Post Porter: Where Does the UK Go From Here?

Summary Report from the AIM Management Research Forum June 2003

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EXECUTIVE SUMMARY

This report summarises the discussions that took place during the AIM Management Research Forum on the 29th April 2003 and the subsequent work of four AIM scholars (Dr Kamal Birdi, University of Sheffield; Dr David Denyer, Cranfield School of Management; Dr Kamal Munir, University of Cambridge and Dr Jaideep Prabhu, University of Cambridge, under the guidance of Professor Andy Neely, Associate Director of AIM).

The major points discussed in the report are:

1. It is people and organisations that innovate, not economies or sectors.

2. There is a need to consider intra-firm issues as well as extra-firm issues when debating and formulating policy. Much of the analysis that has been carried out to date (e.g. the Porter and Ketels' report) concentrates primarily on the extra-firm issues, thereby ignoring the role that intra-firm issues play into translating policy into action.

3. There is substantial evidence that the UK can be described as moderately innovative at best, both in terms of product and process innovation. Particular areas of concern include – patenting, commercialization, adoption and exploitation of technology and management process innovations.

4. There is widespread agreement that the UK cannot continue to compete on the basis of low cost and that companies have to shift their focus to higher value and innovation.

5. There are numerous geographically dispersed exemplars that illustrate how Government interventions can be targeted at helping specific sectors within economies grow – e.g. Acer Computers in Taiwan, Nokia in Finland, the Dutch Flower Industry.

6. The factors that influence innovation can be conceptualised through an Innovation Dynamics Model, which consists of three inter-related components:

    - Intra-organisational dynamics covering strategy, culture, practices, skills, resources and incentives.

    - Inter-organisational dynamics covering customers and market orientation, competitors, university-industry links, clusters, mergers and acquisitions.

    - Environmental dynamics covering regulation and the business environment.

7. Policy recommendations can be made at each of these three different levels, although the communities that will have to enact them are clearly different.

8. For the Government the focus should be at the "environmental dynamics level" and the "inter-organisational dynamics level". Specific policy recommendations at this level include:

a) Promote reflection and learning from practice within firms by identifying and disseminating information about promising practices and role models. This should cover far more than the traditional emphasis simply on best practice, e.g.:

- Idea generation and capture schemes.

- Role model firms that find creative ways to innovate despite the lack of access to resources.

- Role model large firms that make good use of resources to build and buy technological and market assets.

- Role model firms that pursue acquisitions within a well thought out and consistent strategy of growth. In particular, identify those firms that pursue a sustained process of knowledge development by linking internal knowledge with appropriate sources of external knowledge.

- Role model firms that successfully employ new organisational forms such as spin outs.

- The Government as a role model using its purchasing power to influence organisations throughout the supply chain.

b) Provide an economic environment that encourages and facilitates innovation, including:

- Encourage regular entry of start-ups into markets.

- Facilitate the diffusion of innovations through the economy.

c) Continue to pursue the strategy of joined up Government:

- Reduce red tape and bureaucratic procedures.

- Ensure innovation policy is integrated with other policy areas.

d) Develop index of innovation for firms and consumers across sectors to help benchmark and facilitate the identification of role models.

9. For managers (and for those tasked with supporting managers – e.g. Universities and Business Schools, the CBI, Trade Associations, etc) – the focus should be both at the "inter-organisational dynamics level" and the "intra-organisation dynamics levels". Specific recommendations at this level include:

a) The Role of Top Management:

- Set explicit innovation targets and objectives in their strategy. Ensure alignment of organisational, group and individual objectives.

- Sanction a systemic culture change that embeds the values of creativity and innovation in both the people and the processes of the organisation.

- Encourage management at all levels to provide some slack, time and resource in the system to enable innovation efforts.

b) The Role of Middle Management:

- Contribute to idea generation, capture and management schemes.

- Support benchmarking groups or initiatives.

c) The Role of Support Organisations:

- Facilitate technology commercialisation processes involving collaboration between businesses and universities.

- Increase the quantity and quality of education and development opportunities for middle and line management to learn about the day- to-day management of innovation (e.g. how to be innovative in themselves, how to manage the creativity of others, how awareness of different practices can be used to generate and implement ideas).

10. There are also several areas where we simply do not have enough consolidated evidence to make an informed recommendation. These areas that require further research and consolidation include:

   - Comparative data establishing the quality of UK managers against managers in other economies.

   - The best routes through which management education and development can impact on organisational performance.

   - How firms collaborate with universities, and the benefits that they derive from such associations.

   - The relative performance differentials of clusters.

   - The impact of the stock market and fiscal policy – especially its impact on short-termism, the culture of acquisition and relative lack of innovation within UK firms.

   - The role that Foreign Direct Investment plays in stimulating productivity and innovation.

   - Development of national databases and studies that can be used by the academic community to explore the most effective organisational practices.

11. Clearly much research has already been conducted on a number of these topics and some of the prescriptions for practitioners and policy makers are obvious. A key question that remains, therefore is why are more people not acting on what is known. This topic merits further research and will be the subject of a future AIM report.

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1. PREFACE

Policy makers, practitioners and academics in the UK are engaged in a national debate about how to improve the country's innovation and productivity performance. Fuelling this debate are two specific initiatives: the DTI's Innovation Review[1] and the Porter Report[2]. The Innovation Review, which will be published in the autumn of 2003, involves widespread consultation with key stakeholders and is seeking to identify how the DTI and wider Government might best act to increase innovation in the UK. (For the complete list of themes and work-streams in the DTI Innovation Review **see Appendix 1**). Key issues to be covered in the Innovation Review include:

1. The drivers of innovation
2. Current policies and actions
3. The role of government other stakeholders
4. The potential obstacles
5. International comparisons and benchmarking.

> *"Direct input from business and a wide range of stakeholders will be vital to the innovation review's success; not only do our stakeholders have knowledge that is essential to the analysis underpinning the review, but also many will have an important part to play in delivering the resultant strategy".*
>
> *Source: www.innovation.project@DTI.dsi.gov.uk*

In addition to the Innovation Review, the DTI and the Economic and Social Research Council commissioned Professor Michael Porter and his team to conduct a review of the existing evidence on UK competitiveness. The resulting "UK Competitiveness Report" was published in May 2003 and argued that the UK has made good progress in certain aspects of the economy over the past decade. Growth in labour force utilization in the UK has been stronger than in Continental Europe, the UK's growth rate of GDP per capita has shown a rapid increase and trade and Foreign Direct Investment levels have been good. However, there is still a worryingly large productivity gap between the UK and major competitors such as the U.S., France and Germany. The UK Competitiveness Report argues that the UK economy is now in a transitional stage and the productivity and prosperity gap will widen if certain shortcomings are not addressed. The authors of the UK Competitiveness Report conclude that one of the major levers for change is to enhance the currently weak innovation capability of the UK.

[1] For information on the DTI's Innovation review, see www.innovation.project@DTI.dsi.gov.uk
[2] Porter, M.E. et al., "UK Competitiveness: Moving to the Next Stage", 2003 www.aim-research.org/

Key findings of the UK Competitiveness Report include:

- Significant improvements in UK competitiveness.
- Demonstrable managerial abilities.
- UK's potential in comparison to other countries.

However:

- Diminishing returns from current government and company strategies.
- Weak collaborative capacity.
- Inadequate innovation, investment, management training.

In summary, the Porter and Ketels Report suggest that the UK has made considerable progress, but it now needs to make a transition to a high value economy. The key question to address is how the UK can make this change.

1.1. The AIM Management Research Forum

On 29th April 2003, leading academics, practitioners and policy-makers attended the first AIM Management Research Forum titled *'Post Porter: Where Does The UK Go From Here?'* (For a full list of delegates see Appendix 2).

Delegates were presented a number of questions that were pre-defined by AIM and the DTI.

- *Reactions to the Porter and Ketels Report.*
- *Is the UK in a good position to make the transition to a high value innovative economy?*
- *What should the UK do to make the transition?*
- *What must UK firms do in order to become more innovative?*
- *What role should management play?*
- *What role should Government play?*

(For a detailed list of questions posed by AIM and the DTI **see Appendix 3**).

1.2. How The Report Was Devised

Four AIM Scholars from some of the leading UK's business schools were selected to facilitate the discussion groups and subsequently to produce the report under the direction of AIM Associate Director: Professor Andy Neely:

Dr Kamal Birdi, University of Sheffield
Dr David Denyer, Cranfield School of Management
Dr Kamal Munir, Cambridge University
Dr Jaideep Prabhu, Cambridge University

During the AIM Management Research Forum the AIM scholars led and recorded the discussion groups. Post the AIM Management Research Forum the project team met on several occasions to compile the report. A draft report was produced within two weeks and was sent to the delegates who attended the AIM Management Research Forum for comments. The report was submitted to the DTI and the public on June 3, 2003.

1.3. What The Report Contains

The overall objectives of the report were to:

1. *Report the conversations that took place at the forum.*

2. *Present additional research evidence on issues concerning innovation in the UK.*

3. *Ground the discussion in current academic literature.*

4. *Present policy recommendations that could feed into the DTI Innovation Review.*

The report does not attempt to be a comprehensive nor systematic review of the innovation literature.

Throughout this report we use the following definition of innovation:

"Innovation is the successful exploitation of ideas, into new products, processes, services or business practices, and is a critical process for achieving the two complementary business goals of performance and growth, which in turn will help to close the productivity gap".

(For a detailed rationale for our use of this definition **see Appendix 4**)

1.4. Who The Report Is For

It is envisaged that this report will be of interest to the academic, practitioner and policy communities. In particular, the report will:

- *Present policy recommendations that may feed into the DTI's Innovation Review.*

- *Identify gaps in the evidence base, which may provide areas for future research. The report will be submitted to the ESRC's research priorities board.*

2. INTRODUCTION

2.1 Reactions to the Porter Report

The Porter and Ketels Report (2003) strongly emphasized the need for UK firms to upgrade their productivity by competing on unique and innovative products and services. According to Porter and Ketels, if the UK is to remain competitive, it cannot continue to compete on the basis of relatively low input costs and an efficient business environment. It needs to move up the scale on value added, and compete in the premium segments in every industry. Porter and Ketels argue that this “will require changes in management behaviour.”

Insight from the AIM Management Research Forum:

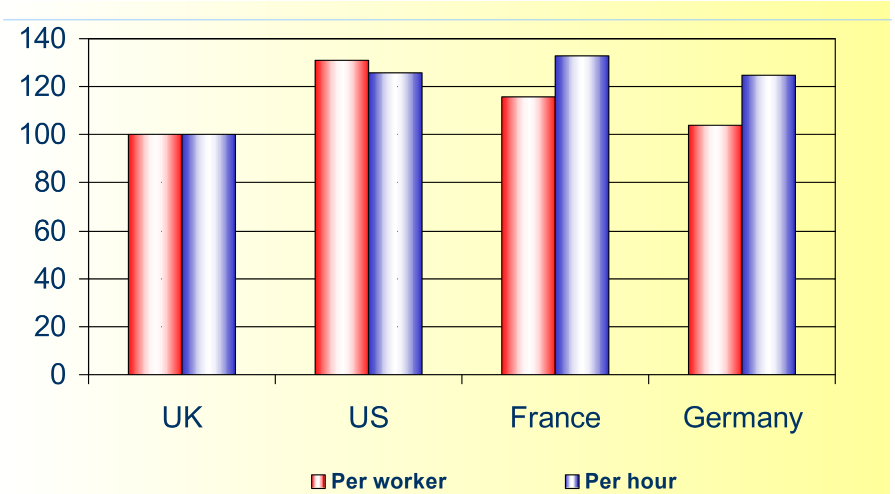
A major consensus emerged around the fact that while the UK currently competes on relative efficiency and cost, it would need to compete on value added in the future. The passage of current relatively low cost manufacturing from the UK to Eastern Europe or East Asia is inevitable over the next few years.

Therefore it is imperative that government, rather than trying to prevent the inevitable by protecting existing activity around low cost competition, should give up on these activists and focus instead on creating the right environment for a value added economy.

Porter and Ketels only provide very broad guidelines on how to achieve such a transition, especially when it comes to transforming firms. In this report, we build on comments from Forum participants and work in the academic and policy literature to layout a framework for making UK organisations more innovative. That such work is needed is now firmly established.

