

Manufacturing

in the Knowledge Driven Economy

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Department of Trade and Industry

→ **Manufacturing
in the Knowledge Driven
Economy**

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‘Our success in the coming years will depend crucially on how well we exploit our knowledge, skills and creativity. Nowhere is this more evident than in manufacturing.’

the fastest growing and high value-added manufacturing industries such as semi-conductors, which are R&D and capital intensive. And although our manufacturers have been striving hard in recent years to improve their productivity, their strongest rivals overseas have in many cases done even better. Measured in terms of output per hour worked, we are now performing worse than our main competitors. We must and can do better.

I have some sympathy with those who say that the best thing Government can do for manufacturing is to stay out of its way. Certainly the first duty of Government towards manufacturing is to keep its macroeconomic house in order – to ensure a stable environment which avoids the peaks and slumps of the 1980s and early 1990s, to conduct an open and fair trade policy and a strong competition policy. Our actions over the last two years provide evidence of our determination to do all of those things.

But I believe firmly that the role of government does not end there. If we are to ensure that UK manufacturing plays a major role in the global knowledge driven economy of the next century, as I am determined it should, then we have important work to do. We must continue and increase our efforts to improve the UK’s skill base, through investing in education, promoting closer links between education and industry, and providing a supportive framework for technological advance. We must play our part in fostering strong partnerships, supply chains, clusters and other networks between businesses. We must strive to make the economic climate supportive to investment in tangible and intangible assets which will generate long-term rewards. And we must dispel the cynical anti-business culture which has done so much damage to post-war industry, by promoting a culture of enterprise and a will to succeed.

The purpose of this publication is to celebrate the success of our world-class manufacturers and to encourage others, including aspiring entrepreneurs, to follow

their example; to point out some of the key challenges which must be faced; and to explain what the Government intends to do - an agenda for action - over the coming years, to help UK manufacturing to regain its position as the envy of the world.



Secretary of State
for Trade and Industry

Executive summary

The purpose of this document

Manufacturing matters. It matters not just as a significant contributor to national prosperity - crucial as this is - but as the heart of a modern, knowledge driven economy. The growing interdependence of manufacturing and services reinforces the need for an innovative, creative and forward-looking manufacturing capacity in the future.

This Government is committed to ensuring it does all it can to help such a manufacturing sector flourish. The Competitiveness White Paper published last year, highlighted the impact of knowledge and the knowledge driven economy on all types of business. Some commentators have speculated that the knowledge driven economy was not relevant to manufacturers, or else only to high-technology manufacturers. This would be entirely wrong. This publication shows:

- *that all manufacturers, large or small and whether from a “traditional” or high-technology sector, are and must see themselves as part of the knowledge driven economy;*
- *that many UK manufacturers are already integrating this challenge into their thinking and actions but that many need to move faster;*
- *what the Government plans to do to help manufacturers compete in a knowledge driven economy and our agenda for action to take this forward.*

Manufacturing in a knowledge driven economy

Four key drivers are changing the nature of competition and the way manufacturers do business:

- *revolutionary changes in information and communication technologies are transforming every stage of the manufacturing process. These range from finding sources of research and applied development to use of the latest CAD techniques, to changing the relationship with customers and suppliers, to the way in which products can be marketed and sold;*
- *the increasing pace of change in science and technology is forcing manufacturers not only to invest faster than ever before in their next generation of products but also to keep abreast of the latest manufacturing techniques and processes in order to manufacture them competitively;*
- *increasingly global competition also requires manufacturers to add more value in their production processes to stay ahead of the cycle and to compete against lower cost rivals;*

“All manufacturers, large or small and whether from a “traditional” or high-technology sector, are and must see themselves as part of the knowledge driven economy.”

- *changing consumer demand - including for more sophisticated, customised and environmentally sound products - places new demands on manufacturing and R&D processes.*

On 10 September, the Secretary of State held a meeting with key business people and trade unionists to explore how industry and Government could work together to improve manufacturing competitiveness. The meeting identified four linked key themes which Government and manufacturers should address:

- *manufacturing profit depends increasingly on high value-added output achieved through developing new knowledge;*
- *the need to create a strong climate for investment in both R&D and capital;*
- *the need for manufacturers to adopt a culture of continuous improvement, innovation and best practice;*
- *the need to ensure that all levels of the workforce have the right skills and training.*

The 1998 Competitiveness White Paper looked at how the Government was helping UK business as a whole to develop capabilities in these areas. This publication looks at what Government is doing to help manufacturing specifically in these areas. It updates progress on initiatives announced for manufacturers in the 1998 White Paper and announces new measures in an “agenda for action”.

