences gained from strong local R&D, innovation, and best practice adoption by some companies are not trickling down fully to others. There are many production capabilities that are generic and transferable, such as: high performance work systems; work teams; quality management etc. As demonstrated in the current work of the Northern Ireland Centre for Competitiveness, advances in one sector – eg in technology, technology management, or best practice – will undoubtedly have application in other sectors. Innovation fora on an intra-cluster, cross-sectoral, or even cross-cluster, basis could encourage co-operation and synergy between firms and result in local innovation partnerships.

**R6. The regional innovation system must be viewed as open, not closed**

4.9 EU (2000) found that one of the major problems of the EU RITTS methodology is that it tends to take a closed view of the regional innovation system by trying to match supplies and demands for innovation from sources entirely within the region. Clearly, this is unrealistic for Northern Ireland. Yet, innovation linkages with the EU are weak in Northern Ireland, even weaker than in Wales which, in the past, regarded itself as the least EU orientated region of the UK. However, if firms are placed at the heart of the innovation system, then the demands and supplies of innovation are part of the globalised production and trade system in which those firms are inevitably entwined. Under such an arrangement,

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5 Grants and loans should be treated differently when defining equity within a company.

6 Formerly known as the Northern Ireland Quality Centre.
Recommendations

Northern Ireland could draw support from both within and outside the region. The RIS must, therefore, be outward-, not inward-, looking, open to sources of external knowledge. Firms must search for, absorb, engineer and use the best ideas, from wherever they come.

Improvement of the Public Governance of Innovation

4.10 Recent policy pronouncements from the EC and the recommendations for policy in Best (2000) stress the need for regional industrial policy to focus around innovation policy. The EC stresses innovation policy’s new ‘horizontal’ role of providing the interface between economic, industrial and science policy (EC, 2000, p.3). Innovation policies must be integrated, complete and systemic, both cluster and competence network-based, stressing an entrepreneurial and innovation culture. The goal is to increase know-how per firm and per person.

4.11 Moreover, there are key market failures that give a critical role to the public sector in nurturing the regional innovation system. Universities, in particular, are seen as key neutral parties for encouraging consultative networking in innovation, based on their role in the provision of basic research, education and training, and on the clustering of innovation activities in incubators, science parks and the like. It is argued that the innovative output of a region’s firms rises with increased regional R&D – public and private, corporate and university-based – again suggesting a strong role for the public sector. A shift in attention to R&D and innovation policy at the regional level as the core of RIS is part of a silent revolution in economic policy that is currently underway in the developed countries. This was recently recommended for Northern Ireland in Best (2000) and is implicit in recent government policy statements (such as those in the Programme for Government (OFMDFM, 2001) and on the reorganisation of the various economic development agencies into a single agency) which give a prominent role to R&D and innovation strategy.

R7. There must be fewer capital grants, more R&D and innovation grants/loans/equity

4.12 An appropriate grant and subsidy regime for the innovation economy would be assistance targeted at R&D as well as product and process development, rather than at investment in plant and machinery. Government assistance to industry in Northern Ireland still remains much more focused on capital support than on R&D and innovation support.

4.13 Furthermore, there should be a shift away from grants, which tend to favour large firms, towards loans (based, not just on single companies, but also on consortia and networks) which generally favour small and medium sized enterprises (SMEs) working either with larger firms or with other SMEs. Indeed, it might be preferable to only give R&D or innovation grants to SMEs, with large companies and the public purse better served by loans, repayable if the R&D and innovation supported is commercially successful. Public sector equity stakes might also be appropriate, in partnership with private venture capital. This would foster an investment, rather than a grant, approach to the encouragement of innovation.