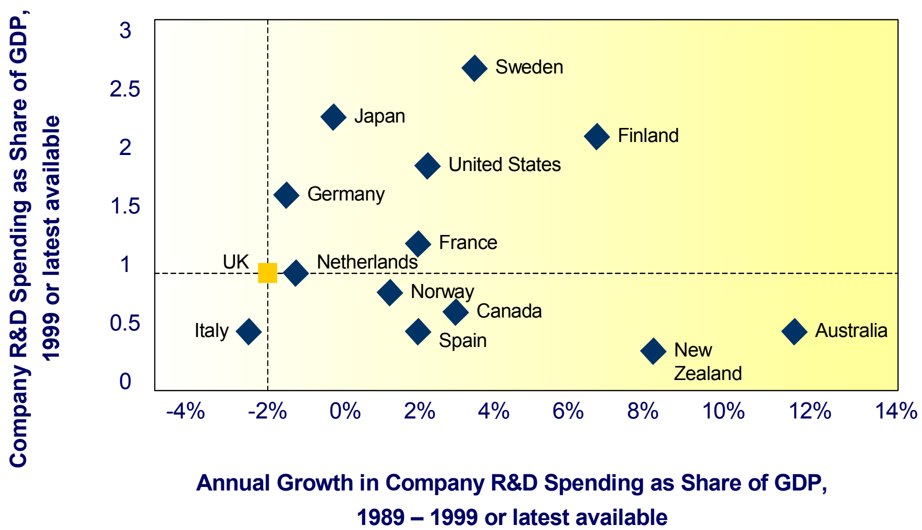
Several studies have found UK productivity to be severely lagging behind its competitors (see Figure 1). Similarly, the level of innovation and R&D expenditures in UK firms have been found to be much lower than the OECD averages (see Figure 2).

Figure 1: UK Labour Productivity Gap (2001)



Source – Vicky Pryce "Innovation: Action for the Future", presentation made to the AIM Management Research Forum, April, 2003

Figure 2: Company Spending on R&D Relative to GDP, 1989 to 1999



Source – OECD (2002)

Our motivation in this report is to explore how UK firms can meet the challenge of transforming themselves for increasing value-addition in premium segments of their markets. Our approach is in contrast to several studies that have already been completed on the subject. While previous studies have worked at the level of the economy as a whole, we shift the level of analysis to the firm. There are several reasons for doing so. First, large firms are likely to be very different in their ability and motivation to innovate than small firms (Schumpeter, 1942). Among large firms, those that are more integrated into the global economy are likely to differ from those that are largely domestic and have operated in protected or regional markets (see CBI Innovation Survey, 2002). Moreover, much of a firm's performance will depend upon its strategic actions, and how well it manages the resources it has access to in order to innovate. An analysis at purely the level of the economy as a whole or even at the purely sectoral level would mask these differences and make it hard to formulate prescriptions tailored to specific types of firms and their management.

2.1.1. Opening The Black Box Of The Firm

It is not economies or sectors that innovate but individual firms within them that do. Understanding what happens within specific UK firms will be crucial to evaluating why general patterns of innovation (or the lack thereof) exist in the UK as a whole. Opening the black box of the firm will in turn help with understanding what can be done to enhance positive trends in firm innovation while reversing negative ones. An analysis at purely the sectoral level would make it hard to formulate prescriptions that are understandable and meaningful to firms and their management. On the other hand, making individual UK firms more innovative has the happy consequence of improving the innovative performance of the UK economy as whole.

In summary, the Porter and Ketels Report:

- Provides a thorough analysis at the UK-wide level.
- Highlights some areas of progress in the UK.
- Lacks a fine-grained analysis across types of firms and within firms.
- Is too generic, so policy based purely on it could be overly generic.
- Emphasises a need to address management issues in innovation.

The AIM Management Research Forum and this report are intended to expand on the role of management in innovation by firms in the UK.

This report will evaluate the need for UK firms to move up the value chain and review evidence on the current status of innovation in UK firms. A multi-level model (The Innovation Dynamics Model) will then be presented which integrates the key themes concerning innovation effectiveness that emerged from the AIM Management Research Forum. Policy and research implications are presented.

The report is structured as follows:

- Section 2 presents the UK's current status on a number of innovation indicators.
- Section 3 introduces and explains the Innovation Dynamics Model in the context of the value chain.
- Sections 4, 5 and 6 discuss Intra- and Inter-organisational innovation dynamics and the broader environmental context. These sections review the theoretical bases and empirical evidence underlying these themes.

- Section 7 provides the main policy and research implications.

3. INNOVATION IN THE UK: Where Are We Now?

In order for the UK to remain competitive it needs to move up the scale on value added, and compete in the premium segments in every industry. Given this, the role of innovation becomes crucial. There are a number of a ways to evaluate the UK's current performance on innovation. The most significant indicators are product and service innovations, patents and process innovations and the value generated by them.

3.1 Product and Service Innovations

The most salient indicator of innovation is the extent to which organisations introduce new products or services into the marketplace. Data from the past decade suggest that the share of UK businesses which routinely introduced innovations was roughly equal to the EU average but the share of turnover in UK businesses accounted for by new products was lower than average, particularly among larger firms (DTI, 2002; The European Commission, 2001).

This picture can be informed further by looking at historical trends in some major sectors. A study of 64 radical innovations in the consumer electronics and home appliances industry over the 1850-2000 period (Chandy and Tellis, 2000) shows that the vast majority of innovations were first commercialized by US firms (40 out of 64 or 62%). The next most innovative firms were from Japan with 10 (16%). In comparison, UK firms were less innovative, responsible for commercialising only 4 out of 64 (6%), on par with France, Holland and Germany (3, 3 and 2 innovations respectively).

Radical innovations are critical to some settings, such as pharmaceuticals and biotechnology sectors. A study of all radically new drugs (those that involved both new molecular entities as well as new therapeutic uses and were therefore both technological and market breakthroughs) commercialized in the US market in the 1991-2000 period (Sorescu et al., 2003) found that UK firms were relatively good at radical innovation in terms of counts of drugs introduced. Of the 15 most innovative firms, two were UK based: GlaxoSmithKline and AstraZeneca, with 19 and 8 out of a total of 226 breakthrough drugs commercialized. However, in terms of the value generated by these drugs, the UK firms performed less well. Of the top 10 most valuable drugs introduced in this period, only 1 UK firm's product entered the list, at number 9 (GlaxoSmithKline's Relenza).

Table 1: Firm-Level Innovation Ranking and Innovation Counts: US Pharmaceutical Drugs 1991-2000[3]

Company	All Breakthroughs	Radical Innovations	Total Innovations
GlaxoSmithKline (UK)	19	8	382
Roche	15	7	147
Bristol-Myers Squibb	15	4	320
Abbot Laboratories	11	2	284
Merck	11	7	489
Johnson&Johnson	10	2	136
Aventis Pharma	9	4	83
Hoechst	9	3	79
Novartis	9	0	163
Wyeth	9	2	144
Pfizer	9	1	118
Parke-Davis	9	4	93
AstraZeneca PLC (UK)	8	0	117
Eli Lilly	6	2	231

[3] Sorescu, A., et al., (2003), "Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals," *Journal of Marketing*, forthcoming (October).

Table 2: Ranking of Highest Net Present Value US Drugs: 1991-2000 [4]

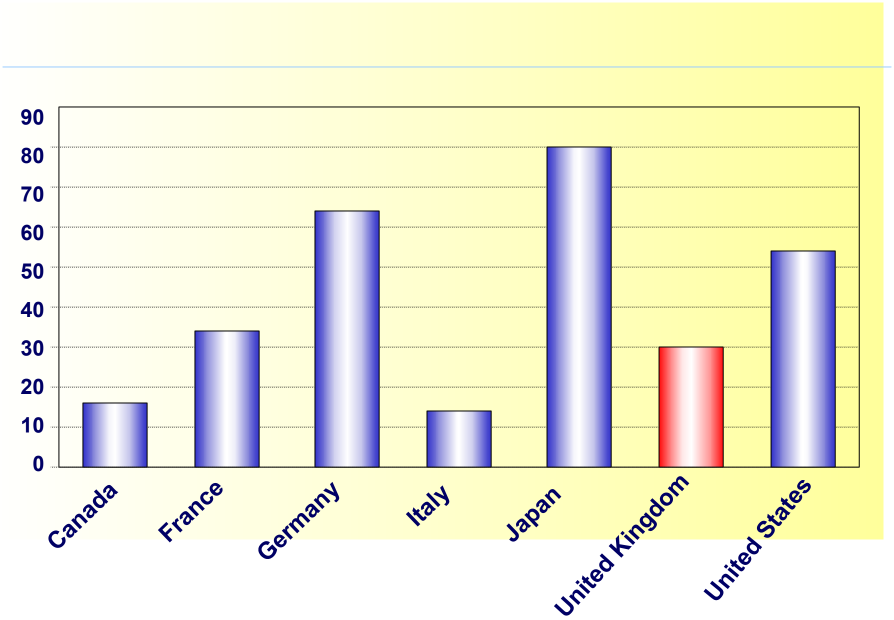
Drug Name	Drug Class	Company	Approval Date	Innovation Type	Licensed	NPV (in $ mil.)
Singulair	Respiratory; Pulmonary Asthma/Anti-Asthmatic	Merck	20 Feb-98	Tech breakthrough	No	6981.7
Tikosyn Dofetilide	Cardiovascular; Arrhythmia/ Anti-Arrhythmic	Pfizer	10 Jan-99	Tech breakthrough	No	6313.5
Viagra	Gynecological; Genito-Urinary Impotence	Pfizer	27 Mar-98	Radical Innovation	No	6189.9
Rapamune	Immunology/ Autoimmune Disease	Wyeth-Ayerst	15 Sep-99	Radical Innovation	No	5745.0
Mylotarg	Cancer; Blood Cancer; Leukaemia	Wyeth-Ayerst	17 May-00	Radical Innovation	No	5552.9
Glucovance	Metabolic Disorders; Diabetes; Diabetic Complications	Bristol-Myers Squibb	31 Jul-00	Tech breakthrough	Yes	5428.8
Rebetron	Infectious Diseases & Viral Diseases; Antiviral Hepatitis	Schering-Plough	3 Jun-98	Market Breakthrough	Yes	4910.0
Aggrastat	Cardiovascular	Merck	14 May 98	Radical Innovation	No	4807.4
Relenza	Infectious Diseases & Viral Diseases; Antiviral Influenza	GlaxoSmith Kline	27 Jul-99	Radical Innovation	Yes	4112.7
Temodar	Cancer, Brain Cancer	Schering-Plough	11 Aug-99	Radical Innovation	Yes	3281.4

[4] Sorescu, A. et al., (2003), "Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals," *Journal of Marketing*, forthcoming (October).

3.2 Patents

Another index of innovativeness is in terms of patents and the UK does not seem to do so well here. The UK showed fewer patent applications on average than Sweden, Germany, Belgium and France to the European Patent Office in 2000 (EEF, 2002). The European comparison is also supported by the analysis of U.S. patenting data which demonstrates that countries such as Singapore, South Korea and Taiwan have grown significantly in the last decade, while the UK has grown only slowly from a relatively low base (Porter and Ketels, 2003). Despite having a strong science base, it appears that the UK lags in patenting and commercialisation (CBI/TUC, 2002; Nickell and Van Reenen, 2002).