Creating and exploiting knowledge

Research and development are crucial to continuous product and process development and improvement. UK manufacturers invest more in R&D than almost any other sector. However compared with our international competitors, UK manufacturing’s investment in R&D is poor. To strengthen the UK manufacturing sector’s ability to compete in a modern economy, the Government will:

- *create an £180 million Enterprise Fund to stimulate the availability of finance for SMEs, to be in place by the end of 1999;*

- *develop next year, an R&D tax credit for small and medium sized businesses, extended to those not yet in profit;*
- *develop a vision of manufacturing in the next 20 years and provide practical guidance to help prepare manufacturing industry for the future, through the Manufacturing 2020 Foresight Panel;*
- *run a Sustainable Technologies Initiative worth £7.8 million to help businesses develop technologies to incorporate sustainability in their products and processes, and a new programme to help manufacturing businesses use recycled materials as a feedstock;*
- *support the Institute of Mechanical Engineers’ new Manufacturing Excellence Awards, including awards for best businesses which exemplify the Foresight approach;*
- *take forward consultations with the Regional Development Agencies about the potential for developing a network of regional centres for manufacturing excellence and productivity.*

People and skills

Increasing investment in R&D and innovation is of no benefit to manufacturing unless businesses have the technical and management skills to identify, adapt and apply this knowledge. Government will help manufacturers address skill requirements and skills shortages by:

- *supporting up to 15 proposals to help manufacturing SMEs cluster together to tackle engineering technician skill shortages through a new joint DTI/DfEE programme worth £1 million;*
- *addressing higher skills needs through expanding the Graduate Apprenticeship model;*
- *providing through DTI up to £4 million to address high-level skills needs in IT, communications and electronics;*
- *strengthening the National Training Organisation network including an additional £750,000 to promote projects to improve skills levels;*
- *providing £5 million to support projects which develop the partnership approach between employers and employee representatives.*

Information and communication technologies (ICTs)

The UK manufacturing sector makes good use of ICT compared with other UK industrial sectors. However it performs less well in comparison with overseas competitors; US, Canadian and Japanese manufacturers all conduct more transactions on-line than UK manufacturers. The Government has set ambitious new targets for improving the ICT performance of smaller businesses including manufacturing in the UK. The DTI will achieve this through:

- *an additional £20 million for the Information Society Initiative (ISI) - which provides SMEs with access to advice about ICT;*
- *supporting Technology Means Business which will raise the ability of small firms advisors to offer advice on how to integrate ICTs within a small business.*

Networks and best practice

A key way for manufacturers to exploit investment and the capabilities of their people and technologies is through networks such as supply chains, clusters and identifying and adapting best practice. DTI will assist manufacturers to do this by:

- *extending the motor industry's successful supply chain improvement model to oil, gas, aerospace and up to eight additional sectors;*
- *establishing local partnerships and supply chain development programmes to promote collaborative projects using ICTs;*
- *extending the Joint DETR/DTI Environmental Best Practice Programme for a further five years to help manufacturers save money and reduce their impact on the environment.*

Competitive modern markets

Greater competition acts as a spur to improved productivity. Government has a key responsibility in promoting a regulatory regime which promotes competition, protects the consumer and allows the manufacturing sector in the UK to flourish. Government will:

- *ensure the next WTO Round of trade liberalisation negotiations removes barriers to trade for manufacturers;*
- *work to provide an environment for manufacturing within the EU which matches the best in the world;*
- *develop a gateway for small businesses to access the information and advice they need to run their businesses more effectively;*
- *following consultation, consider introducing a radical new framework for merger control; and*
- *secure Royal Assent for the Electronic Communications Bill by April 2000.*



Case study:

Dunphy Combustion Limited

Dunphy is a smaller firm which produces burners. It embarked in 1994 on a project costing some £3 million to produce a research centre of excellence to take the business into the Millennium and beyond.

Dunphy Combustion Limited had established its position as a world class manufacturer but wanted to further develop its export potential and increase market share at home and abroad. It realised that long term it could no longer use minimum cost as a key competitive weapon and decided to concentrate on high value adding quality products with unique features and manufacturing technology, which is not easily copied.

Malcolm Dunphy, Managing Director says, "The research centre has already proven its worth to me. One of our most recent developments, a box burner incinerating ammonia with aniline water to prevent it from being ejected directly into the atmosphere has demonstrated that innovation and quality can succeed.

