



Northern Ireland Economic Council

Council Statement

on

The Capabilities and Innovation Perspective:

The Way Ahead in Northern Ireland

by

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ABBREVIATIONS USED

CAD	Computer Aided Design
CBI	Confederation of British Industry
CIP	Capabilities and Innovation Perspective
CS	Computer Sciences
DED	Department of Economic Development
DETI	Department of Enterprise Trade and Investment
DFM	Design for Manufacturing
DSiP	Digital Signal Processing
DTI	Department of Trade and Industry
E	Engineering
EC	European Commission
EDSRSG	Economic Development Strategy Review Steering Group
EF	Entrepreneurial Firms
EU	European Union
GDP	Gross Domestic Product
GER	Germany
GNP	Gross National product
HPWS	High Performance Work System
IDA	Industrial Development Authority
IDB	Industrial Development Board
IPO	Initial Public Offering
IRTU	Industrial Research and Technology Unit
IT	Information Technology
JIT	Just In Time

JHRA	Japanese Human Relations Association
JUSE	Japanese Union of Scientists and Engineers
LEDU	Local Enterprise Development Unit
M	Mathematics
MIS	Management Information Systems
MNCs	Multi-National Companies
NI	Northern Ireland
NICERT	Northern Ireland Centre for Energy Research and Technology
NIEC	Northern Ireland Economic Council
NIERC	Northern Ireland Economic Research Centre
NISRA	Northern Ireland Statistical and Research Agency
NITEC	Northern Ireland Telecommunications Engineering Centre
NS	Natural Science
OECD	Organisation for Economic Co-operation and Development
PCS	Production Capabilities Spectrum
PDCA	Plan-Do-Check-Act
PPs	Policy Proposals
PS	Production System
PWC	Price Waterhouse Coopers
QUB	Queen's University Belfast
QUBIS	Queen's University Business and Industrial Services
QUESTOR	Queen's University Environmental Science and Technology Research Centre
R&D	Research and Development

Abbreviations Used

RD&E	Research, Design and Engineering
RoI	Republic of Ireland
SMED	Single-Minute Exchange of Dies
SMEs	Small and Medium Sized Enterprises
T&EA	Training and Employment Agency
TE	Tertiary Education
TQM	Total Quality Management
TSER	Targeted Socio-Economic Research
TSN	Targeting Social Need
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
UU	University of Ulster

FOREWORD

Two factors lay behind the Council's decision to commission this monograph. First, despite numerous economic development strategies and massive public investment, Northern Ireland has failed to close the gap between its living standard and the average living standard for the United Kingdom (UK). Clearly, only a step-change in economic performance will suffice but creating the environment in which this change can take place has proved illusory. New, innovative policies must therefore be explored. Second, the economic landscape is itself undergoing a dramatic transformation. Not only has the pace of globalisation continued unabated, but also there is now an emerging view that something more fundamental has changed with the appearance of a 'new economy'. According to proponents of the 'new economy' scenario, technology, and information technology in particular is profoundly altering the nature of business leading to permanently higher productivity growth throughout the economy. The Council wished to develop its understanding of this process and of its implications for a small region such as Northern Ireland.

With these two objectives in mind, the Council commissioned Professor Michael H. Best, who is Director of Industrial Competitiveness, University of Massachusetts, Lowell and visiting Professor at the Judge Management Institute, Cambridge, England. We asked him to apply to Northern Ireland the knowledge and experience he has gained from studying and advising on economic development strategies in regions as diverse as Massachusetts, Jamaica, Singapore and Slovenia. In 1990, Michael Best published his seminal book, *The New Competition*, which was one of the first books to identify what has now become known as the 'new economy'. In this monograph, Michael Best develops his insights from *The New Competition* into what amounts to a new model of regional development - *The Capabilities and Innovation Perspective* - that has, at its core, a new perspective on firm behaviour. He applies this innovative perspective to Northern Ireland using his concept of a Capability Triad (consisting of 3 domains: The Business Model; Production Capabilities; and Skill Formation) to x-ray the economy in much the same way as Michael Porter uses his 'diamond'. The results do not make comfortable reading. Despite individual examples of success, Best concludes that:

- the underlying business model is flawed, there are too few entrepreneurial firms and networks are underdeveloped;
- production capabilities, particularly technology management capabilities, require development and wider application; and,
- the skill formation process needs to be better planned.

Best makes a number of specific proposals for industrial policy. In the Council's view, these amount to a call for a fundamental change in the conduct and focus of industrial policy in Northern Ireland. In the statement preceding the report the Council contextualizes and summarizes Best's report. In addition we draw out what, we believe, should constitute the key underlying themes and strategic objectives of an economic development policy designed to deliver the transformational rates of growth that are required to move Northern Ireland closer to average UK and European standards of living.

A unique opportunity exists for Northern Ireland. Relative political stability and a devolved government mean that local politicians have control over economic strategy. The *Strategy 2010* process demonstrated an enthusiasm from all sides for close partnership arrangements.

There exists widespread agreement around the vision for the economy as articulated in *Strategy 2010*, and many good ideas emerged from the working groups established for that process.

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Strategic economic policy, however, requires more than good ideas, vital though they are.

It must be underpinned by an understanding, or a view, of how the economy works, a model that acts as an organising principle to prioritise policy recommendations. In this monograph, Michael Best provides just such a convincing and authoritative perspective. While it is not an economic strategy for Northern Ireland it *is* an innovative framework around which such a strategy can be built.

Janet M Trewsdale
Chairman

COUNCIL STATEMENT

Introduction

Northern Ireland spends over £400m¹ per year on economic development policies, which are either designed to improve regional competitiveness or to compensate for relative weakness therein.

It is imperative that the policies on which the money is spent are grounded on a clear interpretation or understanding of how the economy works. This is the role of economic analysis. Since much of the theory and evidence on economic growth is likely to be drawn from outside Northern Ireland, an appreciation of its relevance to the local economy is required. It is also important that local policymakers are kept abreast of the most recent insights emanating from accredited economic analysis. To assist this flow of information and best practice the Council has, over the past number of years, commissioned or invited leading academics in the field of economic growth and development such as Richard Lipsey, John Dunning, Michael Best, Michael Dunford and Ray Hudson, and John Bradley to comment on the competitiveness of the Northern Ireland economy.