Figure 3: Patent Data

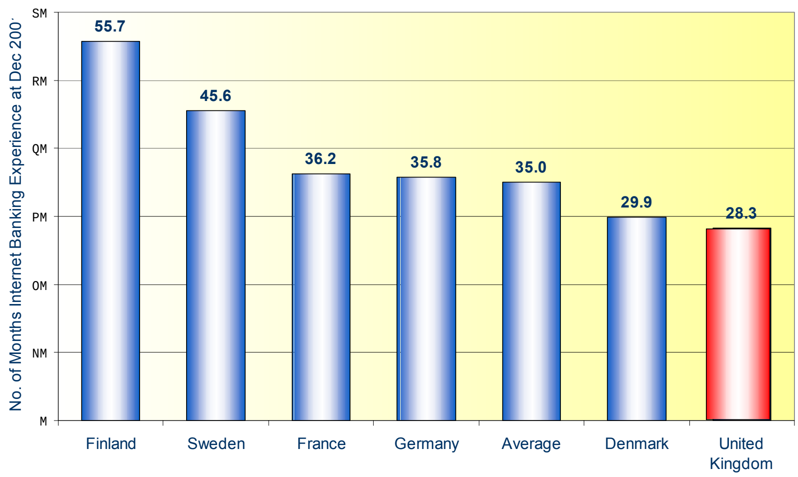


Source – Vicky Pryce "Innovation: Action for the Future", presentation made to the AIM Management Research Forum, April, 2003

3.3 Process Innovations

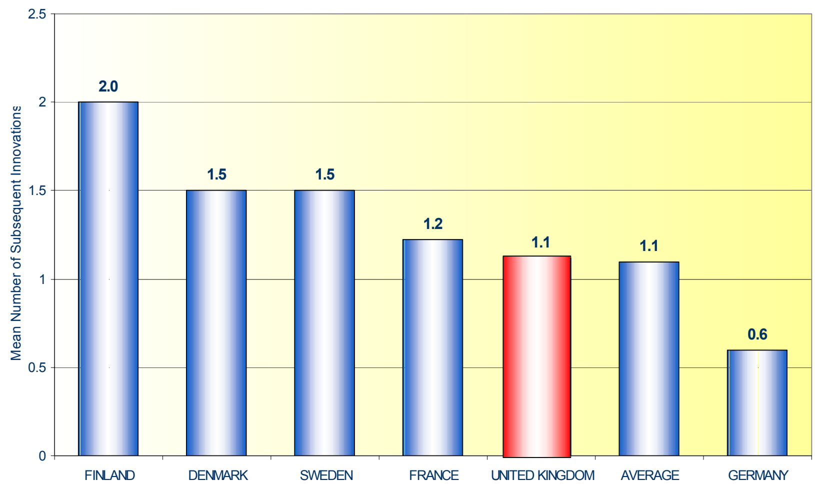
Although the public focus of innovation tends to be on company outputs, changes to organisational processes or technologies can have an equally major impact on performance. Again, there are indications that the UK lags behind others in the adoption of these innovations. For example, a recent study by Schlie et al., (2003) examined the speed with which banks across 6 European countries adopted the Internet and other digital media as vehicles for their retail financial services. The study found that UK banks were on average the slowest of the 6 countries studied: the average number of months of internet banking experience they had by December 2001 was 28.3 in comparison with 55.7, 45.6, 36.2, 35.0, and 29.9 months for Finland, Sweden, France, Germany and Denmark respectively). The study also found that UK banks lagged banks from these other countries in the number of alternative digital media they had employed to provide retail financial services.

Figure 4: Adoption Speed of Internet for Retail Banking
by Banks Across Select European Countries



Source – Schlie, E., Prabhu, J. and Chandy, R. (2003), “Legacy Effects in Radical Innovation: A Study of European Internet Banking,” Judge Institute of Management Working paper.

Figure 5: Mean Number of Incremental Innovations by Retail Banks
Across Select European Countries (PDA, Mobile and TV Banking)



Source – Schlie, E., Prabhu, J. and Chandy, R. (2003), “Legacy Effects in Radical Innovation: A Study of European Internet Banking,” Judge Institute of Management Working paper.

Another study by Clegg et al.(2002a) compared the uptake of modern management practices (e.g. Total Quality Management, supply chain-partnering, integrated computer-based technology) across a total of 880 UK, Australian, Japanese, and Swiss manufacturing companies. It was found that in general companies in the UK adopted fewer practices and had less success with the practices than their counterparts abroad. A further point was that UK-owned companies in the UK adopted fewer practices than their foreign-owned counterparts in the UK, while UK companies abroad adopted fewer practices than the host companies and other foreign-owned companies. This finding is reinforced by Tomlinson and Coombs’

(1998) analysis of the CBI Innovation Trends Survey that showed that overseas companies operating in the UK were more likely than their indigenous counterparts to exhibit innovation behaviour involving the exploitation of novel technologies.

Table 3: The Extent to Which Practices Are Used[a] & For How Long They Have Been Used[b, 5]

	UK		*Japan*		*Australia*		*Switzerland*		
Practice	Use	Yrs	Use	Yrs	Use	Yrs	Use	Yrs	Sig
Total Quality Management	42%	4	61%	9	55%	5	54%	4	***
Just-In-Time	41%	5	40%	9	39%	6	61%	7	***
Integrated Computer-based Technology	34%	5	40%	7	39%	7	61%	8	***
Total Protective Maintenance	15%	4	39%	7	26%	5	35%	5	***
Team Based Working	35%	3	22%	5	45%	4	50%	4	***
Empowerment	23%	3	21%	7	34%	3	47%	5	***
Learning Culture	25%	3	33%	10	31%	4	48%	6	***
Outsourcing	12%	10	35%	15	13%	8	20%	8	***
Supply-Chain Partnering	44%	5	44%	12	47%	5	55%	6	*

[a] Percentage of companies using the practice 'substantially' ('entirely' or 'a lot')
[b] Median number of years in practice has been in use
* $p<.05$ *** $p<.001$

[5] Clegg et al. (2002a). "An international study of the use and effectiveness of modern manufacturing practices". *Human Factors and Ergonomics in Manufacturing*, 12, 171-191.

To add to this discussion, the European Innovation Scoreboard (The European Commission, 2001) compares the innovation strengths and weaknesses of Small and Medium Enterprises (SMEs) across EU countries and classifies the UK as being above the EU mean but "losing momentum". The comparative strengths of the UK appear to be in terms of its numbers of science and engineering graduates, adult participation in lifelong learning and availability of high technology venture capital. However, weaknesses are apparent in the lack of new capital raised, SMEs innovating in-house and innovation expenditure. A trend in declining public and business R&D expenditure was highlighted and this situation looks to be the same for other types of firms (CBI, 2002).

3.4 Value Added in Innovation

Value added is usually thought of as the difference between a product's sale price and the cost of all inputs. Whereas in the past, British firms led value added in several different industries, the ranks of leading edge firms seem to have shrunk in recent years. According to DTI (2002), the average value added by British firms lags behind the G5 average in almost every sector except Pharmaceuticals and Railroad equipment. More specifically, according to DTI (www.innovation.gov.uk) in the top nine European 'Electrical and Electronics' companies (ranked according to value added) only one was British (Invensys). Similarly, in the 'Automobile,' 'Engineering and Machinery' and 'Diversified Industrials' sectors, traditionally British strengths, not a single UK firm features in the top ten European firms according to value added. Finally, whereas three out of the top five 'Software and IT' firms are French, none are British.

Relatively poor British performance compared to leading European countries is additionally worrying because the gap in value added between the U.S. and Europe as a whole also appears to be growing. According to the European Competitiveness Report (2000), in technology driven industries, unit value of European exports is 40% lower than that of imports from the US (in bilateral trade). Furthermore, the US has been increasing its unit value more than the European Union. Europe's longer-term position in several technology intensive industries is threatened by both emerging economies such as Korea and China, and by competitors at the cutting edge, such as the U.S. and Japan.

In summary:

- It appears that although the UK contains some world-class innovators, in general it can only be currently classed as moderately innovative.
- Since many firms in the UK have seen their strength as competing in terms of low cost rather than unique value, it has been suggested that this may have led to a low skills/low innovation equilibrium in the economy (Aiginger, 2000; Porter and Ketels, 2003).
- With other countries becoming increasingly effective at competing on cost, the need for UK firms to adopt more innovation-based strategies becomes imperative.

It is important to understand the notion of value added and how firms can move up the value chain. Related to this is the issue of understanding the dynamic processes that drive innovation within and between organisations and the effect of the broader environmental context in which they operate. In the next section we first discuss how organisations can move up the value chain and then introduce a model of innovation dynamics derived from the discussion that took then place during the AIM Management Research Forum.

4. THE INNOVATION DYNAMICS

4.1 Moving Up the Value Chain

All firms constitute value chains in which value is added at various stages to inputs. Firms differentiate themselves on the basis of where in the value chain they are uniquely positioned to add most value. However, with growing modularisation of products, there is hardly any firm that makes a complex product entirely by itself (Baldwin and Clark, 2000). Indeed, the various components of a product are divided up amongst numerous different players. For example, several firms are involved in designing, manufacturing and assembling a personal computer but, critically, not all these firms add an equal amount of value to the product, and thus their economic contributions vary.

In order to remain competitive and consistently increase profitability, firms need to move up the value chain in their industries over time. Take for instance the case of Acer Computers of Taiwan. Starting with all the handicaps of a firm based in an emerging economy, Acer has gradually become a frontline brand in PCs. While they focused initially on assembling machines for larger brands, they kept creeping up both ends of the value chain, adding value through more innovative designs, efficient assembly and branding. In a space of less than two decades, Acer moved from being a manufacturer of standardized components to one of the leading brands in the PC industry, synonymous with innovation.

The ability of a firm to reach and then stay at the leading edge of its industry is not only a function of entrepreneurial ability, strategy and opportunity, but also of its home environment. The Dutch flower industry, whose members collectively dominate the US $ 40 billion (in 1995) world flower market, is a case in point (see box).

The Dutch Flower Industry

The Netherlands has consistently moved up the value chain in the flower industry, thus decreasing their vulnerability to serious comparative factor weaknesses such as high cost of land, scarce irrigation water and high labour costs.

However, the country boasts the most advanced research institutes specializing in flowers, highly developed transportation and storage facilities, as well as a state-of-the-art auctioning infrastructure. Moreover, government regulation such as the Agricultural Quality Act ensures a consistently high level of quality in the industry. Highly advanced facilities for testing (such as the Bulb Research Center, involved in research regarding cultivation, plant physiology, plant diseases, plant protection, farm economics, and mechanization used in the culture of flower bulbs and bulb flowers) enable implementation of stringent quality control.

This infrastructure has allowed Dutch companies to retain their competitive advantage even as tissue culture production shifted to lower wage countries such as Poland, Portugal, India, Malaysia, South Africa and Brazil. Thus, while the number of companies operating in the Netherlands decreased from 30 in 1990 to 20 at the end of 1994, the Netherlands kept the more sophisticated parts of tissue culture propagation. Similarly, even as flowers are produced outside the Netherlands, the auctioning infrastructure in the Netherlands handles 60-70 per cent of the total world flower production, adding tremendous value.

A value chain approach suggests that firms need to innovate in order to move into higher value segments of their industries. However, innovation is a complex process that involves the interplay of factors both within and outside organisations. The next section introduces a multi-level model of innovation dynamics.

4.2 The Innovation Dynamics Model

Development of the model/framework

The discussions of the policy-makers, academics and practitioners at the AIM Management Research Forum produced a wide variety of comments, suggestions and evidence on factors influencing organisational innovativeness. After the Forum, the authors of the report systematically analysed all the collected outputs from the Forum and collated them into a number of major themes. The relationships between the themes were debated and the Innovation Dynamics Model emerged as the most effective framework within which to describe these issues (see figure 6). The model can be considered as addressing the innovation dynamics of firms at three levels:

Intra-organisational dynamics where:

- Different innovation practices and processes need to be understood and used effectively by firms.
- Organisations are market-oriented and involve their customers in identifying and developing useful innovations.
- Management acquires the knowledge, skills and capabilities to drive innovation at all levels of the organisation.
- Management thinks strategically and long-term.
- Resources and incentives are provided for innovation activities.

Inter-organisational dynamics where:

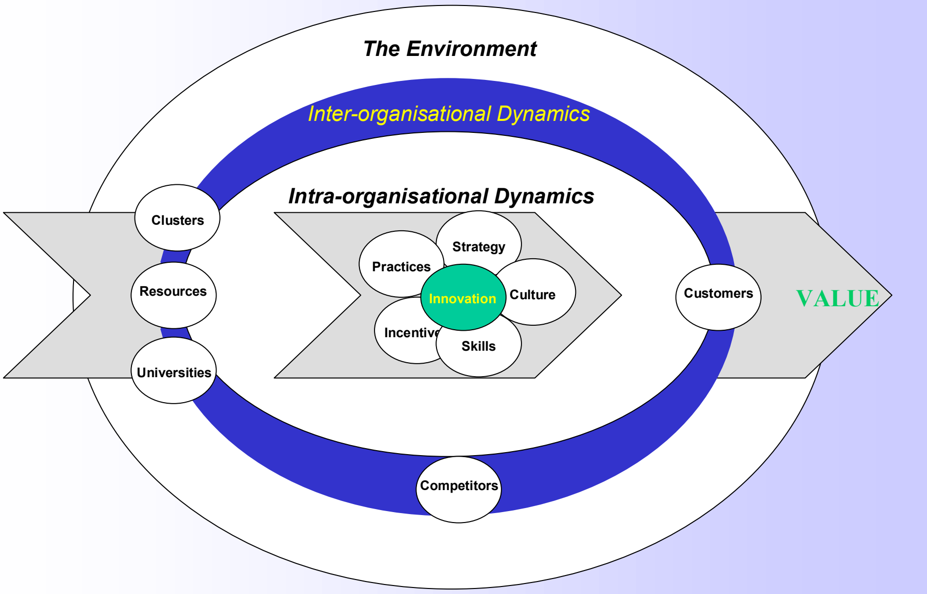
- Firms benefit from stronger linkages with universities and other research institutions.
- Clusters of firms provide a useful route to promoting innovation.