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7 The establishment of a single economic development agency was announced by the DETI Minister in a Statement to the Northern Ireland Assembly on 19 December 2000.
The new single development agency could ensure that all industrial support, whether capital or for R&D and innovation, involves some public-private sharing of equity. One example of this approach in practice is that of Enterprise Ireland in the RoI, which has successfully promoted equity financing in companies. In general, there should be a more flexible and responsive approach from public support – ie not just grants, but repayable loans, tax credits, equity etc – in effect, the accumulation of many more tools in the industrial development workshop. Moreover, there needs to be a balanced support – not just to manufacturing, but also to both tradeable and non-tradeable services on which manufacturing and other industries depend, eg transportation.

R8. Public venture capital should be used to pump-prime private venture capital

4.14 Private sector venture capital will come forward if it is pump-primed by the public sector. There is, therefore, a case for public venture capital in R&D and innovation support, with a range of alternative grant/loan/equity packages. The research suggests that venture capital in Northern Ireland would have to increase by four times its current level to match the per capita levels of Wales or Scotland.

4.15 A public venture capital approach might contravene existing Treasury state aid rules, which appear to favour grants and capital investment for economic development, but there is evidence of other public sector innovation along these lines, even in Northern Ireland. Indeed, a precedent already exists in terms of public sector pump-priming venture capital initiatives. The EC has already accepted the HAMBROS Fund (administered by the DETI) as part of the current Structural Funds Plan and the IRTU are, at present, formulating proposals for a further tranche of venture capital funding.

4.16 An improved flow of information between the public and private sectors should also facilitate the identification of venture capital opportunities. The LINK programme in Scotland produces a model of such collaboration. This programme, established as part of the Sustainable Technologies Initiative, supports collaborative R&D projects.

R9. Innovation promotion and mediating institutions must be supported

4.17 RIS must also address the problem of a large cohort of non-innovating firms, mostly SMEs, but also including large, indigenous non-innovators. In these cases, the best approach would seem to be not to support individual companies in R&D and innovation (since they are not carrying out any) but to support public and private institutions which are trying to foster a culture of innovation in their areas of interest and responsibility. These might be sectoral industry federations or specific mission-driven organisations. They are the type of institutions that are likely to turn non-innovators, especially SMEs, into innovators by encouraging them to interact within the regional innovation system. Other opportunities are offered through the colleges of further and higher education (FE/HE).

R10. A publicly-supported innovation management programme should be instituted

4.18 The non-innovating section of Northern Ireland enterprise is large and enduring. The
reasons for this are historical and complex, but the large number of small firms and the non-
knowledge-based structure of the economy are two important issues. R&D and innovation
are risky, costly and uncertain ventures although their importance to long-run, true economic
competitiveness is, slowly but surely, being recognised. The imperative in a new knowledge
driven economy in Northern Ireland will be for entrepreneurship and innovation management
in all firms, not just the industrial champions.

4.19 Often, the cause of this large cohort of non-innovating firms is weak, old-fashioned,
poorly-skilled and under-educated management, with a resultant paucity of technology,
knowledge, and innovation management. Public and private venture capital providers can
improve management in their investee firms. Public venture capital offers the opportunity of
injecting public equity into these lagging firms, with loans and, perhaps, a portion of grant
subsidy, but at the same time introducing management into the firms to help instill an
innovation culture. The question for the authorities (ie the single economic development
agency) is where such management expertise might come from. Small teams of one-/two-
person innovation and management consultants are available, as are a number of experienced
middle-managers released by large corporation restructuring/downsizing. For example, each
manager, armed with performance targets on productivity, innovation, exports and
employment, might be charged with improving 10 firms, so 100 managers could potentially
reach 1,000 firms in this cohort. This approach – more intensive than mentoring – is radical,
but vital. The need to improve innovation entrepreneurship in all companies in Northern
Ireland must be taken up by the new single economic development agency and given a high
priority. Of course, the onus of responsibility for improving innovation performance in the
currently non-innovating group of companies equally lies within the private sector – ie with
the companies themselves and with their customers and suppliers.