With the rapid emergence in recent years of the so-called knowledge driven economy, the Council felt it imperative for the future of effective policymaking to garner a clear understanding of the key drivers of economic growth and of how Northern Ireland stands in regard to them. Essentially, we wished to develop our understanding of how knowledge intensive businesses and industries function and contribute to economic growth.

The Council turned to Professor Michael Best, Director of the Centre for Industrial Competitiveness, University of Massachusetts, Lowell and Visiting Professor at the Judge Management Institute, Cambridge University, England to shed light on this process. In a seminal book, *The New Competition*, Professor Best outlined a new way of looking at the theory of the firm and the theory of competition, at industrial strategy and comparative economic policy (Best, 1990). Over the years Professor Best's work has provided unique insights into how production and technology management systems within firms are crucial to regional economic development. In 1995 he delivered a thought-provoking Sir Charles Carter Lecture for the Council, in which he outlined key lessons from the growth of the USA and Japanese economies for a region like Northern Ireland. In this report, the Council commissioned Professor Best to extend his analysis of the New Competition to Northern Ireland and to provide a conceptual model or framework for strategic policymaking, consistent with producing a sustainably high rate of growth and transforming the Northern Ireland economy into a "fast growing, competitive, innovative, knowledge based economy", (Economic Development Strategy Review Steering Group (EDSRSG), 1999, p.129).

In this statement on Professor Best's report, the Council considers the main objective of economic policy in Northern Ireland i.e. a sustainably high growth rate, and highlights the key driver in the growth process i.e. productivity. We summarise Professor Best's report and draw our own conclusions as to what it implies for the direction of economic development policy in Northern Ireland.

¹ Estimate includes spending on training and employment.

The Challenge: Higher Per Capita Income

The goal of economic policy in the UK is clear: “to reverse a century of relative economic decline by raising the sustainable rate of growth”. (Department of Trade and Industry (DTI), 1998, p.6). Economic development policy in Northern Ireland echoes the emphasis on growth. The consultative report by the EDSRSG on economic strategy to 2010 (known as *Strategy 2010*) contains the following vision:

[A] fast growing, competitive, innovative, knowledge based economy where there are plentiful opportunities and a population equipped to grasp them (EDSRSG, 1999, p.129).

Such a vision is consistent with the Council’s own: “a self-sustaining, rapidly growing economy providing a high level of employment” (NIEC, 1997, p.47).

Raising the rate of sustainable growth will make it easier to tackle endemic problems of social exclusion by generating more better paid jobs. There is already a raft of measures to deal with the problem of social exclusion and to ensure that the fruits of growth are equitably distributed. Some are locally specific such as Targeting Social Need²; others are UK national government programmes such as the New Deal. However, promoting social inclusion is also an important element in generating sustainable growth not just a vital consequence of it. It is because the two are inextricably linked that we can argue that the main challenge facing economic policymakers in Northern Ireland is to raise the rate of sustainable growth.

The most common measure of the growth of an economy is gross domestic product (GDP) per capita³ and raising this from 80 to 90 per cent of the UK is the key target of *Strategy 2010*. However, this will not be easy, as a historical review of the growth performance of the economy will show. Northern Ireland’s GDP per capita is substantially and consistently lower than the UK average (see Table I). Moreover, other countries are not standing still.

A recent study of the competitive position of the UK economy found that the UK’s overall economic performance in terms of GDP per capita lags behind that of the US by as much as 40 per cent and West Germany by 20 per cent (McKinsey Global Institute, 1998). Table I illustrates the extent of this gap for Northern Ireland and puts Northern Ireland’s performance in an international context. In contrast, the Republic of Ireland has closed the gap with the UK (see also Table I). It should be noted, however, that the Republic of Ireland’s GDP figures greatly overstate the actual welfare of its citizens. The large foreign-owned sector repatriates much of its profits, which consequently do not pass through into domestic income. Gross National Product (GNP) nets off these repatriated profits from GDP, reducing it by some 11-13 per cent. Nonetheless, even in terms of GNP per capita, the Republic of Ireland has converged rapidly towards the UK and EU levels of GDP (where GDP differs little from GNP), and may surpass them by 2005 (Duffy et al, 1999).

² See NIEC (1999a) for the Council’s views on the new policy framework.

³ GDP per capita is not a perfect measure of standard of living (growth in disposable incomes is perhaps a better measure) because it includes the profits of foreign multinationals and transfer payments from abroad. It is, however, the most commonly used measure of an economy’s productive performance.

Clearly only a step-change in economic performance will suffice if Northern Ireland is to close the gap not only with the United Kingdom but also with leading competitors. The urgency of the matter is given an added dimension since figures from an analysis commissioned by the Council show that, under a baseline scenario, Northern Ireland / UK GDP per capita is likely to decline from an average of 79.3 per cent in 1996-98 to 74.4 per cent in 2010. NIEC, 1999b, Table 3.2, p.17). Preventing this scenario becoming a reality and indeed moving to a situation in which Northern Ireland is closing the gap is the key economic challenge facing government. How can it be addressed?