Another recent development from the centre is the T6 range of burner, reaching outputs in excess of 13MW, and the largest Monobloc burner in the world. It has also excelled original predictions, producing sales of 100% over forecasts.

Overall our export sales are some 36% higher than estimated and consequently our manufacturing facilities will need to be enlarged."



1

Chapter 1

Manufacturing - the global challenge

Where are we now?

The manufacturing sector makes a vital contribution to our national prosperity. Although employment in manufacturing fell sharply during the 1980s, partly as a result of macroeconomic instability, the sector still provides 4.3 million jobs directly and accounts for 20 per cent of GDP. In addition to its direct contribution to the economy, there are also strong linkages between manufacturing and other sectors. One fifth of manufacturing industry's spending is on services, and one fifth of the expenditure of the service sector goes on manufactured goods. Products of manufactured industry (for example computers, vehicles and mechanical equipment) are essential to agriculture, construction, utilities, financial services and other sectors, while the provision of many types of service (for example wholesale and retail distribution, vehicle maintenance and other repairs) is intrinsically linked to manufactured products.

The performance of manufacturing is also vital to our balance of payments. Before 1983, trade in manufactured goods was in surplus; since 1983 it has been in deficit, as the structure of our economy has changed. Yet, despite this, exports of manufactured goods account for almost two thirds of total exports of goods and services: a ratio which has remained stable throughout this decade, and a slightly larger share than at the start of the 1970s.

The bulk (around three quarters) of R&D expenditure is also undertaken by the manufacturing sector, and manufactured products are the most important conduit for new technology.¹ The manufacturing sector, as both a producer and user of technology, is central to the technological dynamism essential to success in the modern knowledge driven economy.

While manufacturing remains important to our economy, the long-term trend over many decades in the UK has been for its share of total output and employment to decline.

Although the deep recessions of the early 1980s and early 1990s exacerbated the decline in the UK, a declining share of manufacturing is to be expected in a mature economy. Typically, in the seven major industrial economies, manufacturing output has fallen from about 30 per cent of GDP in 1960 to about 20 per cent in the 1990s. When manufacturing businesses out-source service-type activities, the activities in question are reclassified as services. Estimates suggest that up to 30 per cent of the apparent decline in manufacturing employment may be due to out-sourcing. However, much of the change is real and reflects three important factors at work in advanced industrial economies:

¹ Of course, innovation in services and other sectors may be equally important even if it does not take the form of R&D expenditure or the production of goods embodying the latest technology.

‘The greatest wealth is no longer created from the manufacturing process itself, but from the knowledge that allows it to happen.’

(London Manufacturing Group, 1999)

Changing consumption patterns

Fifty years ago, roughly three quarters of household expenditure was spent on goods and the remaining quarter on services. Now the shares are almost equal. Consumers tend to spend a smaller proportion of their incomes on basic manufactured goods such as foodstuffs and clothing as their incomes rise, and more on the products of service industries such as leisure, entertainment, hotels and catering.

Technological change

With the development of new technologies, the opportunities to reduce unit costs are often greater in manufacturing than in many service sectors. Labour is released from the manufacturing sector as its relative productivity improves and the share of manufacturing output in the economy in value terms falls as the relative price of manufactured goods declines.

International competition

The last few decades have seen the increasing integration of developing countries into the world economy. Although their increasing participation has created new opportunities for exporters in developed economies, there has been some shift in the location of manufacturing production, particularly for products using relatively unskilled labour, from mature to developing economies. At times, this longer-term trend has been exacerbated in the UK by adverse changes in international cost competitiveness, which resulted from mistakes in macroeconomic management during the 1980s. Losses of output and production capacity sustained during the deep recessions of the early 1980s and early 1990s were not fully made up when the economy returned to growth. This emphasises the importance of keeping domestic costs under control and avoiding macroeconomic instability and the peaks and slumps of the past.



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The longer-term forces do not mean that manufacturing in advanced economies is in terminal decline. Over the long-term, some further reduction is likely, but there are signs that the pace of decline is slowing.