Environmental dynamics where:

- Government policy encourages and supports the innovation activities of firms.

The following Sections will critically review the theoretical bases and empirical evidence underlying each of these dynamics of influence on innovation and draw out the relevant policy implications where warranted and highlight further research needs where required.

Figure 6: The Innovation Dynamics Model



5. INTRA-ORGANISATIONAL INNOVATION DYNAMICS

5.1 Strategy and Culture

Strategy is a multi-faceted concept, often quoted but rarely explored in a practical sense. A useful distinction can be made between strategy formulation and execution. Formulation is concerned with setting direction and focus, whereas execution is concerned with making the strategy come alive. Recent research suggests that formulation is far easier than execution. In fact, research conducted by Bain, the management consultancy, found that the two most popular senior management tools were strategic planning (used by 76% of firms) and mission and vision statements (used by 70% of firms). Contrast this, however, with research published in the Fortune Magazine that found that less than 10% of strategies effectively formulated are effectively executed and research conducted by Charan and Colvin (1999), which found that “strategy is less than half the battle… In the majority of cases – we estimate 70% – the real problem isn’t [bad strategy]…. It’s bad execution.”

A significant challenge here is how to “translate strategy into action” (Kaplan and Norton, 1996). The point is that far too often strategy is expressed in vague and open terms that cannot be challenged, but also cannot be enacted. So it is with innovation. We need to find ways of translating broad concepts, such as “we must innovate more”, into specific actions that individuals within organisations can relate to and act upon.

Insight from the AIM Management Research Forum:

Individuals within organisations have to understand how their actions and activities relate to the broader organisational goals. Studies show that only 20-30% of employees know what the firm’s goals are.

Senior managers are responsible for establishing the vision, goals and strategy of the organisation and deciding resource allocation. The innovation agenda therefore needs to initially be set at this level if the whole organisation is to seriously move towards a fundamentally more creative direction. As discussed above, setting the direction is not enough in itself; innovation also needs to be embedded in the values and beliefs that the organisation holds. The CBI (2001) innovation survey concluded that the most innovative organisations (counted as Millennium Award winners) had the most positive innovation culture.

What would an innovative organisational culture look like? Drawing on the CBI study and much other research in the area, the following aspects should be apparent:

5.1.1 Motivation

- All employees should be motivated to try out new ideas. Many studies have emphasised the importance of individual motivation as a contributor to workplace creativity (Amabile, 1988; Ford, 1996; Sternberg and Lubart, 1996).

- Employees must be acknowledged for their efforts. Rewards can take many forms apart from the financial. For example, recognition from immediate managers, public recognition in company newsletters or certificates of achievement can also be valued by employees.

- Especially significant is the finding that employees will perform more creatively if motivated by the work itself (intrinsic motivation), rather than by rewards or punishments (Collins and Amabile, 1999).

- In many jobs, creativity is not seen as a requirement. The extent to which creativity is a formal requirement of the job is strongly associated with the level of innovation (Unsworth and Wall, 2002).

Insight from the AIM Management Research Forum:

The AIM Management Research Forum suggested that generally positive images of innovation and entrepreneurship in the UK are hampered by a lack of identifiable role models and the poor media presentation of these individuals. Research suggests that less than half of all firms have a specific board level champion for innovation (CBI survey, 2001).

In a survey conducted by Ernst and Young, (2003) over 600 of the UKs leading entrepreneurs were surveyed to ascertain their perceptions of UK industry, including their motivations and challenges. The entrepreneurs were asked which business people they admired the most. The list was topped by Sir Richard Branson (24%). The top ten included three Americans: Bill Gates (9%), Jack Welch (6%) and Warren Buffet (2%). British role models included Stelios Hajilannou, James Dyson and Anita Roddick who was the highest-ranking woman in eleventh place. In addition to high profile business role models, many respondents said that parents or grandparents who were business owners acted as a strong motivation for entrepreneurship. The survey also highlighted the importance of having good professional managers act as mentors within organisations.

5.1.2 Opportunity

- Employees must be given opportunities to explore, investigate and experiment. These can be through particular processes such as idea capture schemes (Leach et al., 2002).

- Providing employees with more autonomy in their jobs has been associated with greater levels of individual innovation (e.g. Bailyn, 1985; Axtell et al., 2000).

5.1.3 Support

- Supervisory support, work group support and organisational encouragement are all important influences on individual creativity (Amabile et al., 1996).

- Line managers can provide support in three ways (Port et al., 2003).
  - Helping employees learn how to innovate by sharing their knowledge, skills and experience and role-modelling the desired behaviours.
  - Enhancing employee motivation and confidence by giving supportive encouragement and feedback.
  - Providing opportunities for innovation by giving freedom and resources to employees and being open to challenge and willing to change.

5.1.4 Organisational Climate

- Employees' contribution to innovation is influenced by the degree to which they trust the organisation will take their ideas seriously, indicating the importance of creating a climate of openness and honesty (Clegg et al., 2002b; Ford and Gioia, 2000).

5.1.5 Learning Culture

- Research shows that organisations that actively encourage continuous learning and development in their employees are more innovative (Shipton et al., 2003).

- Exposing the workforce to a greater variety of stimuli can develop the motivation of individuals to learn new things and increase their knowledge and skills to work with innovations.

5.1.6 Strategy and Culture: Where Does the UK stand?

Given that the above draws on a disparate range of studies, there is no simple comparison that can be done of the UK against other nations in terms of all these cultural aspects. Some interesting points can be made, though. Rajan's (2001) survey of 830 senior business and finance executives found that UK firms saw creativity as less important in its own right relative to counterparts in Europe, Asia Pacific, Latin America and the Middle East / Africa. Furthermore, the Clegg et al., (2001) international survey of modern manufacturing practices showed that the UK lagged significantly behind Australia, Switzerland and Japan on uptake of empowerment and learning culture approaches. There are hints that UK firms may not be culturally as innovative as our competitors, but more robust evidence needs to be gathered to support this supposition.

Policy Implications:

Strategy and culture are largely intra-organisational issues that are the responsibility of management. AIM Forum participants suggested that government could:

- Encourage top management to set explicit innovation targets and objectives in their strategy and ensure alignment of organisational, group and individual objectives.

- Encourage top management to sanction a systemic culture change that embeds the values of creativity and innovation in both the people and the processes of the organisation.

- Encourage management at all levels to provide some slack, time and resource in the system to enable innovation efforts.

- Promote reflection and learning from practice within firms.

- Increase the quantity and quality of education and development opportunities for middle and line management to learn about the day-to-day management of innovation (e.g. how to be innovative in themselves, how to manage the creativity of others, awareness of different practices that can be used to generate and implement ideas).

- Raise the profile of professional British managers.

5.2 Innovation Practices

Researchers have generated different models of the innovation process but most appear to highlight at least four key aspects that need to be addressed by the organisation (e.g. Wolfe, 1994). First, there should be activities that usefully identify significant opportunities, problems or needs that would benefit from innovative solutions. Second, there is a stage in which a number of ideas should be generated or captured which could address the opportunity/problem/need; it is important that as broad a range of options as possible are considered at this point in order to encourage truly novel solutions. Third, there should then be a systematic evaluation of the generated ideas to identify the best options to take forward. Fourth, there is the extended implementation phase, which involves various activities to put the selected ideas into practice (e.g. development, prototyping, market testing, routinised production). The inference is that different strengths and capabilities are required for each of these aspects, but the better the organisation is at all of them, then the more successful their innovations will prove to be.

Although Research and Development functions are seen as a major route to creating new products and services, organisations can establish activities to involve all employees in the aforementioned types of innovation activities. Research has been conducted to uncover what these practices might involve, how common they are and whether they do relate to innovation performance.

5.2.1 Idea Generation and Capture Systems

Idea capture systems provide an opportunity for employees, customers or suppliers to share their ideas so that their relevance and feasibility can be assessed. Savings from these schemes can be substantial, but there is very low participation in UK organisations compared to those abroad. A study of 160 idea capture schemes in the UK by Leach et al., (2002) found that more effective schemes:

- Involve end-users in the development of the scheme and its rewards, recognition and feedback systems.

- Give timely, detailed and encouraging feedback to employees on their ideas.

- Have rewards (not just monetary ones) that are perceived as being fairly distributed and valued by employees.

- Engage in sufficient marketing and continuous publicity to maintain the momentum of the scheme.

- Are visibly supported by senior management.

- Encourage use of the schemes as part of daily work.

Many organisations actively undertake systematic approaches to locate and assess good practice elsewhere in attempts to improve their own performance. Benchmarking comparisons can be made both externally, with direct competitors or those in other industries, and internally, examining similar operations within different parts of the organisation.

- Organisations that benchmark their operations frequently tend to be more innovative (Leach et al., 2001).

- Organisations should benchmark themselves using an audit tool in terms of their innovation processes and outcomes in order to highlight areas for improvement (Turgoose et al., 2000).

5.2.2 Ideas Management Systems

Having captured ideas, the organisation is faced with the task of making the best use of those ideas. The CBI (2001) survey of 350 UK firms suggested that UK companies might be weaker in this area.

- Under 40% of the companies they surveyed had a formal process for monitoring and evaluating innovation and only 56% stated they reviewed past ideas regularly to spot new opportunities.

- Only 15% of companies used IT to keep track of their ideas and a lower amount considered selling or trading unexploited ideas with other organisations.

5.2.3 Employee Participation In Decision-Making

- A survey of 500 UK organisations showed that those that conducted extensive internal and external discussion and negotiation prior to idea implementation, were more likely to produce successful innovations (Leach et al., 2001).

- By broadening participation in decision-making, the organisation is encouraging a wider range of viewpoints and ideas from which to choose. This also helps motivate employees by giving them a sense of ownership and control over changes at work, as opposed to them resisting imposed changes.

5.2.4 Innovation Practices: Where Does the UK stand?

The CBI (2001) Innovation Survey showed the most popular methods for capturing ideas were through having ideas meetings with customers and suppliers, followed by employee suggestion schemes. Using multi-skilled learners and monitoring academic research were the other most common methods utilised for generating ideas. This study found that the most innovative organisations used more of these idea generation practices and also allocated time and resources for people to follow-up their own ideas. The CBI report concluded that although organisations were now doing reasonably well in processes for generating and capturing ideas, the management of those ideas was haphazard and risked missing valuable opportunities.

Policy Implications:

- Dissemination of best practice in idea generation and capture schemes.
- Initiatives to support the use of idea generation and capture schemes.
- Support benchmarking groups or initiatives.
- National databases and studies to highlight the most effective organisational practices.
- Support usage of innovation audit tools.
- Encourage systematic employee participation initiatives.
- Involve employees in the development of empowerment practices.

5.3 Skills

Management at all levels should play a major role in influencing the innovativeness of their organisations (Nonaka, 1991). The Strategy and Culture section discusses the role of top management in driving innovation in firms. Middle management has the role of implementing the organisation's general innovation aspirations through concrete functional processes and practices. Finally, many studies have shown that line managers have a crucial responsibility in managing the day-to-day creativity of their employees. For example, Tierney et al., (1999), in a study of Research and Development departments, showed that the quality of leader-member exchange was a significant predictor of employee innovation. In a truly innovative organisation, all employees have a chance to contribute and Axtell et al., (2000) found that shop-floor employees with more supportive managers were more likely to have their ideas implemented.

When it comes to the specific knowledge, skills and abilities required by management to successfully carry out these innovation roles, there appears to be little clarity and guidance. Creativity training workshops are popular in some organisations, but there is much less on the management of innovation (CBI, 2002).

Insight from the AIM Management Research Forum:

An interesting, and novel theme debated at the AIM Management Research Forum, was whether employee mobility in the UK helped or hindered innovation within firms. The conventional wisdom is that employee mobility helps, because it ensures a regular flow of new ideas into the firm. It could, however, be argued that employee mobility hinders innovation as it prevents people from seeing the big picture and where the organisation is going in the longer term.

5.3.1 Creativity and Innovation Training

- Despite their widespread use, little evidence exists about the effectiveness of creativity and innovation training and education initiatives.