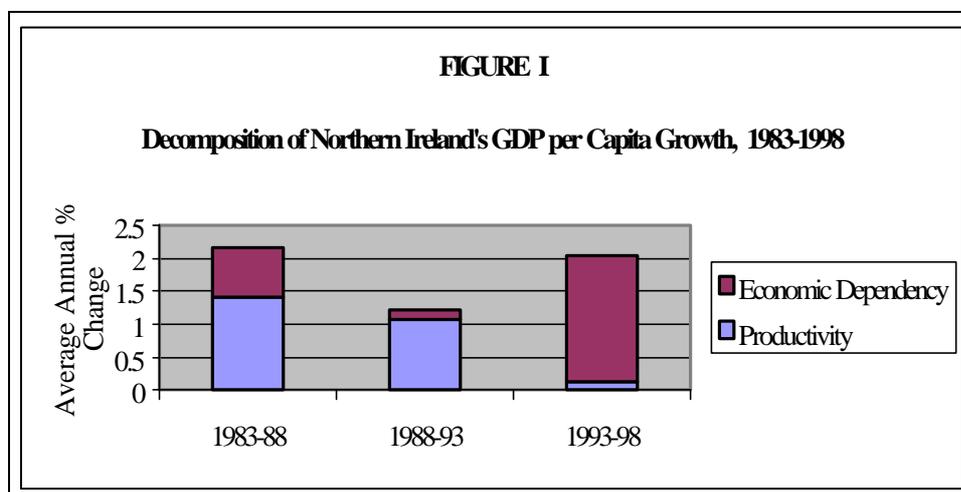
Year	NI / UK	ROI / UK	UK / GER	NI / GER	UK / USA	NI / USA
1960	63.00	51.50	100.40	63.30	75.00	47.20
1973	73.00	58.80	91.00	66.40	71.10	51.90
1986	80.00	65.20	86.90	69.50	68.20	54.50
1991	74.80	79.20	80.50	60.20	68.70	51.40
1991	74.80	79.20	90.50	67.70	68.70	51.40
1992	75.90	81.60	89.60	68.00	69.10	52.50
1993	76.90	83.90	90.80	69.80	67.40	51.90
1994	77.70	88.80	89.00	69.10	66.90	52.00
1995	79.20	96.50	86.90	68.80	65.10	51.50
1996	77.60	94.80	89.50	69.50	66.10	51.30
1997	77.80	100.20	94.10	73.20	67.90	52.90
1998	75.80	105.10	94.60	71.70	67.50	51.10
1999	75.80	109.30	95.20	72.20	66.90	50.70
2000	75.80	112.00	96.20	72.90	68.10	51.60

NOTE: Data for NI/UK 1999 and 2000 taken from 1998 unchanged.

Source: Data for NI/UK (1960-1986) taken from Hitchens and Birnie (1999) Table 1 p5. Subsequent years from Vincent (2000). Data for ROI/UK, UK/GER, UK/USA calculated from European Economy (1999) Table 9, pp 266-267

term (see Price Waterhouse Coopers (PWC), 2000), but its potential is not unlimited. It is, in any case, highly unlikely that the *higher* rates of growth required to close the gap in GDP per capita between Northern Ireland and the UK can be squeezed out of further reductions in economic dependency alone. So the target of industrial policy in Northern Ireland must be to raise the rate of productivity. To achieve growth rates in GDP per capita of over 4 per cent per annum – the step change which is required to move Northern Ireland from 80 per cent to 90 per cent of the UK average as targeted in *Strategy 2010* - will require a sustained annual growth rate in productivity of over 2 per cent which is higher than the average achieved in the mid 1980s (*ceteris paribus*). While there is obviously considerable scope for improvement this will not be easy.

Poor productivity performance, particularly in the manufacturing industry in Northern



Source: NIEC from data supplied by NIERC (Northern Ireland Economic Research Centre) and NISRA (Northern Ireland Statistical and Research Agency).

Ireland, has long been recognised and widely documented (see, for example, Isles and Cuthbert (1957), Matthews Report (1963), Quigley Report (1976), Hitchens and Birnie (1989), Harris (1991) and Roper (1995). Harris (1991) showed that relative labour productivity in manufacturing industry was only 58 per cent of the UK average in 1958, rising to only 79 per cent in 1985. He found little evidence of convergence between 1968 and 1992 despite high levels of government assistance. Hitchens and Birnie (1999) arrive at a similar conclusion finding that labour productivity in Northern Ireland between 1963-73 averaged 84 per cent of the Great Britain average, compared with 82 per cent between 1980-1992. A rigorous analytic study by Borooah and Lee (1991) interpreted the Northern Ireland decline in manufacturing employment over the 1970s in terms of a systemic loss of regional cost competitiveness. They show that growth of total factor productivity in Northern Ireland during the 1960s and 1970s was at a rate substantially below that of the UK but at the same time wage rates in Northern Ireland converged rapidly in the UK average.

Part of the productivity gap between Northern Ireland and the UK is due to a structural disadvantage related to industry-mix and plant-size structure⁵. However, there is a strong body of evidence that manufacturing plants in Northern Ireland on average operate at lower levels of technical efficiency when compared to their counterparts in other regions of the UK. (see Hitchens, Wagner and Birnie, (1990) and Harris, (2000)). A forthcoming report commissioned by the Council will show that establishments in the Northern Ireland manufacturing sector have lower levels of labour productivity than establishments in other UK regions, despite evidence that they have higher capital expenditure per employee (Griffith and Simpson, forthcoming). The available evidence would suggest, therefore, that there is scope to improve productivity both within individual firms and sectors and by shifting from traditional low-productivity sectors to newer high-productivity ones. Some of these shifts are already occurring. What policies can governments pursue to assist the transition of the economy to a higher level of productivity growth?

Public Policy and Economic Growth: The Role of Government

Orthodox economic theory takes the view that all one has to do to promote faster industrial growth is to be sure that appropriate policies are in place that facilitate the free movement of goods and the factors of production (i.e. labour and capital). There is widespread agreement regarding many of the essential elements of the appropriate policy regime: a stable fiscal and monetary environment, which encourages exports, savings and investment; investment in human capital, research and development (R&D) and public infrastructure; and a competitive environment (see Nelson and Pack, 1999 and Ahn and Hemmings, 2000). Within a conducive policy regime efficient firms will grow and inefficient ones will fail and there is little that government can or should do about it.

Porter (1990) agrees that the roots of productivity lie in the national and the regional environment for competition but he goes further and identifies four broad attributes (the competitiveness “diamond”) that shape the business environment in which firms compete:

- *Factor conditions*: the availability and quality of the factors of production such as skilled labour, infrastructure etc.
- *Demand conditions*: the nature of local and external demand for the industry’s product or service, where local demand can play a vital role in encouraging product innovation and improvement.
- *Related and supporting industries*: the presence or absence of supplier industries and related industries that are also internationally competitive.
- *Firm strategy, structure, and rivalry*: the national conditions governing how companies are created, organised, and managed.

⁵ Roper (1995) argues structural factors account for up to two-thirds of the difference.