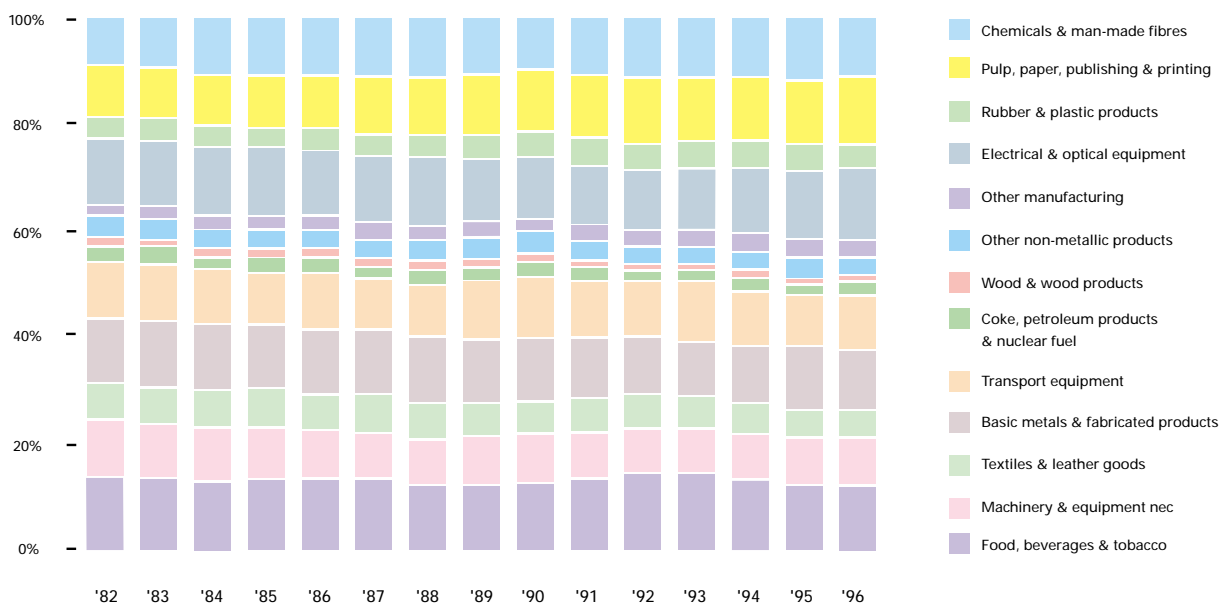
Looking at the structure of manufacturing itself, we can see whether the decline in the share of manufacturing is due to the

contraction of particular sectors, or is a general trend experienced by all to greater or lesser degrees (*Chart 1.1*). The chart shows that between 1982 and 1996, sectors which increased their share of manufacturing output included chemicals, publishing and printing, and electrical and optical equipment, while basic metal products, textiles and food products all experienced a

reduction in their share. This is consistent with a shift already under way to more knowledge-intensive activities within manufacturing.

But what is striking about the sectoral composition of UK manufacturing is not how much, but how little it has changed since 1982. Even textiles and leather goods - the sector more vulnerable than any

Chart 1.1 *Shares of Manufacturing*



Based on Gross Value Added at Current Factor Cost Source: ONS UK National Accounts (*The Blue Book*) 1997

other to competition from low wage countries - retained a share of 1996 manufacturing not greatly reduced from its 1982 level. However, it is important to remember that the shift to more knowledge-intensive activity also takes place within manufacturing sectors as well as between them. In any given manufacturing sector, the successful firms are the ones who are upgrading their production processes and introducing new products to keep one step ahead of low-cost competitors.

Manufacturing performance

While there are similarities across sectors and between countries in the long-term trends and performance of manufacturing industry, there is no room for complacency. It is clear that some sectors of manufacturing industry have experienced particular difficulties in recent years as a result of the global economic slowdown following the Asian crisis. Manufacturers trading within Europe have also had to face the challenge of the strong pound. Manufacturing exporters should now benefit

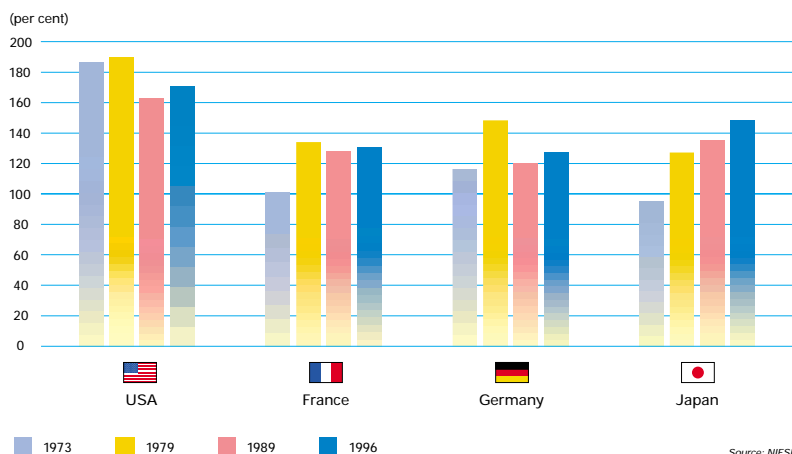
from the improved prospects for the world economy and from the steps taken by the Government to promote macroeconomic stability, consistent with the objective of a stable and competitive pound in the medium term.