Insight from the AIM Management Research Forum:

A recent study by Birdi (2003) of three different types of creativity course found that they all improved employees' generation of ideas, but that idea implementation was much more strongly determined by organisational factors (e.g. management support). These findings combined with others (Wang and Horng, 2002) imply that this type of training can enhance idea generation and innovation motivation, but if the work environment is not supportive of innovation then few of these ideas will be put into practice.

- More research is required into the precise nature of skills needed to both generate and implement ideas and the best means of conveying and ensuring application of the learning.

- Organisations can consider other routes to stimulate learning about creativity. These include providing access to books, articles and web resources, setting up innovation discussion groups and encouraging coaching by line managers.

5.3.2 Getting The Mix Right

- Beyond a focus on the individual manager, an important issue is the mix of people and skills in a management team.

- For example, West and Anderson's (1996) study of top management teams showed that their group processes best predicted the overall level of team innovation, while the proportion of innovative team members predicted radicalness of decisions. This finding clearly has implications for both the selection and development of management teams.

5.3.3 Skills: Where Does the UK Stand?

Handy (1987) showed that less management education was conducted in the UK relative to Germany, USA, France and Japan. The 1990s saw a series of attempts to address that situation. Storey, Mabey and Thomson's (1997) study of management development in 900 UK organisations indicated that significant improvements had been made. For example, more organisations rated management development as important, participation rates had increased and the use of formal qualifications was more common. The trend has continued over the last few years. In 1996 23% of managers had a degree, while in 2001 that went up to 30% (Tamkin et al., 2002) and the number of MBAs grew from 8,000 per year in 1995 to 11,000 in 2000 (CEML, 2002).

While qualifications and educational participation are one measure of management development, many other informal routes exist such as coaching and mentoring. Storey et al., (1997) found that more of these activities were also being used compared to previous years. In fact, many organisations see MBAs as less effective methods of management development compared to mentoring, action learning and cross-functional working (Horne and Stedman Jones, 2001). There is also some evidence that UK organisations prefer to use these work-based methods more than their continental neighbours (Tregaskis, 1997).

However a major issue we came across is the lack of evidence of the impact of management development activities on organisational performance (CEML, 2002). In a recent survey of companies, 80% of HR participants said their organisation had yet to build frameworks to gauge the impact of management development on their business (Staunton and Giles, 2001). Furthermore, despite the increase in management education, a recent UK survey indicated that nearly half of all junior managers rated the quality of leadership in their organisations as poor while only 15% of CEOs or Managing Directors rated the quality of leadership as high (Horne and Stedman Jones, 2001). Furthermore, national data from the Workplace Employee Relations Survey (1998) shows that employees feel there are still notable skill deficits e.g. 24% of managers were classed as poor at dealing with work problems and 34% as poor at responding to suggestions from employees (Tamkin et al., 2002). Inadequate management skills have also been pointed out by other studies as significant contributors to lost working days and poor relative adoption of lean manufacturing practices in the UK (EEF, 2001; Proudfoot Consulting, 2002).

In summary, the last decade has witnessed increased participation in management education and development activities in the UK but there has been little evidence gathered of the impact of these activities on organisational performance. Current research by Mabey (2002) is attempting to track these linkages, but more still needs to be done on this front. There are questions also as to the type of knowledge and skills being taught in business schools and their relevance to the contemporary workplace (CEML, 2002). We can particularly consider this with regards to innovation and its management. There is currently very little systematic evidence as to how effectively managers are taught about innovation through either educational (e.g. MBAs) or work-based routes (e.g. creativity training). There is therefore a pressing need to address this issue of how to develop the right types of skills in the right types of ways for UK managers.

One particular study that is ongoing is being conducted by Port et al., (2003) and seeks to identify line managerial behaviours that enhance employee innovation. Using data from 389 employees in 6 organisations, initial results indicate that the management behaviours can be structured into four key themes, representing the manager's own innovation level, feedback style, social interaction style, and willingness to empower staff. This on-going research will have implications for line management development and education processes, but work is needed at the higher levels of management, too.

Policy Implications:

- Gather comparative data establishing the quality of UK managers against other economies.
- Support new research to establish the best routes through which management education and development can impact on organisational performance.
- Audit MBAs and other management courses for how management of innovation is taught. Ensure good practice guidelines are being conveyed.

- Identify how to evaluate better the impact of management development activities.
- Educate children and students to encourage more creative and autonomous thinking and learning.
- Review content of undergraduate programmes to ensure that there is an appropriate balance between technical and managerial skills for future employers.

5.4 Resources and Incentives

Successful innovation requires two broad types of capabilities: those needed to create innovations and those needed to commercialise them (Mowery and Rosenberg, 1998; Teitelman, 1994). Developing each of these types of capabilities requires the sustained expenditure of substantial resources needed to build technological and market assets over time (Sorescu et al., 2003).

The technology needed to create radical innovations has grown increasingly complex with time. Often it is only large firms that possess cutting edge know-how or have the resources to create new know-how by investing in Research and Development (Schumpeter, 1942). Further, few firms can develop all the latest know-how internally. Instead, new technology must frequently be purchased from external sources through acquisition, licensing or partnership (see John, Weiss, and Dutta 1999, Wind and Mahajan, 1997; Kotabe et al., 1996). Each of these options in turn requires resources that only the largest firms may possess.

Creating innovations is not enough. Firms must also be able to extract value from them. This in turn requires market-based assets such as brand recognition and brand equity, both of which require sustained expenditures on advertising and distribution over time.

Because innovations, especially radical innovations, use new technologies and serve new markets they are particularly risky and prone to failure. New technologies are poorly understood and lack the refinements that come with time. New markets too are uncertain: there is always the possibility that consumers will be slow to adopt the innovation, if they adopt it at all. Consequently, innovation requires access to financial resources to ride out the high risk of failure that accompanies radical innovation (Arrow, 1962; Comanor, 1965).

In sum, only the largest firms may have the resources to:

1. Build technological and market capabilities.
2. Buy those capabilities they cannot build.
3. Ride out the high risk of failure.

While large firms may have access to resources they may not always employ these resources in the manner most suited to innovation. Innovation, especially radical innovation, requires a long-term commitment to developing the necessary technological and market assets. If firms' resources come largely from one source of financing, say equity versus debt markets (as Porter and Ketels 2003 point out is the case for UK firms), then this could lead to a short-term approach that works against innovation. Similarly, if firms face macro-economic instability (as the same authors indicate was once the case for UK firms) then this might result in a legacy of risk aversion that also works against investing for innovation. Small firms too may be influenced by external factors in their use of resources for innovation. For instance, they may face credit rationing (higher interest rates, smaller loans) that can impair growth or even lead to failure following the introduction of a radical innovation (Scanlon, 1984).

In addition to these external factors, there are also internal factors that drive firms' incentives to invest in and take the calculated risks needed for innovation. Large firms are likely to be bureaucratic and inertial. They are also likely to be complacent and risk-averse. Their past successes may sow the seeds of their subsequent inability to innovate because innovation means change and involves switching customers and technology (Cooper and Schendel, 1976). Given their investments in current customers and technology, it is hard for large firms to abandon these and move on (Christensen, 1997). Small firms, on the other hand, are organisationally flexible and nimble. By definition they are more entrepreneurial. All this makes them better able to embrace new technologies and markets and to innovate.

Small and medium sized firms therefore also have an important role to play in any economy. Their dynamism and entrepreneurial nature often enable them to overcome their resource disadvantage and to innovate. Further, the relative strengths and weaknesses of large and small firms set up the possibility of various forms of collaboration between them.

- Small firms may come up with innovative ideas that they then license or sell to large firms to develop and commercialise.

- Large firms may attempt to re-create the dynamism of small firms within their own organisations by providing financial or non-financial incentives needed to foster an entrepreneurial culture as 3M does (Bartlett and Mohammed, 1995).

Insight from the AIM Management Research Forum:

Large firms can also adopt other organisational forms such as internal markets that ensure speed and accountability for in-house innovation, or create spin-offs that benefit from the resources of the parent firm while ensuring the entrepreneurial spirit of the small firm (Damanpour, 1987; Damanpour, 1991; Damanpour and Gopalakrishnan, 2001).

Research by Julian Birkinshaw (London Business School) has found that up to 80% of spin off corporate ventures in the UK fail, despite the benefits outlined above.

5.4.1 Reward Systems for Innovation

Providing employees with recognition for their contributions to innovation is vital (Collins and Amabile, 1999) and can take the form of both financial and non-financial rewards (e.g. the awards for innovation offered by BAE Systems to its employees).

- The most innovative organisations operated some form of reward system for the innovation of their employees (CBI, 2001).

5.4.2 Accepting Risk

Innovative organisations accept that risk is inherent in creative ventures.

- The Isaksen et al., (2001) study of the best and worst climates for creativity identified risk-taking as a key discriminating dimension.

- The CBI (2001) study on innovation showed that Millennium Award winning companies were more likely to undertake at least one high-risk venture a year compared to non-winners.

- An innovation culture should reflect this acceptance of risk by showing a tolerance for errors and rewarding effort as well outcomes.

- There also needs to be an element of learning from any mistakes that are made, by instigating regular reviews and reflective practices.

- There have been suggestions that the UK culture is currently more risk-averse than others abroad (Rajan, 2001) but other evidence questions this (CBI, 2001).

5.4.3 Resources and Incentives: Where Does the UK Stand?

Current evidence suggests that small firms in the UK may be better at innovating in terms of counts per employee, but not in terms of value generated per employee (see Tether, 1998). Further, a survey of 400 UK firms conducted by the CBI between January and March 2002 finds a "clear correlation between company size and the types of resources put into idea generation, with the largest companies being most active. For example, 71% of companies with 5000+ employees use formal staff suggestion schemes, compared to just 33% of SMEs; and 75% of large companies have a specific future-watch activity, compared to just 30% of SMEs."

Large UK firms do not make very good use of their resources in terms of investing over time in developing technological and market assets. On the one hand, judging by the Porter and Ketels Report (2003) and statistics from the DTI: UK firms are relatively poor on R&D investment, capital expenditure and patenting. However, the Porter and Ketels Report concludes that UK firms are good at marketing and branding, but does not substantiate this conclusion with figures or analysis.

The CBI survey mentioned above finds that the:

> *"Recent economic downturn has had an effect on 84% of companies in the survey. Most have taken the short to medium-term measures of cutting back on technology spending and reducing the recruitment of skilled staff, while nearly a third have increased their marketing. Where investments in new technology have been made this had usually been in an effort to reduce costs and/or increase productivity. Of most concern is that 43% of the largest firms have recently reduced or even cancelled R&D spending. The sectors hardest hit are telecommunications and electrical and electronic engineering."*

The CBI (2001) survey of 350 companies finds that only just over half of their respondents (55%) "offered financial or other rewards to their innovative individual or teams." The survey also finds that there is a direct relationship between firm size and the use of such rewards. Only 40% of SMEs, compared to over 70% of large firms, offered rewards linked to innovation success. Regarding non-financial rewards: small firms barely used them (8%) compared to 67% of large firms that did.

Policy Implications:

- Identify role model large firms that make good use of resources to build and buy technological and market assets.
- Identify role model large firms that successfully employ new organisational forms such as spin outs (e.g., like Prudential did with Egg).
- Identify role model small firms that find creative ways to innovate despite the lack of access to resources, perhaps by collaborating with academia or large firms (e.g., Biotech start-ups in clusters such as Silicon Fen).
- Explore the role that foreign direct investment plays in stimulating productivity and innovation.

6. INTER-ORGANISATIONAL INNOVATION DYNAMICS

6.1 Customers and Market Orientation

Consumers are crucial to the Innovation Dynamics Model. Not only are they critical to the commercialisation of innovations, determining whether new products live or die in the marketplace, but they are increasingly critical to the creation of innovations as well. Thus, lead users provide valuable input into the development of innovations and enable the testing of radical innovations even before they are launched (von Hippel, 1988). And, following launch, innovators (the venturesome few) and early adopters (opinion leaders respected by other members of society) enable the quick and successful diffusion of innovations through the economy (Rogers, 1995). Understanding the role of these consumers in the creation and commercialisation of innovations is just as important as understanding the role of the firms involved. Moreover, it is important to understand how firms work with these consumers in facilitating the innovation process.

Individual consumers are not the only customers in an economy. Very often, firms and organisations are consumers of goods and services as well. Among organisational consumers, there are few more powerful and potentially influential than government agencies and public sector organisations. These organisational customers can be an important influence in shaping the direction of innovation and facilitating the diffusion of innovation through the economy at large.