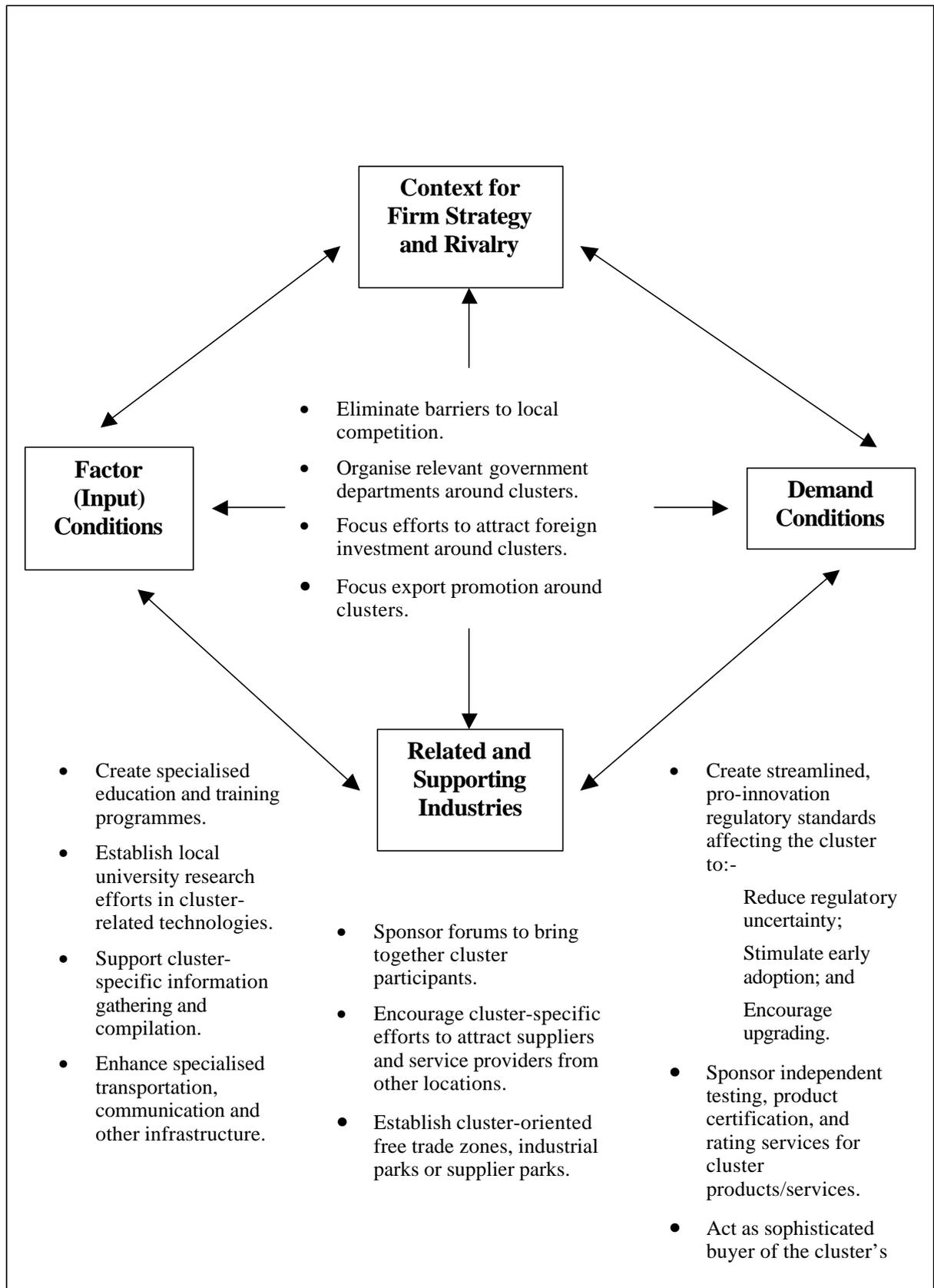
Government policies can influence all four parts of the ‘diamond’ but government does not feature as a critical element of the diamond. Getting the right conditions in each segment can lead to the formation of ‘clusters’, which are a prominent feature on the landscape of every advanced economy and an essential ingredient of economic development (Porter, 1990, 1998).

Figure II illustrates specific policy roles for government in developing clusters. While insightful in explaining, as it does, how industrial ‘clusters’ can drive economic growth, Porter’s analysis does not explain the behaviour of individual firms in successful clusters. However, understanding firm behaviour is important to policymakers.

Productivity is more than just efficiency (more for less). In a modern economy, *what* a nation produces in terms of the value of its products and services and *how* it goes about it in terms of the application of advanced technologies are equally as important (Porter and Stern, 1999). In essence “there are no low tech industries only low technology companies that fail to incorporate new ideas and methods into their products and processes” (Porter and Stern, 1999, p.12). Thus innovative companies, no matter what sector they are in, are the engine for productivity growth.

When a firm undertakes something innovative to itself and to the community in which it resides, this involves an element of risk and a process of learning. The learning process proceeds at several different levels: that of individual workers and teams of them; that of establishment and firms; and at the level of an industry and perhaps beyond. (Nelson and Pack, 1999). The process can ultimately involve firms, universities, research institutes and government agencies. Understanding it and particularly the role of firms in it is vital for understanding how regional economies grow and for effective policy making.

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Source: Porter (1998, p.251)

Against this background the Council commissioned Professor Michael Best to illuminate this process and develop a conceptual model or framework which could underpin and inform a strategic economic policy aiming to create a “fast growing, competitive, innovative knowledge based economy” (EDSRSG, 1999, p.129).

A fresh and innovative approach to industrial policy is clearly required if Northern Ireland is to get the step change in economic performance, in terms of productivity and therefore in growth, which is required to close the gap in living standards with the rest of the UK. Two key interrelated themes seem to emerge from recent studies into the process of technological change: innovation and capabilities. Innovation is said to account for 80 per cent of productivity growth (EC, 1998) while the DTI view “capabilities [as] the bedrock of our competitiveness” (DTI, 1998, p.6). “The UK’s distinctive capabilities” the DTI state “are not raw materials, land or cheap labour. They must be our knowledge skills and creativity”. (DTI, 1998, p.6). Professor Best’s report emphasises these two key interrelated variables.