But the manufacturing sector will only be able to take advantage of these opportunities, while earning reasonable wages and profits, if its performance matches or exceeds that of our major competitors. It must develop innovative goods and services

that customers want to buy, and use world class production systems and the most sophisticated technology to keep ahead of its rivals.

Productivity is the key indicator here. The latest comparative figures show that in 1996, output per hour worked in manufacturing industry - the standard measure used for international comparisons - was some 70 per cent higher in the US, some 50 per cent higher in Japan and about 25 per cent higher in France and Germany (*Chart 1.2*).

Chart 1.2 Output per hour in manufacturing (UK=100)










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Table 1.1
Manufacturing productivity growth 1989-98 (% per annum)

	United Kingdom	2.2
	United States	3.0
	Japan	3.4
	Germany	3.3
	France	3.7

Source: US Bureau of Labor Statistics, August 1999

Some progress was made in closing the gap during the 1980s, but the gains were not sustained during the 1990s. Since 1989, the growth rate of productivity in manufacturing in the UK has fallen below that of our main competitors (Table 1.1).

UK performance in the 1990s has lagged behind all our main competitors, including the US, which after slow progress in the 1980s has achieved a remarkable improvement in manufacturing productivity growth in recent years, albeit heavily concentrated in the Information and Communications Technology (ICT) sector.

During 1999, there is evidence that UK manufacturing productivity growth has picked up, with annual productivity gains of 3 per cent being recorded, but a substantial gap remains to be closed.

In other words, there is ample evidence that we are not as productive as we could be. Studies show that this is due to a range of factors, including low historic levels of investment (linked to excessive volatility in the economy), deficiencies in skills, R&D and management, and the lack of an enterprise culture. Improvements are needed in all these areas if our industries are to match the performance of the best.

Evidence suggests that manufacturing productivity growth is strongest in those industries which are most open to trade and where competitive pressures are strongest.

Manufacturing in the knowledge driven economy

The Competitiveness White Paper argued that the key to improving performance and

securing a vibrant manufacturing sector in the future is through the greater development and exploitation of *knowledge*. Manufacturing has always been a “knowledge driven” sector, but survival in a global market will depend more than ever on effective exploitation of all the knowledge resources available to each individual business. This applies not just to the high-profile or high-technology sectors within manufacturing such as computers, telecommunications and biotechnology. It is important for all businesses, from traditional industries to those at the cutting edge of science. OECD work suggests that those industries that are focusing considerable effort on developing and exploiting knowledge are already reaping the rewards.

Knowledge is more than just information. Today’s manufacturing business has access to an ever-expanding amount of information about new products and processes and about new markets, but information only becomes knowledge when it has been

assimilated and understood. How the information is interpreted and used will vary according to the experience, expertise and skills of the people accessing it.

An important distinction is often made between “codified” and “tacit” knowledge. Knowledge is codifiable if it can be written down and transferred easily to others. Technical specifications for a new product are an example. Tacit knowledge

is often slow to acquire and much more difficult to transfer, for example familiarity with a particular production process or management practice or knowledge of customer needs and preferences. By its nature, tacit knowledge or “know-how” can be an important source of competitive advantage.

↑ Case study:

<p>Sonatest</p> <p>Owned by their employees and operating since 1958, Sonatest of Milton Keynes are a leading manufacturer of ultrasonic flaw detectors, thickness gauges and transducers.</p> <p>Their reputation for innovative design has enabled them to build up export sales exceeding 80 per cent of production during the last 20 years in what is a highly competitive world market. However, their design expertise was challenged when they came to introduce a new line of Sitescan detectors.</p> <p>Sonatest, like many other small UK businesses have become more aware of the competitive advantages of using microelectronics technology, and programmable silicon chips in particular, in the products they design or manufacture.</p>	<p>Sonatest learned to use Field Programmable Gate Arrays (FPGAs) to develop the Sitescan 130, which was conceived as a small, lightweight portable device, with a maximum possible in-service life between battery replacements/recharging.</p> <p>It has proved a great success, quickly capturing a significant proportion of the world market and preserving Sonatest’s reputation for state of the art equipment.</p> <p>Indeed, so impressed are Sonatest with the benefits obtained from turning to FPGAs in the first place, they plan to move to even higher density chips to reduce the component count and increase performance still further.</p> <p>Sonatest’s experience led to them being used as a case study to encourage other companies to use the DTI’s Microelectronics in Business Programme.</p>
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Increasing dependence on the generation and exploitation of both types of knowledge for wealth creation is the characteristic of today’s knowledge driven economy. The growing importance of knowledge as a determinant of manufacturing performance is being driven by four mutually reinforcing factors that are changing the nature of competition and the way manufacturers do business:

- *revolutionary changes in ICT;*
- *more rapid scientific and technological advance;*
- *global competition; and*
- *changes in tastes and lifestyles that arise from increased incomes.*



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ICT

The “information highway” allows manufacturers to create and access new markets and changes the way they relate to customers, suppliers and competitors. Through the Internet and other information sources, potential customers can tap into a whole new range of information about products and alternative suppliers. Digital information and communication technologies can transform every stage of the manufacturing process by enabling closer relationships with customers and suppliers and permitting greater specialisation and radical new approaches to distribution and supply chain management. ICT enables functions such as customer support to be contracted out to call centres and allows manufacturers to monitor their contractors more effectively. Manufacturers can gain access to large amounts of commercial and technical information from around the world. This in turn increases the speed of innovation and facilitates the spread of best practice and new ideas from one manufacturer to another.

Science and technology

Recent years have seen large increases in the resources devoted by the industrialised economies to basic scientific research and to commercial R&D. These developments have enabled scientific knowledge to spread through industry more quickly, and have generated fundamental advances in areas such as genetics and biology, spawning new generations of products. Technologies originally designed for one application can also be readily adapted to others. This has increased the pace of change, which means that manufacturers must monitor developments more systematically in order to be aware of the opportunities being thrown up by technological and scientific change. Advanced scientific processes are being combined in ever more sophisticated ways in traditional products such as cars and white goods. As a result, manufacturers need access to technical knowledge, whether by employing higher skilled workers, or by networking with specialist firms or universities.

Global competition

Reduced tariffs, capital liberalisation and lower transaction costs as a result of improved transport and technology have all contributed to the accelerating process of globalisation. This has resulted in enhanced competition and sharpened the international division of labour. It has permitted even very small businesses to access world markets. Globalisation makes people, knowledge and production increasingly mobile, as demonstrated by the huge increase in foreign direct investment flows. This process enhances the competitive position of manufacturing business in countries with relatively low input costs. Where labour costs are high, manufacturing companies have to innovate and to add more value in their production processes in order to stay ahead of the cycle and to compete against lower cost rivals.

Changing demand

As economies grow, a higher proportion of income is spent on higher-quality products. Consumers demand more sophisticated, and often more customised, products, all of which require greater flexibility and greater use of knowledge. Growth also changes consumers' social attitudes as they place a greater value on environmental quality. Manufacturers will have to innovate in order to produce more output without placing unsustainable demands on the natural environment. This will pose a major challenge for many industries in the near future.

² "A better quality of life - a strategy for sustainable development in the UK" available on-line from <http://www.environment.detr.gov.uk/sustainable/quality/life/index.htm>

Implications for manufacturers

In a world characterised by rapid technological advance, the competitive advantage to be gained from leading-edge products or new skills is likely

to be temporary: technology will either displace the competitive advantage or make it easier to imitate those products. Moreover, globalisation facilitates production in lower-cost countries. Our future

Sustainable Development

Sustainability is driving pressures for change in existing ways of doing business. Rising environmental and social expectations are coming from both governments and the marketplace. They are biting increasingly hard on manufacturers, and are likely to intensify as the world grows both richer and more populous.

Greater resource efficiency is a key to change. The exact scale of the challenge remains uncertain - some have suggested a ten-fold improvement by 2050 - but a faster rate of change than achieved hitherto will be needed. This will require innovation on an unprecedented scale: new processes, new products, new ways of doing business.

Forward-looking businesses are already using knowledge to turn these challenges into new opportunities to win competitive advantage. They are "doing more with less" by redesigning or re-manufacturing products to improve material efficiency, developing closed-loop production where waste becomes the feedstock for new products. And they are leasing, not selling goods, which shifts interest to product durability, upgradeability and recycling. Such "eco-efficiency" benefits the bottom line, and can provide new opportunities for growth as demand for more environmentally acceptable goods builds.