Market orientation is 'the organisation-wide generation of market intelligence pertaining to customers, competitors, and those affecting them, internal dissemination of the intelligence, and reaction as well as proactive responsiveness to the intelligence' (Jaworski and Kohli, 1996). Over the last decade, there has been gathering consensus about the role of firms' market orientation in facilitating innovation.

- Firms that are more market oriented develop more new products, are more successful with the commercialisation of these products and perform better in the long run as a consequence (Han et al., 1998; Hurley and Hult, 1998; Narver et al., 2000; Ottum and Moore, 1997).

The implication of these findings is that in order to be innovative firms must:

- Stay close to customers.
- Scan markets for changes in customer preferences and new competitive offerings.
- Respond to changing customer preferences by involving cross-functional teams in new product development.

Recently, there has been some debate about whether market orientation is always a good thing or whether in some cases it might actually deter innovation within firms.

- Some have argued that staying close to current customers blinds firms to new market developments and hampers their ability to keep innovating over time (Christensen and Bower, 1996; Christensen, 1997).

- Firms that are too market oriented, i.e., too close to current customers, might consequently miss out on new market opportunities.

While there is merit to this view, it does not, however, negate the important role of being market oriented.

- Being too market oriented can be a problem for incumbent firms, but clearly start-up firms need to be market oriented if they are to capture any market share.

- Start-ups are more likely to be developed in response to a market opportunity, thus boosting overall innovation within the economy and forcing large incumbents to innovate.

- Being market oriented and therefore close to current customers does not automatically imply ignoring future customers (Slater and Narver, 1998). Indeed, being truly market oriented means being close to all types of customers: existing and potential. The ability to do this is of course a considerable challenge for all kinds of firms: large and small, new and old alike.

6.1.1 Customers and Market Orientation: Where Does the UK Stand?

Current evidence suggests that UK consumers are on the whole only moderately innovative. A study of the speed to take-off of home appliance and consumer electronics innovations in 16 European countries in the 1930-2000 period (Tellis et al., 2003) concludes that: "Based on the consistent inter-country difference in time-to-takeoff, we can classify the 16 countries according to their innovativeness:

- Highly Innovative: Norway, Sweden, Denmark, Finland

- Moderately Innovative: UK, Ireland, Germany, Austria, Belgium, Netherlands, Switzerland

- Laggard: France, Portugal, Spain, Italy and Greece."

The study also finds that "large, developed economies, such as the UK, Germany and France, show early product introductions, but late product takeoffs, while Scandinavian countries, such as Sweden and Norway, show relatively late product introductions and early takeoff." They suggest that UK consumers are less prone to adopt new innovations than some other European consumers.

The apparent lack of interest of UK consumers contrasts with a recent survey of 400 UK firms conducted by the CBI (2002), which finds that:

> *"Of the key factors driving innovation, customers were clear leaders followed by competitive pressures from the UK and overseas. Encouragingly, almost all companies do now engage customers in the process of ideas generation and many (69%) also link up to their suppliers."*

Policy Implications:

- Facilitate the diffusion of innovations through the economy. Develop motivational strategies aimed at identifying and rewarding lead users, innovators and early adopters.
- Play a crucial role as lead users and innovative consumers of radical innovations, driving the design and development but also the adoption of innovations in the economy. The government and public sector organisations have an important role to play as large and powerful consumers. For example, the government's use of the Internet or mobile phones to develop applications related to the filing of income tax returns or voting can help facilitate the uptake of e-commerce and m-commerce applications, as well as the up-take of broadband (from AIM Management Research Forum)
- Measure and reward firms for being market oriented.
- Develop index of innovation for firms and consumers across sectors to help benchmark and facilitate the identification of role models.
- Encourage regular entry of start-ups into markets.

6.2 University-Industry Links

That it is highly useful to have extensive links between academia and industry is now well established. Universities frequently provide technological expertise needed by companies, particularly in science-intensive industries. As well as creating new knowledge in the form of research results, universities contribute to innovation by supplying skilled graduates; creating new instrumentation and methods; assisting with technological problem-solving; and generating new firms (Salter et al, 2000).

Several researchers have demonstrated the tangible benefits of industry-academia linkages. For instance, MacPherson (2002) showed that based on a large-scale survey, innovation rates were higher among firms that exploit university resources. Similarly, George et al., analyzed almost 2,500 university alliances formed by 147 publicly traded biotechnology firms and found that companies with university linkages had lower research and development (R&D) expenses and higher levels of innovative output in some respects than companies without such alliances.

At a wider level, the economy also benefits from spin offs created by institutions of higher education (HEI). These spin offs often tend to be knowledge-based and add tremendous value to the economy. Increasingly, it is realized that if a national economy is to remain competitive, its HEI's must create new firms, as well as engage with existing firms. This becomes even more important, as the knowledge systems accessed by various sectors in the economy become increasingly distributed (Howells, 2000). Indeed, few companies can afford to rely only on in-house talent for needed expertise.

Finally, strong industry-university relationships play an increasing role in determining the economic payoffs of public and private investment in R&D as well as a country's attractiveness for venture capital and for highly qualified and mobile professionals

(OECD, 2002). For a detailed discussion of the benefits of industry-academia linkages see Martin et al.(1996).

While there is significant evidence of the benefits of collaboration between academia and industry, there are also concerns about the extent to which this collaboration takes place. Of current topical interest is the issue of how to enhance links between Universities and Industry. Digby Jones, Director General of the CBI, for example, has recently called for "Universities and lecturers [to] accept their role as training providers for industry or see UK businesses look to overseas institutions for the graduate employees they require[6]". The National Audit Office is reported to have claimed that "the gulf between academics and policy-makers means that much of the £1.4 billion that the government spends on research each year is wasted[7]". As a result the Treasury has launched the Lambert Review to explore the issue of how to enhance links.

6.2.1 University and Industry Links: Where Does the UK Stand?

Fortunately, the UK Science Base is extremely strong, both in its research productivity and scientific impact. It is broad based and performs well in most areas of research despite spending less in real terms between 1986-97 than many OECD countries (DTI, 2002). In 1999, with only 1% of the world's population, the UK produced 8% of the world's scientific research papers. British scientific publications are also among the most heavily-cited – attracting 9% of total citations in 1999. The UK leads France and Germany and rivals the US and Canada in terms of papers and citations per head (DTI, 2002).

The UK is particularly creative in science and technology having over seventy Nobel prize-winners for Science, some of the finest research facilities in the world and an excellent reputation for both scientific research and technological development (British Council Report on Innovation in the UK).

However, to what extent British firms and the economy in general is taking advantage of this is debatable. Howells (2000) for instance suggests that the UK has been much less effective than many OECD countries in commercialising the innovation that takes place in its universities. Thus, while the UK has a much higher level of scientific publications and citation rate than Japan, it is nowhere near Japan when it comes to number of patents.

Porter and Ketels (2003) also suggest that UK patenting in the U.S. is characterized by a low role of universities and other public institutions, a "danger sign in modern technology development and commercialisation processes." In comparison, France, a country with a roughly equal level of overall U.S. patenting, registers a significantly larger role for universities and research institutions in patenting. This is consistent with UK universities being less active in commercialisation efforts than their peers in other advanced economies.

Porter points out that a shift in the way research and development (R&D) is organized is strengthening the role played by universities in commercial R&D. In the past, universities did basic science, while companies worked separately on applications for commercial use. Today, these boundaries have blurred, and successful R&D often involves cooperation throughout the innovation process. Private sector research is increasingly related to public sector research. Funding universities has become imperative not only to keep the HEIs competitive but to keep

[6] Digby Jones, Director General of the CBI, Times Higher, 18th April 2003.
[7] National Audit Office Report, April 2003.

the economy strong. The relatively low level of financing for UK universities as well as universities' low levels of patenting are indications that the industry-academia relationship in the UK needs to be improved (at least outside of the life sciences).

This conclusion is also borne out by the fact that the proportion of enterprises citing the science base as an important source of knowledge is relatively low across Europe as a whole (Guinet and Cervantes, 2002). Academic research varies in the extent to which it has direct application to firms' innovation efforts. It plays an important role in sectors such as Pharmaceuticals, Aerospace and Computers, but in the majority of industries, university research has to undergo a slow period of diffusion – through the training of new graduates, dissemination of new techniques, further research or consultancy.

Admittedly, government policy in the past has focused on this issue, and several programs are now underway targeting a better utilization of UK's strong science base. Notable among these are the Teaching Company Scheme (TCS) and the Cooperative Awards in Science and Engineering (CASE). A number of more specific initiatives are run by the Research Councils, which are also seeking to provide postgraduate education and training geared towards industry needs. For instance, the EPSRC offers an Engineering Doctorate program (4 year award designed to develop innovative ideas, while tackling industrial problems); Postgraduate Training Partnerships (jointly funded by DTI); Research Masters; Total Technology; Integrated Graduate Development Scheme; and several fellowships. Similarly, a Graduate Schools program has been set up by the EPSRC (one week long courses to broaden the skills training of postgraduate engineers and in particular to help prepare them for employment). The success of this scheme can be gauged from the fact that only around 1000 students pass through Graduate Schools each year (Howells, 2000).

Although causal relationships are tenuous at best, and data is limited, it appears that some progress has been made in this regard. For instance, Howells et al., (1998) point out that the UK has a growing number of spin-off businesses that have been set up by universities to exploit a particular research potential. Indeed, by 1998, around half of the universities surveyed by Howells et al., (1998) had set up such concerns, identifying a total of 223 companies. Similarly, the second annual Higher Education Business Interaction Survey reveals that during 2000-2001 the number of spin-off companies from the UK's HEIs rose by 22%. The number of patents filed by higher education institutions has grown by 26% and the number of intellectual property licenses by 25%.

6.2.2 The Road Ahead

To achieve high quality entrepreneurial activity the general infrastructure has to be put in place. And whatever success the UK has found so far has been at the cost of excessive pressure on the existing infrastructure. Apart from physical infrastructure, availability of cheap capital is necessary to create new enterprises. Unfortunately, UK start-ups find it difficult to attract Venture Capital funding. UK funds tend to focus on highly profitable, and productivity-enhancing, Management Buy-outs rather than start-ups, which are considered riskier and less liquid. Thus, UK firms face higher cost of capital on average than their international competitors (DTI, 2002).

Apart from ensuring private equity for new ventures, we also need to create a better trained, dynamic labour market for both scientific and managerial purposes. At the same time, more investment in public infrastructure is needed. Thus, we need to escalate the rate of investment in the educational system, the transportation infrastructure, and in UK's scientific and technological capacity.

Much more research is needed to ascertain how well the industry-academia linkages are working in Britain. A close linkage is needed not only for R&D purposes, but also to ensure that firms are aware of their strategic positions in their respective industries. In other words, it is not only technological research, but also managerial and social research that can make the difference between a competitive and non-competitive firm.

Moreover, as MacPherson (2002) found, firms tend to benefit more from university linkages if they already have an in-house R&D effort going, and are willing to invest in academic interaction. Similarly, Goldfarb and Henrekson (2003) discovered that top-down government policies of setting up publicly funded intermediaries commercialising innovations occurring in universities do not tend to work as well as bottom-up approaches in which universities compete for research funds, which leads to significant academic freedom to interact with industry.

Policy Implications:

- Facilitate technology commercialisation processes for universities.
- Look into the development of academic centres of excellence based on the needs of clusters situated around universities.
- Carry out more research on how firms collaborate with universities, and the benefits that they derive from such associations.

6.3 Clusters and Innovation

While in today's world, companies are encouraged to look across the globe for the best deals on sourcing capital, information, technology and other inputs, the emphasis on the importance of local links is decreasing. However, as Porter (1998) has argued, such thinking conflicts with reality. The odds of finding a world-class mutual fund company in Boston are higher than in almost any other place. Similarly, the likelihood of finding a leading biotech company is higher in South East UK than in most places in Europe. This is because companies have discovered that despite the allure of global sourcing, the benefits of having a network of suppliers proximate to you can yield tremendous benefits. It is no wonder then that clusters dominate today's economic map of the world.

A cluster is a geographically proximate group of companies and associated institutions in a particular field, linked by commonalities and complementarities, through market or non-market links (Porter, 1998). Geographical proximity allows accumulation of related know-how, often spanning several industries. For instance, companies specializing in light-emitting polymers may choose to locate in a cluster where their products are used and developed further, or companies specializing in optics may choose to situate next to large camera or optical lenses manufacturers. Similarly, it has been determined that learning and adaptation to changing market conditions and technological shifts are much better handled at a regional level since tacit knowledge is communicated more efficiently when actors are co-located (Todtling and Kaufmann, 2001; Vickers and North, 2001).