The Capabilities and Innovation Perspective (CIP): The Way Ahead in Northern Ireland. A Summary

Professor Best’s report presents a radical and challenging way of exploring the strategic context of industrial policy-making in Northern Ireland. The CIP outlines dynamic growth processes that can explain high rates of growth for a decade or more. It outlines the futility of trying to explain productivity and competitive advantage in the terms of measures of inputs or factors of production, ignoring the mediating role of capabilities. Technology is already acknowledged as critical to rapid growth, but the notion of technology as a capability as well as a commodity and the need to integrate technological change with business organisation and production capabilities in order to understand industrial change better, is a unique insight provided by the CIP.

Technology management capabilities involve the capacity of a region’s enterprises to develop, diffuse, adopt, adapt, and combine technologies. The CIP sets out and elaborates an ambitious new perspective on the economics of industrial growth that has three key components:

- the Business Model;
- Production Capabilities; and
- Skill Formation

known collectively as the Capability Triad. A central tenet of the CIP is that growth involves synchronised advances in all three elements of the Capability Triad. The Capability Triad provides another way of analysing or x-raying an economy. In this respect it is a tool similar to Porter’s Diamond.

The Capability Triad

The Business Model

The Business Model is one based on product-led rather than price-led competition. Entrepreneurial firms are the basis of this business model. To remain competitive, today’s

companies need to do more than simply deliver products or services that are better or cheaper than those of their rivals. They must also add features, improve performance and reduce prices more quickly. They must be faster to launch new lines. If they want to grow, they may have to create entirely new markets. The real stars reinvent themselves – not once, but over and over again. The focus on product-led competition is what distinguishes such entrepreneurial firms. They pursue product-led competitive strategies and operate high-performance work systems. To compress new product development cycle times they integrate design and manufacturing processes. Crucially, entrepreneurial firms focus on core capabilities and network for complementary capabilities. This involves horizontal or multi-enterprise integration as distinct from vertical integration. In other words entrepreneurial firms are part of open-system networks, which are the counterpart to increasing specialisation of the entrepreneurial firm. The goal of the entrepreneurial firm is to develop the organisational capabilities to differentiate the firm's product in the market place and establish an ongoing relationship with customers. Success requires product development, technology management and innovation capabilities. To the extent that firms are successful, the mode of competition shifts from price-led to product-led.

The rebounding pressures of product-led competition in the market on the internal organisation of the firm reinforce the drive to develop unique products and production capabilities. A new dynamic between internal organisation and inter-firm competition is established. In pursuit of its goals, the entrepreneurial firm propagates new productive opportunities, which are pursued internally or pushed outside, producing opportunities for new enterprises, spin-offs or existing enterprises with the requisite capabilities (a process Best terms 'techno-diversification'). Open-system networking also means that a technical change at one link in the chain will create new pressures and opportunities for specialists in each of the complementary capabilities. In this way advances, in design and technology, are diffused.

Open-system networks are the mediating link between firms and the region. Regions that make the transition to product-led competition can enjoy a competitive advantage over regions in which the dominant mode of competition is price. Entrepreneurial firms driven by technology capability and a market opportunity dynamic are forever advancing their own capabilities. In the process the region's technological capability seabed is revitalised by the ongoing activities of its inhabitants. It is a virtuous circle. Regional technological capabilities spawn entrepreneurial firms, which upgrade regional technological capabilities, which spawn more entrepreneurial firms.

Thus, a region's technological capabilities are an outcome of a cumulative history of technological advances embedded in entrepreneurial firms. But the historical process is also collective. Just as individual entrepreneurial firms develop unique technological capabilities, a virtual, collective entrepreneurial firm extends a region's unique technological capabilities. The regional process of technology capability advance will likely involve a succession of firms, with new firms building on advances made by previous innovators. Regional specialisation, in the form of industrial districts or clusters, is the outcome of the technology/market dynamic played out at the level of the collective entrepreneurial firm.

Production Capabilities

Production capabilities are an expression of an underlying but unifying principle of production and organisation. Competitive strategy and production systems are bound together. Any effort by business managers to advance performance outcomes that does not put in place the requisite production capabilities will not be able to compete against firms that have done so. Competing on the basis of rapid new product development, without having a production system in which manufacturing and design are integrated, will only produce frustration. Competitors that have integrated design and manufacturing will be equipped to smoothly introduce new technologies in support of new product concepts on a regular basis.

Having this production capability is a distinguishing feature of an entrepreneurial firm. Technology management rather than simply technology is the key. In the old economy technology management was limited to the confines of R&D laboratories. New technologies would be introduced into production at irregular intervals but with considerable resistance and severe ‘teething’ difficulties during which quality and output suffered. Changes were highly disruptive to production performance and were to be avoided. The business model was well suited for a world of long production runs and predictable product life cycles. Technology management was an obstacle to be avoided. Some firms, in R&D intensive sectors, pursued the technology/market dynamic of the entrepreneurial firm. They, too, however, separated technology management from production. The lack of technology management capability meant that new technologies would often mean investment in new, dedicated facilities.

In the new knowledge driven economy, technology management is about the capability to develop and introduce new technologies, machines, materials, techniques, and methods into production to improve production performance. It includes the capability of enterprises to create, develop, adopt, adapt, combine, re-engineer, upgrade and otherwise advance technologies for purposes of increasing productivity.

Skill Formation

The growth process in knowledge intensive industries is limited by the supply of engineering and scientific personnel required to staff rapidly growing firms. Regional growth will be choked if the requisite numbers and types of graduate engineers are not produced by the education system. Three conditions must be met for success. The first involves characterisation of the demand for specific technological skills. The second involves investment in technical education. The third involves skill formation in the workplace. The report makes the important point that a region that can institute skill formation processes in anticipation of technology transitions has a competitive advantage.

Professor Best’s Conclusions

Professor Best uses the Capability Triad as a conceptual tool to comment on and review the existing situation in Northern Ireland. His conclusions, although based on a limited survey, do not make for comfortable reading. In summary he finds that:

Business Model

- Northern Ireland lacks enough entrepreneurial firms to propel regional growth

- Open-system networking operates only on a very limited scale

Production Capabilities

- The requisite production capabilities for a knowledge-driven industrial system on a scale to drive a high rate of growth are lacking in Northern Ireland.
- Evidence suggests that high performance work systems are not widely pursued outside the externally-owned sector.
- Technology management is not considered a powerful resource for growth in most Northern Ireland business enterprises.