Sustainability is not just about creating greater prosperity with less environmental damage, it is about doing so in ways that are acceptable to society. Fair dealing with customers and suppliers at home and abroad together with transparency and accountability in decision-making, are now an integral part of many businesses' strategies. This is because competitive advantage is increasingly found through "branding": Public perception can make or break brands and severely damage corporate reputations.²



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Manufacturing - the global challenge

prosperity depends on our ability to compete on quality and know-how rather than on cost alone. If UK manufacturing businesses are to maintain a competitive advantage, they must invest to keep ahead of the competition: by being entrepreneurial; by innovating; and by constantly improving the skills of their workers.

The challenge for the UK is to maintain this development and make the most of the opportunities that the knowledge driven economy presents. This can only be delivered by Government and manufacturing industry working in partnership. The Government's Competitiveness White Paper, *Our Competitive Future: Building the Knowledge Driven Economy*, put in place policies to build UK capabilities, foster collaboration and encourage competition. As the following chapters demonstrate, these policies are already enabling UK manufacturing industry to seize the opportunities of the knowledge driven economy.

Help for manufacturing in a knowledge driven economy

The most important contribution Government can make to the success of manufacturing is to pursue policies which generate macro-economic stability and provide a sound legal and regulatory framework. It is also important to provide an enabling tax regime for capital investment. The Government has introduced measures to strengthen incentives, including the reduction in corporation tax rates, and the extension of enhanced capital allowances for SMEs, and is continuing to listen to the needs of manufacturers in this area.

The DTI plays a central role in delivering the Government's commitment to modernising the economy. The Department's aim is to increase UK competitiveness and scientific excellence in order to generate higher levels of sustainable growth and productivity throughout the economy. A significant proportion of the resources, activities and policies that the Department deploys in pursuit of this aim directly and

indirectly benefit manufacturing industry. Government support for manufacturing falls into three main areas:

- **sponsorship of manufacturing sectors** - *strategic partnerships with industry and stakeholders to improve competitiveness. Sponsor directorates in DTI and other Government Departments consult and communicate government policies to business and act as the industry voice within Government. They support the development of clusters and networks, inward and outward investment, globalisation, improvements to supply chains, technology transfer, sectoral skills shortages and sectoral Foresight;*
- **generic support** - *available to all businesses but used particularly heavily by manufacturers. Wide ranging, this includes support for management best practice, sustainable development, substantial support for exploitation and application of scientific research and export promotion. Annex A contains fuller details of sectoral and generic support;*

‘If UK manufacturing businesses are to maintain a competitive advantage, they must invest to keep ahead of the competition: by being entrepreneurial; by innovating; and by constantly improving the skills of their workers.’

- **regional and local support** - *in the English regions, the new business-led Regional Development Agencies (RDAs) are designed to provide economic leadership and to promote enterprise and business innovation and attract new investment in the regions. Regional Selective Assistance (RSA) is the main DTI instrument of regional policy in England. Available in Assisted Areas it supports new investment which creates or safeguards employment. The Government has also recently announced its intention to introduce new Enterprise Grants, which will be available to SMEs in Assisted Areas. At a local level, the main sources of help and advice are Business Links. DTI recently announced proposals to establish a Small Business Service to form a new local gateway to all Government services for SMEs including manufacturers and to develop new services for them.³ In Scotland, Wales and Northern Ireland the devolved administrations lead support for business including manufacturing (see box at end of chapter).*

³ A consultation paper - "The Small Business Service A Public Consultation" DTI URN 99/815 was published in July

It is important that Britain's smaller, innovative businesses have access to appropriate sources of finance. Government has created a £180 million Enterprise Fund to stimulate the availability of finance to SMEs. The Enterprise Fund will include support for the creation of Regional Venture Capital Funds which will provide equity finance to growth businesses, thereby addressing the "equity-gap". Other elements of the Enterprise Fund include the Small Firms Loan Guarantee Scheme, a national venture capital fund to support early stage, high-technology businesses and support for innovative proposals from the finance industry which address financing needs of Britain's small, growing businesses.

Future support for manufacturing

Business is responding to the challenges of the knowledge driven economy - so should Government support. DTI is considering how its policies to support manufacturing and other sectors might develop

further to support business more effectively as the knowledge driven economy develops. On 10 September, the Secretary of State met with key business people and trade unionists to explore how industry and Government could work together to improve manufacturing competitiveness. The meeting identified four linked key areas which Government and manufacturers needed to address;

- *UK manufacturing profit depends increasingly on high value-added output. This in turn depends on manufacturers developing and exploiting new and specialised knowledge in the UK;*
- *the need to create a strong climate for investment in both R&D and capital investment;*
- *the need for manufacturers to adopt a culture of continuous improvement, innovation and best practice;*
- *the need to ensure that all levels of the workforce have the right skills and training*

The following chapters identify what the Department is doing now and planning to do in the future to help meet these requirements - the agenda for action - for manufacturing.