R11. Local innovation governance initiatives should be supported

4.20 Local responses to promoting innovation in the Northern Ireland economy can play an
important role in RIS. For example, in Fermanagh and Tyrone, “Into the West” (a group
made up of local District Councils and other local economic development agencies) has
carried out an innovation audit in those counties and has formulated a local strategy –
“Innovation West” – to promote innovation in the area. This is designed to be complementary
to regional (ie Northern Ireland) initiatives by pointing local companies in the direction of
innovation and help from the IRTU etc. It is also envisaged that it will provide some local
mentoring services to encourage companies to begin the process of innovating, and to help
them implement ICT developments, e-commerce, and other best practices. A similar
initiative appears to be forming in the North West. A RIS should strengthen complementary
local strategies designed to support innovation and ICT adoption.

R12. Skill formation and training provision must be fully integrated with innovation

4.21 The innovation management capabilities of firms must be developed. There is,
therefore, a need for extensive education and skills provision in technology management,
entrepreneurship, and innovation management in order to encourage the creation and growth
of technology-/ICT-based and innovation-led enterprises. A strong role for the FE/HE sector
exists here. Human resource development must be an important ingredient of RIS (Best, 2000), as well as featuring in entrepreneurship strategy and economic development strategies in general. Some models that might be considered are: the Institutes of Technology in the RoI, as well as academic and training programmes in ICT, enterprise and entrepreneurship, and innovation and technology management. Adoption of such models would allow the FE/HE sector to be fully involved and integrated into the regional innovation system, uniting the visible colleges with the invisible ones of the business sector (Best, 2000).

R13. Innovation must dominate the agenda of the new economic development “super-agency”

4.22 Sir Reg Empey’s metaphor of innovation as the ‘golden thread’ (see p.2 above) running through “the entire fabric of the new Agency” is extremely apt. The promotion of innovation must be the lead activity in the new single agency, and this must be reflected in the allocation of resources. RIS must be the core of regional economic development strategy, and top the agenda for securing a competitive economy, as set out in the Programme for Government (OFMDFM, 2001). Innovation support must be rationalised and made more visible within the agency. Capital and employment grants should not be regarded as the first tools of support. The primary function of the agency must be the joining-up and high-level co-ordination of innovation policy in all of its aspects – R&D; training; management; enterprise and entrepreneurship; finance; marketing, etc. Regions with successful innovation records regard such high-level co-ordination as critical to their success.

4.23 One fear expressed is that critical mission-driven agencies, such as the IRTU and the Information Age Initiative (IAI) might be given too low a priority within the new agency. However, the Minister, in his statement to the Assembly on announcing the establishment of the agency, stated that the “skills and knowledge of the people in these agencies [IRTU and IAI] must go right through the new agency” (Northern Ireland Assembly, 2000). The IRTU will, presumably, be one of the primary public sector spinners of the ‘golden thread’, with industrially focused R&D centrally embedded in the new agency.

R14. RIS must be driven from the highest authority level

4.24 Of course, the driver of the RIS must be the regional authority, not the new economic development agency (whose role will be to implement the strategy). It is, therefore, the responsibility of an authority (eg the DETI) to commission the strategy, not the responsibility of an agency (eg the IRTU), although the authority might – even, perhaps, should – delegate the actual formulation of the strategy to the agency. However, if the strategy is not backed up at the highest political level, it is unlikely to be successful. The research findings (EU, 2000) show that the existence of a strong driving force in the region for the strategy is critical to the success of RIS. The importance of innovation and the priorities attached to it must be made clear to those involved in allocating public expenditure resources: the DETI, the Economic Policy Unit within the OFMDFM and the Department of Finance and Personnel.