Moreover, as Harding and Cowling argue, "as expertise starts to build, specialist financiers, accountants and lawyers are established to support the base in knowledge production and, accordingly, any start-up businesses are provided with appropriate and readily accessible advice and consultancy. In addition, the development of clusters of sector-specific firms creates a regional job market for specialist managers and workers. This provides an important safety net for prospective sector-specific entrepreneurs and their employees, who know that if their current employment, or new business ceases they can swiftly gain employment in the region" (2003:2).

These dynamics associated with clusters have led several researchers to declare that national competitive advantage is generated at the regional rather than the national level (Cooke and Morgan, 1998; Harding, 2000). And not surprisingly, policy makers have been attracted to the cluster phenomenon. What is surprising in this context is the relative absence of research on the nature and scope of clusters, or the measurement of their influence on wider economic performance (Harding and Cowling, 2003). In particular, as pointed out by the Business Clusters in the UK Report (1998), there has been a lack of research into clusters in Britain. While the Business Clusters in the UK Report itself does a remarkably comprehensive job of drawing up a detailed inventory of existing clusters across all sectors of the UK economy, it remains at the level of clusters, choosing not to analyse firm dynamics within them.

Insight from the AIM Management Research Forum:

Among the most important roles that government can play in fostering a climate of innovation is as an investor in critical infrastructure. Such infrastructure would principally include but not be restricted to transportation (roads, airports, ports etc) and telecommunications, as demonstrated by the Dutch flower case and Finland with Nokia.

Further, it is hard and perhaps inadvisable for government to try and start clusters from scratch. A more sensible approach to cluster creation would be for government to develop infrastructure around geographical areas that already include universities and entrepreneurial activity. For instance, the expansion of Stansted Airport to include transatlantic flights would be a big boost to innovation in the Cambridge cluster. These issues are, of course, often politically charged.

Many participants in the Management Research Forum felt that in this regard the UK government lacks **ambition**. What is needed is a far-seeing plan (vision) for what the UK's infrastructure needs will be in the *future* as opposed to merely filling current demand.

Thus, while we know that the financial services and in particular, banking (based primarily in London) are UK's most successful clusters followed by ICT/electronics in Eastern region, we know little about firm behaviour in these particular clusters. Similarly, our knowledge of firm behaviour in declining clusters (such as food processing and footwear manufacture) remains almost non-existent. This is especially frustrating given some evidence that some of this decline appears to be due to the failure of the food processing machinery manufacturers to adapt to shifting demands in the market – the consumers demanded hot smoked food while the UK machinery industry was geared to cold smoking.

While being in a cluster has its advantages, it cannot compensate for poor awareness of market conditions, failure to adapt to technological shifts, or better management of the process of innovation. It is imperative then, that we conduct more research on organisational dynamics within clusters, in particular the ability of organisations to access knowledge (both from HEIs and other firms).

Current evidence suggests that UK firms are not very good at collaborating with each other or with other sources of innovative ideas. A recent CRIC report by Tomlinson and Coombs (1998) concludes that: “Foreign firms operating in the UK are somewhat more likely than comparable UK firms to exhibit innovation behaviour involving the use of novel technologies and externally sourced technologies.” The CBI survey mentioned above finds that “a mere 18% of firms surveyed considered selling, trading or spinning out ideas that could not be used straight away.”

Policy Implications:

- Carry out more research on firm-level dynamics within clusters.
- Research on the reasons for the variable performance of clusters.
- Finally, create knowledge on the socio-economic dynamics inherent in university-cluster linkages.

6.4 Mergers and Acquisitions: Do They Help Innovation?

In high-technology industries, the level of market and technological uncertainty is often so high that firms cannot rely purely on internally generated knowledge (John et al., 1999). For example, as Saxenian (1994) notes, Digital Equipment Corporation’s overriding reliance on internally generated knowledge was a prime cause of its decline and subsequent takeover by Compaq.

Acquisitions are a very important means by which firms can access and build on external ideas. Indeed, “a well-planned policy of external acquisition affords technology strategy options that a ‘go-it-alone’ attitude would preclude,” Capon and Glazer (1987, p. 6). An innovation strategy that includes acquisitions may sometimes also be more cost-effective than one solely based on internal R&D.

However, much research suggests that acquisitions tend to *hurt*, not help innovation (Ernst and Vitt 2000; Hitt et al., 1991a). First, firms may take on considerable debt to finance acquisitions; the interest expenses and repayments associated with the debt may choke off funds needed for innovation (Hitt et al., 1991b). Second, the many activities involved in trying to consummate and integrate acquisitions can distract managers from the task of innovation (Hitt et al., 1990). Finally, key employees, including scientists and champions of innovation may leave the firm after acquisition (Ernst and Vitt, 2000). As a result, acquisitions have been referred to as a “poison pill” for innovation (Hitt et al., 1991b).

Nevertheless, these conclusions may be too general and unnecessarily pessimistic. Many technology-intensive firms acquire other firms as a means of boosting innovation (Chaudhuri and Tabrizi, 1999). Indeed, innovation is a primary goal of acquisitions in knowledge intensive contexts (e.g., Weston et al., 1999). Anecdotal evidence suggests that some firms do appear to succeed at innovation from acquisitions. For example, some observers attribute Johnson & Johnson's strong innovation record to its ability to spot and integrate its acquisition of other firms (Barrett, 2002).

Some very recent research suggests that acquisitions may actually be good for innovation, provided that firms pursue a careful strategy of growth. Thus, firms that are rich in internal knowledge to begin with are likely to achieve significantly greater innovation from their acquisitions than other firms. In particular, a sustained process of internal knowledge development in a particular technological area can pay off by enabling the firm to better identify and assimilate knowledge generated by outside firms (Ahuja and Katila, 2001; Prabhu et al., 2003). A key implication of this research for UK firms that choose to use acquisitions to improve their ability to innovate is that they should build internal know-how before they try to buy and use external know-how through acquisitions.

Policy Implications:

- Identify the extent to which UK firms acquire other firms for market power and cost efficiency reasons as opposed to reasons of gaining access to new technology and innovation.
- Understand better how the stock market and fiscal policy in general drive more short-term rather than long-term approaches to acquisition and innovation within UK firms.
- Identify role model UK firms that pursue acquisitions within a well thought out and consistent strategy of growth. In particular, identify those firms that pursue a sustained process of knowledge development by linking internal knowledge with appropriate sources of external knowledge.

7. ENVIRONMENTAL INNOVATION DYNAMICS

The government has a crucial role to play in creating an environment in which businesses can flourish.

Participants at the AIM Management Research Forum identified four significant roles for national government:

- Regulation of the macro environment.
- Creation of an internationally competitive business environment.
- Creation of policies designed to facilitate innovation.
- Communicate good practice.

7.1 Regulation of the Macro Environment

British industrial relations and fiscal policy have traditionally been antagonistic to innovation and enterprise. The UK economy has also been characterised by volatile economic fluctuations between boom and bust. However, over recent years the economic environment has been stabilised. Whilst, the continuing global economic slowdown has increased unemployment in the US, Japan and Germany, unemployment levels in the UK have remained low, partly due to government-introduced schemes such as New Deal and welfare-to-work.

7.2 Creation of an Internationally Competitive Business Environment

Whilst the UK has strengths in some of these areas, particularly low levels of regulation and openness to trade, the Global Competitiveness Report (GCR) highlighted two major weaknesses.

- A history of underinvestment in the country's infrastructure (physical, administrative, IT, science and technology).
- The creation of a skills gap by an educational structure, weak in science, engineering and technology.

AIM Management Research Forum Insight: The Nokia Story

The significant role that government can play in developing innovation can be best exemplified by the creation of an internationally competitive environment for ICT in Finland.

Recently, Finland has become one of the worlds leading producers and consumers of information and communication technologies. Nokia, Finland's Flagship Company has become the world market leader in mobile phones with almost one third of the market share. The development of Nokia appears to have been strongly influenced by the competitive business environment and the result of far-sighted, goal-oriented national policy.

The business environment: the foundations for rapid growth
Mobile communications and digital transmission systems were developed in Finland since the 1960s. Traditionally, there has been fairly open competition among operators and equipment suppliers, which has promoted innovation and the diffusion of new technology. This was enhanced in the 1980s when the government deregulated the ICT sector. Finland was the first country in the world to initiate the application process for licences for telecommunications with the third generation mobile technology.

Rather than auctioning licences the government allocated them to four operators. This enabled these companies to avoid the high costs of bidding for licences in other European countries. The country also benefited from a highly skilled labour force. Within Finland there has been a history of collaboration between supplier and operators. Further, the strong relations and interaction between firms and universities has enhanced learning and the diffusion of new technologies and knowledge.

Government policy to enhance innovation
Since then, national policies have been intent on making Finland the leader in information. TEKES, the National Technology Agency of Finland, was founded in 1983 and has been the principle organisation for implementing technology policy and is directly responsible to the Ministry of Trade and Industry.

The report *Finland – towards an information society (December 1994)* outlined the government's commitment to promoting an information society and providing the necessary infrastructure. The *Information strategy for Education and Research (Ministry of Education, 1995)* highlighted the changes needed in education and culture in order to meet the needs of the information strategy. Various government departments produced action plans and provided funding for ICT projects and the *National Information Society Committee* and the *Information Society Forum* were formed to coordinate policy.

Nokia

Nokia was founded in 1865, but began its rise to prominence during the 1970s and 1980s, by its growth in the television sector. Nokia became a shareholder in Televa, a government controlled company that developed digital telephone exchanges. The Government also provided significant financial support for Nokia through TEKES. In the 1980s Nokia redefined its strategy towards consumer electronics, communication, and personal computers. By the early 1990s the company reoriented towards global growth markets, particularly mobile communications.

In addition to the business environment and support of the national government, Nokia's success can also be attributed to company strategy and the leadership of several keys visionaries and its ability to take advantage of its local and international network. The company invests heavily in research and development; it has developed the Nokia Research Centre, an independent research unit with locations in many countries. The research centre has strong links with the government, TEKES, the universities and the local business clusters.

7.3 Creation of Policies Designed to Facilitate Innovation

National governments have a number of direct innovation policies that can be used to influence the functioning of their national innovation systems.

Table 4: Innovation Policy Across Several Countries[8]

Intervention / Programme	Country
Centres of Excellence – to create critical mass through networking	Canada
Foresight Programmes	UK, Germany, Japan
Government purchasing	Norway
Industrial R and D grants	Most
Innovation culture schemes (e.g. young enterprise schemes)	UK, USA
Innovation management (techniques)	EU, Canada
Intellectual property system improvements	UK
Learning from the good practices of others	UK (Best Practice and benchmarking)
Promoting electronic commerce	USA, UK, EU

Intervention / Programme	Country
Promoting linkages among innovating organisations and clustering	UK, Scotland, Wales, Ireland, Holland, Scandinavia
Reach out fund to promote university interaction with business	UK, Norway
Regional Innovation funds aimed at forging links at the regional level	USA, UK
Small business innovation research programme funds to enhance university links with small businesses	USA, UK
Support for research	UK, Finland
Tax incentives (e.g. tax concessions for RandD)	EU, UK
Teaching company schemes	UK
Technology incubators to develop new firms	USA, Canada, Israel, Finland, Norway
Technology transfer / diffusion programmes	Most
Universities to develop different roles – supporting internationally rated research groups, while others work with regional and local businesses	UK
Venture capital	Most

[8] Source: Adapted from http://www.isr.gov.au/library/content_library/2InnovationSupportOverseasMiles.doc
Further information on all EU-supported RandD activities, including programmes, projects can be obtained from the Community Research and Development Information Service (**CORDIS**).

The European Commission has recently published a study entitled *Innovation Tomorrow,* which evaluates the EU's innovation policies and suggests that government policy needs to take into account the interfaces between innovation and other policies such as competition, employment and education. The report concluded that national governments could improve innovation performance by:

- Recognising the importance of innovation as an integrated dimension within all policy areas.
- Reducing red tape and bureaucratic procedures if innovation policies are to be adopted.
- Understanding drivers of innovation at the company level as well as the external factors that enable or constrain innovation.