Skill Formation

- Northern Ireland has a range of university level disciplines in engineering and science-related areas, particularly in information technology, which few regions of its size in the world possess.
- The university system has world-class research facilities in several areas but active industry/university partnerships are too few, as is active student involvement.
- FE colleges enjoy little guidance particularly in the crucial area of manpower planning.
- Every successful rapid and sustained industrial growth experience is simultaneously an account of proactive and strategic institutional development of visible and invisible colleges of knowledge diffusion. The area of manpower planning is not adequately addressed in Northern Ireland.

Policy Implications

Professor Best outlines ten proposals, which would change the future direction of industrial policy in Northern Ireland, but before discussing the implications of these specific policy proposals, we wish to draw out from Professor Best's analysis:-

- key themes, which should underlie an economic development strategy; and
- the main strategic objectives on which policy should focus if it is to deliver a step-change in economic performance.

Key Underlying Themes

Based on Best's report and other work the Council believes that five themes should underlie economic development strategy.

Evidence-based policy making - A core strength of the conceptual approach taken in the report is that it disabuses the reader of any notion that policy making consists of simply drawing up unstructured lists of 'things to do'. For effective policy making it is important to have some prior view on what are the key drivers of economic growth and their strengths or weaknesses in a given region. Rigorous analysis and not gut-feelings or anecdotes must underpin policies.

Long-term - A long term planning horizon has to be envisaged, over a ten to 20 year period with regular reviews.

Integrative - Economic development strategy has to be integrative. It must embrace all the factors that contribute to growth. In practice this means close cooperation between government departments and a breaking down of the 'silo mentality' by which departmental budgets are jealously guarded. A skill formation policy, no matter how successful at turning out highly trained people, will not foster transformational growth if it is not 'in sync' with the demand of

local technology oriented firms. An integrative approach also means a close partnership with the private sector and trade union interests. Although it is firms that ultimately drive growth, the government has a responsibility to create the right macroeconomic environment and economic infrastructure and to ensure that the incentives on offer through grants, subsidies and various fiscal measures generate new economic activity rather than compensate for inefficiency. Moreover, it is clear that successful firms in the knowledge driven economy work in collaboration and networks, which bring together public and private sector interests. Partnerships, networks, collaboration as well as competition may well be facilitated in a model, which is built on social partnership. A social partnership model has underpinned the strong growth performance of the Republic of Ireland. However, the success of the Republic of Ireland model was built on its ability to adopt a different set of macro policy norms (low corporate taxes, a partnership approach to wage bargaining and the public finances) to those applying in the UK and its regions. As a region of the UK, Northern Ireland does not have such control over the major macroeconomic levers so a different model of social partnership will have to be developed which encourages and facilitates the development of networks and the diffusion of skills and capabilities.

Knowledge - Increasing know-how per person is essential for maximising output per person. According to Professor Best, knowledge is created and diffused not only in the ‘visible’ colleges of secondary, further and higher education but also within technical and occupational communities that cut across companies (the ‘invisible college’). There, knowledge is created and diffused in ongoing production activities as workers address challenges and devise new methods. Growth involves the expansion in all types of knowledge. The task of industrial policy, in part, is to account for all the types of knowledge that are required to achieve growth goals.

Inclusive - An integrative, knowledge based strategy must also by its nature be an inclusive strategy. The emphasis in Professor Best’s model on education and training policies should ensure that all the people of a region have the opportunity to share in and, indeed, drive economic growth. People with the right skills, values and knowledge are the fuel on which dynamic knowledge intensive industries depend.

Strategic Objectives

Professor Best’s report, in our view, highlights five key strategic objectives which an economic development strategy for Northern Ireland should target:- Productivity, Innovation, Capabilities, Entrepreneurship and an Outward Focus.

Productivity - The key focus of industrial policy has to be on driving up productivity. Policies should aim to build up a region's productive skills rather than merely allow it to bid for business more cheaply. Productivity growth can be pursued by two courses of action – encouraging structural shifts from low productivity to high productivity sectors (inter industry) and driving up productive capabilities within firms, and industries through use of high performance work systems (intra industry). Professor Best’s approach encourages both.

Innovation - Sustained growth in productivity must be built on innovation. Process and, particularly, new product innovations account for 80 per cent of productivity growth. The

defining feature of the old competition when it emerged and the reason it successfully put all the competitors on notice was that it drove down the costs and prices of production. The defining feature of the new competition of today is rapid new product development created by the marriage of productivity and innovation, and the redefinition of both. Whereas productivity and innovation were a trade-off in the old competition, they have become a dynamic in the new. The term dynamic is used to capture the transition from a trade-off between two goals to a mutually reinforcing interaction: improved performance in achieving one goal enhances performance in the second, and *vice versa*.

Capabilities - It is futile to attempt to explain productivity and competitive advantage solely in terms of measures of factor inputs, ignoring the mediating role of capabilities. Economic capabilities at the firm level are productive assets that come in two forms: unique and generic. Firms strive to develop their unique capabilities, which are the basis of their competitive advantage and the determinant of their profitability. Generic capabilities, such as technology management capabilities, can diffuse across firms and combine with firms' unique capabilities to explain the productivity of the region's embedded labour and capital. The dynamic that exists between the development of unique and generic capabilities and the exploitation of market opportunities is the driver of regional industrial growth. According to the DTI, "Capabilities are the bedrock of our competitiveness" (DTI, 1998, p.6). The concepts of capabilities, particularly technology management capabilities, are critical to raising output per worker. Movements from less technology and skill intensive sectors to more complex and knowledge intensive sectors involve transitions to technology management capabilities based on more advanced principles of production.

Entrepreneurship - Professor Best links innovation to entrepreneurship in his concept of an entrepreneurial firm. Such firms ultimately drive economic growth. Companies can broadly be regarded as the product of ideas and systems of values that are transmitted and borne by individuals. Governments must nurture cultures and systems of high technology and knowledge, and freedom to experiment, right from primary school level. To inculcate a wider culture of entrepreneurship will require close cooperation between departments with responsibilities for economic development and education.

Outward Focus - Finally, it is clear that to be competitive a small economy like Northern Ireland must be outwardly focused, tapping into world best practice through the development of networks and partnerships and through a targeted approach to inward investment.