4.25 In other words, the agency contracted to develop and implement the strategy must enjoy solid and long-term support from these strands of Government. This policy dimension
Recommendations

must be integrated right from the beginning and set at the core of the RIS. Innovation support cannot be left only to the innovation and technology transfer organisations, such as the IRTU, within the new single agency. Nevertheless, good project management will be essential, and this should be carried out by the relevant specialists like the IRTU – indeed, management should be in the hands of the body which is responsible for the implementation of innovation policy (a role foreseen for the IRTU in the new “super-agency”). A high degree of respect for the work, remit and capabilities of the IRTU was already evident among the large majority of firms and organisations interviewed by Cooke, Roper and Wylie for the research monograph.

4.26 The new single agency is intended to be a Non-Departmental Public Body, sponsored by the DETI, with a high degree of autonomy (e.g., the ability to recruit directly and to operate in a business-like manner) but ultimately accountable to the DETI and the Assembly. However, it is intended that the DETI will retain the key responsibility to set and drive strategy and policy. Strategy must, of course, be integrated with service delivery and, therefore, the Minister has announced that there will be close working relationships between the Department, the agency and other Departments with key roles in economic development.

Interaction of Business Innovation with the Public Governance of Innovation

4.27 Best (2000) stresses a strong role for regional government in Northern Ireland, in partnership with entrepreneurial firms, mission-driven agencies and education and training institutions, to create a coherent innovation policy response. In order to flourish, innovation needs dense networks of collaboration between businesses, universities, research institutions and government in social partnership. Above all, as already discussed above, Best stresses the centrality of entrepreneurial firms to the regional innovation system.

R15. The research-industry interface at the local universities must be strengthened

4.28 The fact that Northern Ireland’s firms’ links with universities are predominantly local attests to the high quality of the two local universities – The Queen’s University, Belfast and The University of Ulster. These institutions are critical elements in the regional innovation system and must feature prominently in any RIS. Local university-industry links are currently strong but they need to be further strengthened if Northern Ireland is to prosper in the new innovation-led era. Firstly, there is a need for more university places in Northern Ireland, to provide industry with an adequate number of suitably qualified graduates with specialist knowledge. In addition, there is an increasing demand from industry for graduates with transferable skills in areas such as ICT, communications and team-working. Such practical and interpersonal skills development falls outside the formal remit of the universities, but may be appropriately obtained through work experience within industry by means of industrial placements during, or after, the academic term. This heightens the need for universities to increase their outreach to industry, as well as for industry to develop a culture of lifelong learning. The recent DTI/Department for Education and Employment (DfEE) *Opportunity for All in a World of Change. White Paper on Enterprise, Skills and Innovation* (DTI/DfEE, 2001) indicates that the UK Government seeks to establish top-class university innovation centres and new technology institutes in the regions with a view to boosting R&D, innovation, and technology transfer and to providing the regions with skills in ICT and high tech. It will
be essential for Northern Ireland to have a fair share in the development of these centres.

4.29 University-based companies are important in Northern Ireland due to the relatively low endowment of new technology-based firms in the under-developed knowledge driven economy of the region. Any RIS must target the creation of good, new university spin-offs, exits and entries each year. Therefore, the *Programme for Government* aims to,

by March 2002, increase, in collaboration with Queen’s University, the University of Ulster and the Northern Ireland Science Park, the capacity in research based incubation units across Northern Ireland to sustain 50 high technology/value added new start-up companies each year (OFMDFM, 2001, para 5.3.1, p.51).

4.30 Moreover, with a large share of R&D in Northern Ireland carried out by the universities, and with a dearth of local government and industry-funded research institutes, it is important that commercial exploitation of academic research (eg through the use of Business Angels and venture capital) is well developed. In knowledge driven economic growth, academic entrepreneurship is increasingly important in order to transfer basic science into local commerce and industry. In return, strong industrial clusters must provide sustained support to the science base in the universities. Centres of Excellence – sponsored by the universities, the IRTU, the EU and local companies – must be built up. It is important to provide incubator support, in HE/FE and in other public research laboratories and institutions, for the start-up of knowledge-based companies involving entrepreneurship. The Northern Ireland Science Park provides additional opportunities to attract UK-wide industry and government-funded research institutes to Northern Ireland.