7.4 Communicating Good Practice

Within the UK, the government and other agencies have attempted to communicate good innovation practice by documenting and presenting "best practice" in a given area. Case studies or carefully documented case histories are produced to provide a description of a situation in which the best practice is used, what it does, how it works, and how it is implemented. Thus, managers can learn from others' attempts, and avoid costly and time-consuming duplication. Examples can be found at:

- Living innovation – examples of companies who have benefited from the innovation framework (www.livinginnovation.org).
- Smart Award Winners – case studies of firms, which have used SMART awards to foster innovation.
- Design Council Millennium Products – lessons learnt from new product development, which have benefited from innovation.
- Benchmark Index - allows a company to measure its performance against others.
- Confederation of British Industry - PROBE (PROmoting Business Excellence). Benchmarking tools.
- DTI Management Best Practice – range of information sources on management best practices, techniques and technologies (www.dti.gov.uk/mbp).
- Fit for the Future – CBI / DTI scheme to create widespread awareness of the value to be gained from adopting best practice (www.fitforthefuture.org.uk).
- Inside UK Enterprise – A programme of one-day visits to UK companies committed to improving the performance of their businesses through best practice implementation (www.iuke.co.uk).

Policy Implications:

- Fiscal policy should ensure a stable economy is critical for innovation.
- Improve the country's infrastructure and improve the general level of education and skills amongst the workforce.
- Innovation policy should be integrated into other policy areas.
- Reduce red tape and bureaucratic procedures.
- Communicate good practice.

8. POLICY AND RESEARCH IMPLICATIONS

When the draft version of this report was completed it was circulated to all participants in the AIM Management Research Forum, who were then invited to vote for which of the policy implications identified in the report were most important and why they felt this was the case. The responses were analyzed and an integrated set of policy implications developed. These are listed below, under three different categories – implications for Government, implications for business support agencies and practitioners, implications for the research community.

Implications for the Government:

1. Promote reflection and learning from practice within firms by identifying and disseminating information about best practices and role models. This should cover far more than the traditional emphasis simply on best practice, e.g.:

   - Idea generation, capture and management schemes.

   - Role model firms that find creative ways to innovate despite the lack of access to resources.

   - Role model large firms that make good use of resources to build and buy technological and market assets.

   - Role model firms that pursue acquisitions within a well thought out and consistent strategy of growth. In particular, identify those firms that pursue a sustained process of knowledge development by linking internal knowledge with appropriate sources of external knowledge.

   - Role model firms that successfully employ new organisational forms such as spin outs.

   - The Government as a role model using its purchasing power to influence organisations throughout the supply chain.

2. Provide an economic environment that encourages and facilitates innovation, including:

   - Encourage regular entry of start-ups into markets.

   - Facilitate the diffusion of innovations through the economy.

3. Continue to pursue the strategy of joined up Government:

   - Reduce red tape and bureaucratic procedures.

   - Ensure innovation policy is integrated with other policy areas.

4. Develop index of innovation for firms and consumers across sectors to help benchmark and facilitate the identification of role models.

Implications for Managers and Business Support Services (including Universities)

5. The Role of Top Management:

   - Set explicit innovation targets and objectives in their strategy. Ensure alignment of organisational, group and individual objectives.

   - Sanction a systemic culture change that embeds the values of creativity and innovation in both the people and the processes of the organisation.

   - Encourage management at all levels to provide some slack, time and resource in the system to enable innovation efforts.

6. The Role of Middle Management:

   - Support the use of idea generation, capture and management schemes.

   - Support benchmarking groups or initiatives.

7. The Role of Support Organisations:

   - Facilitate technology commercialisation processes involving collaboration between businesses and universities.

   - Increase the quantity and quality of education and development opportunities for middle and line management to learn about the day- to-day management of innovation (e.g. how to be innovative in themselves, how to manage the creativity of others, awareness of different practices that can be used to generate and implement ideas).

Implications for the Research Community (including the ESRC and EPSRC)

Research is required to provide sufficient data for evidence-based policy making in several important areas. Topics for further investigation include:

8. Gathering comparative data establishing the quality of UK managers against other economies.

9. The best routes through which management education and development can impact on organisational performance.

10. How firms collaborate with universities, and the benefits that they derive from such associations.

11. The relative performance differentials of clusters.

12. The impact of the stock market and fiscal policy – especially its impact on short-termism, the culture of acquisition and relative lack of innovation within UK firms.

13. The role that Foreign Direct Investment plays in stimulating productivity and innovation.

14. Development of national databases and studies that can be used by the academic community to explore the most effective organisational practices.

15. Clearly much research has already been conducted on some of these topics and some of the prescriptions for practitioners and policy makers are obvious. A key question that remains therefore, is why are more people not acting on what is known? This topic merits further research and will be the subject of a future AIM report.

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Appendix 1: Themes and Work-Streams in the DTI Innovation Review

1. Economic Analysis - What contribution does innovation make to productivity? What is the importance of that contribution? What factors impact on the rate of innovation? How well does the UK do on factors which affect innovation? This work will lead to a better understanding of the contribution that innovation makes to productivity, the market failures in the UK and will set out an initial menu of policy options.

2. Innovation in Business - How does innovation happen within business and how does it diffuse throughout the business environment? What is the role of science and technology within service sector businesses? What are the implications for policy?

3. IPR and Design - What more could organisations like Patent Office and Design Council do to improve the rate of innovation within business, communicate better with business, and raise the profile of the benefits of design and innovation? How well does the intellectual property framework at UK, European and international levels serve UK business and the academic community?

4. Regulation/NMS/Standards - How do the regulatory frameworks impact upon the competitiveness and innovativeness of business? How can the design and means of implementation of regulations, or alternatives such as guidance, voluntary agreements and longer term goals be used to drive innovation? What could the NMS do in the future to diffuse and promote new standards and to accelerate developments in areas such as biotechnology and nanotechnology?

5. Technology - This theme will identify key existing and emerging technologies with the potential separately or in combination to have significant and pervasive impacts on markets and businesses. What Government policies and programmes can make a real difference and how could they be improved?

6. Business best practice and collaboration - What sort of business networks and relationships (including supply chains) can be used to drive innovation better? What role does DTI/Government have in stimulating and facilitating more effective business networks?

7. People, Skills and Management - We will look at the demand from business for skilled labour and identify skills shortages. Together with DfES, Sector Skills Councils and RDA's we will examine how we can improve the supply of skills to meet the needs of the economy of tomorrow. How do management skills and organisation of the workforce drive innovation and productivity? DTI and DfES will determine an action plan for promoting best practice in this area.

8. Finance and Investment - We will investigate the effects of fiscal and investment measures on the innovation performance of UK business. Is access to finance a barrier to improved productivity considering factors such as size and stage of business and size and availability of investment? What activities should the DTI and others undertake to make the market work more effectively?

9. International strategic comparisons - What are competitor governments, regions and other stakeholders doing to promote innovation, how do we compare, and what lessons can we learn? Particular attention may be paid to USA (California), Scandinavia, Germany and China. We will also review what the UK does to promote UK as innovative internationally through, for example, Invest UK, Trade Partners and International Technology Promoters, e.g. "Innovation UK" in Japan.

10. International Relationships: EU and Worldwide - We will examine how we can make better use of EU membership and international relationships to improve the rate of UK innovation, drawing on the knowledge base of Scientific Attaches and the International Technology Service. What strategic advantage do UK businesses derive from collaboration abroad and what can DTI/Government do to increase UK innovation performance through these institutional arrangements, programmes and networks?

11. Regional innovation strategies, including devolved administrations and RDAs - We will consider how effectively clusters, incubators, regional networks and other policies and activities promote innovation at a regional level within the UK. We will look at the links between universities and education and Science and Industry Councils to assess their impact on business innovation and what key changes would have the potential to make significant improvements to business performance?

12. OGDs' Science and Innovation Strategies - We will examine how the many parts of government that promote or use innovation operate. What can Government departments can do to promote innovation; both as intelligent customers and in terms of the technology they develop (e.g. MoD, NHS). What key changes would have the potential to significantly increase innovation?

Source: www.innovation.project@DTI.dsi.gov.uk

Appendix 2: Delegates at the AIM Management Research Forum

Adrian Alsop…………………………………………………………………………………………………… ESRC
John Baker……………………….……………………………………………………………………..DTI
Pardip Bans, Cabinet Office………………………………………………………………….....Strategy Unit
Dr John Barber………………………………………………………………………………………….DTI
Mark Beatson…………………………………………………………………………………………...DTI
Dr Kamal Birdi………………………………………………………………………….. University of Sheffield
Dr. Julian Birkinshaw………………………………………………………………..London Business School
Dr Brian Blunden……………………………………………………………………………………..Airto
David Clarke……………………………………………………………………….....Rolls Royce Aerospace
Maria Cody……………………………………………………………………………………………..DTI
Dr David Denyer……………………………………………………….. Cranfield School of Management
Professor James Fleck…………………………………..School of Management, University of Edinburgh
Dr. Lynda Gratton……………………………………………………………….London Business School
Rebecca Harding………………………………………………………………….....The Work Foundation
Professor Chris Hendry……………………………………………………………………City University
Walter Herriott…………………………………………………………………..St Johns Innovation Centre
Professor Mike Hobday………………………………………………………………....Sussex University
Paul Hollinshead, Cabinet Office……………………………………………………………..Strategy Unit
Professor Anne Huff……………………………………………………………………………………AIM
David Hughes…………………………………………………………………………………………...DTI
Mike Keoghan…………………………………………………………………………………………..DTI
Andrew Miller……………………………………………………………………..Small Business Service
Dr Kamal Munir…………………………………………………………………..University of Cambridge
Professor Andy Neely……………………………………………………………………………………..AIM
Professor Nick Oliver……………………………………………………………....University of Cambridge
Dr Jaideep Prabhu……………………………………………………………….....University of Cambridge
Vicky Pryce……………………………………………………………………………….……….DTI
Professor Goran Roos……………………………………………………………………….…..ICS Ltd
Daniel Storey……………………………………………………………………………………Treasury
Clive Taylor……………………………………………………………………………………….Gartner
Dr Mike Tubbs………………………………………………………………………………………….DTI
Professor Toby Wall…………………………………………………………………..University of Sheffield
David Way………………………………………………………………………………………………DTI
Professor Michael West………………………………………………………………Aston Business School
John Wilson……………………………………………………………………………………………...AIM

Appendix 3:
The Predefined Questions Posed by AIM and the DTI to the AIM Management Research Forum April 29th 2003.

- *Do we agree that past improvements in the UK business environment place us in a good position to move up the international productivity and innovation league tables (as argued by Professor Porter)? How far is this true across all industrial sectors?*

- *What more does the UK need to do in order to make the transition from an economy competing on relatively low input costs and an efficient business environment to a high value, innovative economy?*

- *What must UK firms do in order to become more innovative? What are the factors that will help them become more innovative and what are the factors that will constrain them? What role do strengths and weaknesses in management play? (In all cases, what is the research evidence to support our collective assertions)?*

- *Is the picture consistent across contextual variables – e.g. industry sectors and firm size?*

- *What are the challenges that UK management must meet in order for UK Business to prosper and grow? What role does increasing innovation play and is UK Management capable of achieving this?*

- *How far do any deficiencies in UK management lie with the quality of individual managers, with weaknesses in the management structures adopted by UK firms or with the strategy setting of firms and their relationships with stakeholders?*

- *What role, if any, can Government play in improving the quality and performance of UK management?*

- *What role can government more generally – both national and local - play in helping build the factors that will enable firms become more innovative? Is the government equipped to do this?*

Appendix 4:
Rationale for the Definition of Innovation used in this Report

The Department for Trade and Industry define innovation as the successful exploitation of new ideas. This is a valuable definition because it makes clear that innovation is more than simply invention. A point originally made by Freeman (1982) who says "an invention is an idea, a sketch or model for a new or improved device, product, process or system" whereas "an innovation in the economic sense is accomplished only with the first commercial transaction involving the new product, process, system or device".

While implicit, it is important to make the point that "the successful exploitation of new ideas" does not have to relate to products alone. Innovation encompasses product, process and organizational innovation, a point recognized by the OECD in 1981 and the EU in 1995 with their respective definitions:

"Product innovation refers to the new or improved product, equipment or service that is successful on the market. Process innovation involves the adoption of a new or improved manufacturing or distribution process, or a new method of social service" (OECD, 1981).

"In brief, innovation is: the renewal and enlargement of the range of products and services and the associated markets; the establishment of new methods of production, supply and distribution; the introduction of changes in management, work organisation, and the working conditions and skills of the workforce" (EC,1995).

For the purposes of this report we have adopted the DTI's broad definition of innovation, namely:

"Innovation is the successful exploitation of ideas, into new products, processes, services or business practices, and is a critical process for achieving the two complementary business goals of performance and growth, which in turn will help to close the productivity gap".