Specific Policy Proposals

The CIP provides the conceptual framework which can deliver improvements in these five areas. Operationalising Professor Best's conceptual model and policy prescriptions will require considerable thought and consultation. His report implies a considerable rethink on the way in which industrial policy is conducted in Northern Ireland. The need for co-ordinated change across three domains - the business model; production capabilities and skill formation - as being vital for transformational rates of growth is unique. The notion of technology as a capability as well as a commodity (and the need to integrate technological change with business organisation and production capabilities in order to understand industrial change better) shifts the focus of industrial policy from capital subsidisation to capability development. The report is particularly insightful in the last domain, skill formation, and

makes the important point that a region that can institute skill formation processes *in anticipation* of technology transitions has a competitive advantage.

Professor Best outlines ten proposals to guide industrial policy in Northern Ireland (see Table II). These proposals are directional rather than prescriptive. Professor Best's first proposal and indeed a common theme which runs through all his proposals, (particularly PP1, PP6-10, Table II) is the need for systems integration at the macro level as the organising principle of industrial policy so that the activities of the separate agencies can become mutually reinforcing.

There is widespread support for the view that networks of collaboration between businesses, universities, research institutions, the wider education system and government are vital to maximise the output of science and technology activities. For example the Organisation for Economic Cooperation and Development (OECD 1999) states,

The output of science and technology activities depends not only on the amount of input, but also on the entire innovation system (p.8).

TABLE II

Professor Best's Policy Proposals (PP's)

PP1 Apply principle of system integration.

PP2 Concentrate on entrepreneurial firms.

PP3 Diffuse high performance work organisations.

PP4 Foster open networks.

PP5 Develop and diffuse technology management capabilities.

PP6 Integrate technology management and skill formation.

PP7 Partner with inward investment to advance capabilities.

PP8 Integrate mission-driven diffusion agencies with industrial policy goals.

PP9 Link visible and invisible colleges.

PP10 Administer the research, technology development and innovation infrastructure.

while the EU have supported the development of Regional Technology Plans and Regional Innovation Systems in over 100 regions (EC, 1998).

Understanding the regional innovation system, which operates in Northern Ireland, is absolutely critical if the local economy is to thrive in the fast-growing, knowledge-based economy. Professor Best's report points to specific weaknesses in the regional innovation system that implicitly operates in Northern Ireland, particularly in respect to the utilisation of, what he regards as, a world class R&D infrastructure. The Council has also recently pointed to a decline in public investment in R&D, which may restrict the growth of private sector R&D and inhibit the potential for innovation in the region and the need for a more coordinated policy approach. (NIEC, 1999c). The Council has therefore commissioned a study from leading academics in the field, Professor Phil Cooke and Dr Stephen Roper, to establish where Northern Ireland currently stands in terms of regional innovation and its regional innovation system relative to other regions and to suggest ways forward for Regional Innovation Strategy and policy, based on best practice elsewhere and on the nature of the local economy.

Best also calls for a systematic and integrative partnership approach to the vital issue of skill formation involving educational institutions, technology-driven firms and policy-makers. The CIP, in the Council's opinion, highlights challenges for all three sectors should this active partnership be undertaken in Northern Ireland.

Challenges for Educational Institutions:

- The challenge for educational institutions is not simply to increase the number of graduates but to increase graduates educated in a curriculum that includes emerging technological methodologies.
- To collaborate with industry and government in skill formation appropriate to the region. The supply of graduates must be "in sync" both in skill and quantity with the demand from technology-driven firms.
- To assess the teacher pool in terms of size and orientation particularly in maths and science.
- To actively encourage an interest in science amongst young people in the early years of education.

Challenges for Business:

- To collaborate with educational institutions and government in skill formation appropriate to the region. Northern Ireland's problem is not so much the supply of skilled labour (particularly graduates) but the capability of industry to absorb them.
- To make better use of the 25 research and development centers that currently exist in Northern Ireland.

Challenges for Policy-makers

- To develop governance capabilities for fostering applied technological development to reinforce and foster the continuity of unique, regionally based technological capabilities.
- To take account of all sources of knowledge and skill formation. The CIP offers new insights into the importance of what are called “invisible colleges”. By this Best means skill formation that is built up by enterprises conducting experiments, formal and informal over long periods of time. Tacit or non-codifiable knowledge is often a critical ingredient in unique capability development and a source of unique competitive advantage. Mission-driven organisations can affect growth by fostering a region’s invisible colleges. Industrial transitions, in particular, can be fostered by mission-driven intermediary institutions (neither business enterprises nor government agencies) which form integral parts of regional and national business systems. Ignored by much of the industrial organisational literature, these intermediary organisations can be established by industrial policy-makers, by groups of enterprises, or by professional associations. Best cites an example from Japan - the Japanese Union of Scientists and Engineers (JUSE).
- To commit funding for research and technology infrastructures.
- To address bottlenecks in the overall process in terms of declining enrolments in science and engineering courses at the tertiary levels which can be traced back to preparing maths and science teachers to stimulate interest in these subjects at an early age.
- To drive the institutional changes necessary to synchronize industrial development and skill formation for knowledge-intensive industries.

Although the emphasis is on systemic issues, Professor Best puts the focus of industrial policy explicitly on firms or rather on a specifically defined type of firm i.e. the entrepreneurial firm (PP2, Table II). Such firms are the first among equals in a regional innovation system. They are the microcosm in which coordinated organisational change in each of the three domains of business model, production capabilities and skill formation, takes place. Their development is the key goal of the system. Entrepreneurial firms foster open systems networks, develop and diffuse technical management capabilities and are an important mechanism for diffusing high performance work organisation. Identifying their centrality to the industrial development process in general and to the regional innovation system in particular is another major insight from this report. The next problem, however, is to define policies which will foster their growth and development.

The systematic issues in regard to innovation and skill formation as outlined above are obviously important. Professor Best also calls for specific policies, which will diffuse high performance work systems (PP3, Table II), foster open system networks (PP4), develop technology management capabilities (PP5) and create partnerships with inward investment to advance capabilities (PP7).