**R16. Commercially focused public and private R&D must be increased**

4.31 Northern Ireland companies must be innovation leaders, not just followers, and for that they need to maintain a strong regional R&D base. Public R&D must support and complement firms’ R&D. Most studies show that more regional R&D translates into more regional innovation, and into more leading edge, rather than follower, innovation. Northern Ireland needs to increase the funding of public and private R&D to the levels of leading EU regions, such as Bavaria. As argued in NIEC (1999), a RIS must have phased and balanced targets for both public and private R&D and innovation (p.156). This is acknowledged in the targets and strategies for private, public and university R&D recommended in the *Programme for Government* (OFMDFM, 2001, p.51).

4.32 In meeting these goals, the Council would like to see an increased role for R&D grants. The IRTU has seen a significant increase in companies undertaking pre-competitive R&D under its Start8 programme (from 6 to 60 participants over a 5-6 year period). This positive development should be further encouraged. Moreover, R&D grants under the IRTU Compete9 programme (targeted at small, first-time users of R&D grants and many first-time

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8 A Programme for supporting industrially relevant pre-competitive R&D.
9 A Programme to support industry in market-led development of innovative products and manufacturing processes.
Recommendations

doers of R&D) bring companies into the innovator fold. Again, this type of grant support needs continued encouragement.

**R17. Public and private R&D strategy must be central to RIS**

4.33 Northern Ireland’s policy-makers must pay increased attention to the linkages between public and private R&D and innovation; to the regional innovation system overall, and to R&D and innovation strategy. The Council takes the view that a co-ordinated R&D and innovation strategy should be developed for both public and private R&D and innovation in Northern Ireland, and that this strategy should be fully embedded into a knowledge driven economic development strategy. Additional public funding of collaborative R&D and innovation, between Departments, agencies, universities and industry, should be undertaken. The Council welcomes the policy initiatives on these subjects in the *Programme for Government* (OFMDFM, 2001) and the announced reorganisation and refocusing of the economic development agencies.

**R18. An ICT strategy must be central to any RIS**

4.34 The importance of ICT strategy within RIS also appears to be fully recognised in Northern Ireland, as demonstrated by the policy initiatives of the *Programme for Government* (OFMDFM, 2001), and the proposed focus of the new single development agency (incorporating the current IAI). The Council fully concurs with this emphasis.

**R19. Sources of innovation in the RoI must be more fully exploited**

4.35 Innovation linkages are weak between firms in Northern Ireland and firms and institutions in the RoI. Cross-border links (especially with universities, Institutes of Technology, research laboratories and other knowledge institutions) have a lot of potential that is not currently being exploited. Linkages with industry and government-funded research institutes and laboratories in the RoI should be encouraged – as they are with Great Britain (GB) – especially given the paucity of such institutes in Northern Ireland.

**R20. The development of RIS must be fully inclusive**

4.36 The RIS must be built on openness, dialogue, co-operation and partnership, with the intensive involvement of all stakeholders. These will include regional institutions as well as national, EU and other inter-regional interests. The goal of RIS is to foster an economy and society open to new ideas and knowledge (from wherever they might come) and this can only be achieved by encouraging a comprehensive stakeholders’ debate on regional innovation involving: regional, national and international scientists; technologists; firms; trade unions; financial institutions; innovation support organisations, and innovation policy-makers and implementers. The formation and development of the strategy must be a consultative, inclusive and systemic process.

4.37 The Council believes there is merit in considering the establishment of an all-inclusive Northern Ireland Innovation Council, Board or Forum to take forward RIS. In France, a strategic vision for R&D and innovation is maintained by a committee (under the Prime
Recommendations

Minister) that fixes priorities for R&D and innovation annually. This makes R&D and innovation strategy more responsive to economic and social needs and allows industrial actors a greater role in determining priorities.