Best points out that High Performance Work Systems, or the less demanding philosophy of Total Quality Management, an integrative process approach prominent in world class

manufacturing plants, is ignored in the various Northern Ireland economic strategy documents which have been published over the years. As the pace of technological change quickens, Northern Ireland's firms are slower to use new technology in the production processes (Roper and Anderson, 2000). More must be done not only to encourage firms to introduce new technologies into the production process but also to manage the production process to the highest world standards. A greater emphasis needs to be put on upgrading the quality of technology management capability in Northern Ireland, perhaps through increasing the profile and activities of the Northern Ireland Quality Centre.

Creating the necessary critical mass of key actors so that the process of innovation and the development of capabilities becomes an active dynamic process could pose problems for a small region such as Northern Ireland. Professor Best recommends a strategic approach to the attraction of foreign direct investment so that the emphasis is not so much on short-term increases in employment but on fostering regional growth dynamics through the diffusion of new technology management capabilities across industry. In this regard the Council has recommended that a Regional Linkages Programme, modelled on the National Linkages Programme in the Republic of Ireland, should be established (NIEC 1999d). Such a programme could also help focus attention on the development of open system networks. Best also encourages the development of cross-border networks of cooperation. This would mean tying the regional innovation system in Northern Ireland with those in other regions, particularly in the Republic of Ireland. The Council will explore this idea further in a forthcoming report on a Regional Innovation Strategy for Northern Ireland.

A key question, of course, is how to make it all happen. Clearly a number of elements are involved. The message has to be communicated and its revolutionary import widely discussed and understood. But institutional factors will be crucial. We have already alluded to the importance of assessing and developing a Regional Innovation Strategy for Northern Ireland. Best's proposal to integrate mission-driven diffusion agencies with industrial policy goals (PP8) which would involve the various development agencies being unified by a capabilities development vision and led by a strategic agency could be as important as anything else in the report if it results in attention being focused on fostering transformational growth.

Northern Ireland has a range of development agencies:- the Industrial Development Board (IDB), the Local Enterprise Development Unit (LEDU), the Industrial Research and Technology Unit (IRTU), the Training and Employment Agency (T&EA) - but in some cases it is not clear that their objectives are fully integrated with the goals of industrial policy. For example, the responsibilities of two of the largest agencies i.e. IDB and LEDU are divided rather arbitrarily along the lines of number of client company employees, those below 50 are LEDU's responsibility, while those above 50 are IDB's, which has the added responsibility of attracting inward investment. In the past the Council has suggested that the Department of Economic Development (DED) (now the Department of Enterprise Trade and Investment (DETI)), in its role as a holding company for its various agencies, should publish an annual report which would set the strategic direction of economic development policy and assess its role and that of its agencies in meeting the overall objectives of economic development policy in Northern Ireland (NIEC, 1994).

While this recommendation remains valid, the debate on the best institutional structure for economic development agencies has moved on. *Strategy 2010* has proposed the creation of a

single agency for economic development, combining the IDB, IRTU, LEDU and the company development programme of the T&EA. The Council has argued (see NIEC 1999c and NIEC 1999d) that such an agency should have a strong policy co-ordination and implementation function around key priorities which must include high profiles for R&D and innovation. However, a single agency should not be a simple bolting together of existing bodies. It should serve to simplify and infuse the operational process with a sense of mission consistent with desirable industrial policy goals. In the Republic of Ireland the reorganisation of the separate development agencies following the “Culliton” Report in 1992 provides an interesting model (Culliton, 1992). As a result of the reorganisation the government established under the aegis of FORFAS two separate and autonomous agencies, each with its own Board, Managing Director and grant-in-aid. The role of the agencies as currently constituted is as follows:

FORFAS has its own Chief Executive and has a vital co-ordinating role. It is the national policy and advisory board for enterprise, trade, science, technology and innovation. It is the body in which the State’s legal powers for industrial promotion and technology development have been vested. It is also the body through which powers are delegated to Enterprise Ireland for the promotion of indigenous industry and to IDA Ireland for the promotion of inward investment. The broad functions of Forfas are to:

- advise the Minister on matters relating to the development of industry in the State;
- advise on the development and co-ordination of policy for Enterprise Ireland, IDA Ireland and such other bodies (established by or under statute) as the Minister may by order designate;
- encourage the development of industry, technology, marketing and human resources in the State;
- encourage the establishment and development in the State of industrial undertakings from outside the State, and
- advise and co-ordinate Enterprise Ireland and IDA Ireland in relation to their functions.

Enterprise Ireland is empowered to support the development of indigenous industry and is organised sectorally with a strong regional base.

IDA-Ireland is empowered to attract internationally mobile investment to Ireland.

An Bord Trachtala is responsible to the Minister for Tourism and Trade.

The structure is interesting from a CIP perspective because one body is charged with the co-ordination of the policy framework in which the others operate. It therefore provides the institutional opportunity to unite the various agencies around a developmental vision, such as Capabilities and Innovation, and is therefore consistent with Best’s recommendation - PP8, in Table II. The Council has also argued that a new agency structure should be at arms length from the Government and that

the Board of Management should include prominent representation from the critical players in the knowledge-based economy and the regional R&D and innovation system,

especially the universities and indigenous threshold small and medium sized enterprises (SMEs) but also international R&D innovation partners. (NIEC, 1999c, p. 172).

It is the Council's view that the lead strategic agency should be concerned with increasing productivity by focusing on the four key strategic areas of Innovation, Capabilities, Entrepreneurship and Outward Focus, with an emphasis on innovation to ensure that the success of the IRTU in increasing the profile of this vital growth dynamic is not dissipated.

Conclusion

To conclude, Professor Best has provided an insightful, detailed and immensely stimulating analysis of the dynamic processes which underpin the knowledge driven economy in three critical areas: - the business model, production capabilities and skill formation (The Capability Triad). Coordinated action across these three areas is necessary for a region to achieve rates of growth, which can ultimately transform an economy from a laggard to a leading performer. Best's analysis of the Northern Ireland economy through the perspective of the Capability Triad has pointed to a number of weaknesses and indeed strengths of the local economy. The Capabilities and Innovation Perspective challenges policy-makers to reassess the fundamentals of economic development policy. Informed by it, the Council developed five key underlying themes (Evidence-based policy making, Long term planning horizon, Integrative, Knowledge based and Inclusive) and five key strategic objectives (Productivity, Innovation, Capabilities, Entrepreneurship and Outwardly focused) as the basis of an economic development strategy for Northern Ireland.