R21. **RIS must be led by actors of high capability and legitimacy**

4.38 The research monograph (Cooke, Roper and Wylie, 2001) confirms that the RIS project must be led by high-powered leaders with enough legitimacy, respect and capability to maintain the support and confidence of all partners in the regional innovation system. The profile and legitimacy of the strategy can be raised by having private sector executives and labour leaders as figureheads. They can bring much needed insight into how their own firms manage their innovation strategies and how innovation management can be improved throughout the economy. The Northern Ireland RIS should be spearheaded by known and respected leaders in the local innovation scene.

R22. **There must be study, monitoring, benchmarking, evaluation and policy learning**

4.39 For RIS to be successful, there is a need to instil a culture of innovation into the private sector, and to “increase the absorptive capacities of regional policy-makers and policy- implementers towards new ideas and new paradigms in innovation policy” (EU, 2000, p.96). Policy development and learning are important, as is an evidence-based approach to regional innovation policy (utilising evaluations of past policy instruments). The policy element is often the critical missing link in the matching up of regional innovation supplies and demands. There is great scope for inter-regional learning here – from those regions of GB and the RoI which have implemented successful RISs, and from other successful EU regions.
Challenges for Policy-Makers

5.1 The following list provides a set of challenges for policy-makers.

- A RIS should be developed which will ensure the smooth flow of knowledge and resources between firms; research and technology organisations; innovation support agencies; venture capitalists and government bodies. This can only be achieved through a consultative, inclusive and systemic process, which incorporates representatives from all the various dimensions of an innovation system.

- Policies should be geared towards maximising demand for a fully integrated public governance and innovation support system.

- The principle goal of the new “super-agency” must be to stimulate demand for public and private services to facilitate innovative development, thus aiding the restructuring of the local economy.

Challenges for the Private Sector

5.2 The following list provides a set of challenges for the private sector.

- Firms must move away from focusing only on cost competitiveness and must concentrate on becoming more competitive through increasing levels of R&D and innovation.

- Companies should recognise that government grants are no longer the principle route for undertaking innovation. Financial and management services from equity-based investors must be embraced, and companies should be encouraged to seek out these services.

- Firms must network with those multinational and exemplar indigenous firms which provide vision and leadership with respect to innovation.

- Firms need to become fully interactive with all other key players in the regional innovation system.

Conclusions

5.3 The research monograph (Cooke, Roper and Wylie, 2001) provides a comprehensive examination of Northern Ireland’s regional innovation system together with guidelines for the development of a RIS for Northern Ireland. It highlights a number of weaknesses within Northern Ireland’s regional innovation system when compared to the UK as a whole, including an under-representation of knowledge-based industries, and relatively low levels of financial and business services activity – two elements which are considered important initiators of innovation. Such weaknesses can only be reduced through the development of a
RIS. In total, 22 recommendations are presented. These recommendations are grouped within three broad areas (presented in Boxes 1 to 3, see pp.14-15 above), namely:

- Improvement of the Business Innovation System
- Improvement of the Public Governance of Innovation
- Interaction of Business Innovation with the Public Governance of Innovation.

5.4 The monograph’s recommendations include a strengthening of the research-industry interface at the local universities, and an increase in commercially focused public and private R&D. The importance of restructuring financial support packages is also identified. The Council particularly welcomes the recommended switch from capital grant support towards more R&D focused support, such as tax credits. It is hoped that these recommendations will assist policy-makers in developing and delivering the strategy. At present, a number of important developments are in progress, or are being planned – for example, the increase in university incubators, the emergence of new, spin-out firms and the increased availability of venture capital.

5.5 The emergence of new, entrepreneurial firms is identified by Best (2000) as critical in driving regional economic growth. In pursuing market opportunities, these new firms advance a region’s technological capabilities. Undoubtedly, many of these new firms will fail but this, in itself, has benefits in that the capabilities and skill base within Northern Ireland will be improved, and previously unidentified growth opportunities will be identified. New entrepreneurial firms will then emerge, locking the regional economy into a virtuous circle of creative growth.

5.6 The Northern Ireland Executive recognises that innovation policy is not simply a matter for the DETI. This is evident from the recent announcement of a Creativity Seed Fund by the Department of Culture, Arts and Leisure. In welcoming that announcement, the Department of Further and Higher Education, Training and Employment (DFHETE) acknowledged that innovation is not restricted to the workplace:

> It is only by harnessing the creative talents of all the people of Northern Ireland, that we will be able to build a true enterprise economy for the twenty first century (Sean Farren, Minister for DHFETE).

At the same time, the Department of Education affirmed that innovation frequently manifests itself much earlier than working age:

> There is no section of our society where creativity is more evident than among our children and young people (Martin McGuinness, Minister for Education).

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10 www.northernireland.gov.uk/press/cal/010627b-cal.htm

11 Department now renamed – Department for Employment and Learning.
5.7 It must be stressed, however, that a RIS is only one element within a broader strategy for the development of Northern Ireland’s economy. In its Statement preceding Best (2000), the Council develops five key strategic objectives as the basis of an economic development strategy for Northern Ireland. These are as follows:

- Productivity;
- Innovation;
- Capabilities;
- Entrepreneurship; and,
- Outward focus (Best, 2000, p.xviii).

5.8 Northern Ireland has an economic legacy of low growth, low productivity and low levels of innovation, as well as a culture of risk aversion. While there is evidence to suggest that this situation is improving somewhat, the pursuit of any single objective, in isolation from the other four, will be insufficient to close the persistent gap between Northern Ireland and the UK in terms of economic performance and resultant prosperity.
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References


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<table>
<thead>
<tr>
<th>Year</th>
<th>Title</th>
<th>Author(s)</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>98/3</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Structural Funds Plan 2000-2006 (Department of Finance and Personnel)</td>
<td>2</td>
</tr>
<tr>
<td>98/4</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Housing Selection Scheme Review: Proposals for Consultation (Northern</td>
<td>12</td>
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<tr>
<td></td>
<td></td>
<td>Ireland Housing Executive)</td>
<td></td>
</tr>
<tr>
<td>99/1</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Water and Sewerage Services in Northern Ireland: A Consultation Paper</td>
<td>11</td>
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<tr>
<td></td>
<td></td>
<td>(Department of the Environment for Northern Ireland)</td>
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<tr>
<td>99/2</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Shaping Our Future. Towards a Strategy for the Development of the Region</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Department of the Environment for Northern Ireland)</td>
<td></td>
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<td>99/3</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Vision 2010 - Energy Action Plan (Department of Economic Development)</td>
<td>15</td>
</tr>
<tr>
<td>00/1</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>A Consultation Paper on Research Funding Allocation Method to be Applied</td>
<td>30</td>
</tr>
<tr>
<td></td>
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<td>to the Northern Ireland Universities (Northern Ireland Higher Education</td>
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<td>00/2</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Learning for Tomorrow’s World. Towards a New Strategic Plan for Education</td>
<td>44</td>
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<td></td>
<td></td>
<td>Services in Northern Ireland 2000-2006 (Department of Education for</td>
<td></td>
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<tr>
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<tr>
<td>00/3</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>The Education and Training for Industry Inquiry (The Northern Ireland</td>
<td>14</td>
</tr>
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<td></td>
<td></td>
<td>Assembly Committee for Higher and Further Education and Employment)</td>
<td></td>
</tr>
<tr>
<td>00/4</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Restructuring of the Economic Development Agencies (Department of</td>
<td>10</td>
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<tr>
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<td></td>
<td>Enterprise, Trade and Investment)</td>
<td></td>
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<tr>
<td>01/1</td>
<td>A Response by the Northern Ireland Economic Council to:</td>
<td>Developing a Regional Transportation Strategy (Department for Regional</td>
<td>16</td>
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<td>Development)</td>
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