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Directly as a result of the summit, the Department has announced:

- *a financial package to support the growth of training clusters for engineering technicians (see page 38);*
- *support for awards recognising and rewarding excellence in innovation and strategic forward planning across UK manufacturing;*
- *the opening of discussions with the Regional Development Agencies about the potential for developing a network of regional centres for manufacturing excellence and productivity.*

A long term future for manufacturing

The Foresight Manufacturing 2020 Panel, chaired by Nick Scheele, President of Ford Europe, is looking at the long-term future of manufacturing in the UK, and the key issues which need to be addressed if UK manufacturing is to be competitive in 2020. The panel will report in November 2000. It is aiming to deliver a robust and relevant vision for 2020 which UK manufacturing industry can use as the basis for action today. The Panel's initial views were published in November 1999 and will be the subject of an extensive consultation process through which we hope to capture the views of the whole spectrum of UK manufacturing and its partners. Against this background, the Panel will then develop its vision and provide practical guidance to business and policy makers on the action which is needed to pave the way for a successful long term future.

By encouraging a true partnership between Government, the education

system and manufacturing industries the aim is to work together to create an economic, legislative and physical infrastructure which will:

- *support, encourage and reward soundly-based entrepreneurial practice and supply chain relationships;*
- *foster the development of the skilled workforce, working practices and technologies needed to support UK manufacturing in 2020.*

The DTI is committed to ensuring that manufacturers can benefit from the Foresight approach now. The Department will be supporting the Institute of Mechanical Engineers' Manufacturing Excellence Awards, which include new awards - one for SMEs, the other for a business of any size - which best exemplify the Foresight approach.

Support for manufacturing in the UK



England: strong regional partnerships

Within the English regions, the new Regional Development Agencies (RDAs) will play a key role in helping manufacturing to compete in a knowledge driven economy: raising regional skills, encouraging links between business and higher and further education, working with the Small Business Service to improve business support, encouraging business collaboration and facilitating the development of clusters.

DTI is providing RDAs with a £10 million competitiveness development fund over the next three years. This fund is available to RDAs to address the priorities they identify for improving the competitiveness of business in their region. Many of the projects supported by the fund are assisting manufacturing industry.

For example:

- *Yorkshire Forward, the RDA for Yorkshire and the Humber, is supporting 15 regional sector networks. This business-led network, which is part funded by*

DTI, promotes business innovation and exchange of good practice between companies in sectors such as textiles, engineering and multimedia.

- *Advantage West Midlands is establishing a regional programme called FORENSIC ('Foresight Regional Network for Sectoral Industry Competitiveness), to promote use of the Foresight approach and the transfer of knowledge and technology in key sectors. Working through sectoral partnerships, it will exchange best practice with other regions in the UK and Europe and provide a means of forecasting the potential threats and opportunities faced by West Midlands industry.*
- *In the East of England, the RDA is drawing upon DTI funding to support a number of sectoral initiatives. These include projects which promote the development of supply chains and innovation in the region's medical technology and biotechnology sectors.*

RDAs also play a leading role in developing supply chains - in most regions they host the DTI's Regional Supply Office (see Chapter 5) - and supporting clusters in their regions. The RDAs will address the need for co-ordination between inward investment and the supply chain, ensuring that new investors benefit regional suppliers. RDAs are also keen to promote SME access to finance. DTI is working with RDAs on

proposals for the establishment and enhancement of regionally-based venture capital funds.

Ministers have asked each RDA to produce an economic strategy for its region. The fundamental purpose of each regional strategy will be to improve economic performance and enhance the region's competitiveness, addressing market failures which prevent sustainable economic development, regeneration and business growth in the region. As part of this work, each RDA is identifying key industrial sectors in its region and developing proposals for improving the competitiveness of these sectors; these will have a major impact on manufacturing over the next 3-4 years.

The chairmen of the RDAs presented their regional economic strategies to Ministers on 26 October. Each RDA's strategy includes plans to improve the competitiveness of key sectors in their regions. For example, the South West of England Regional Development Agency has identified seven sectors with the greatest potential for growth in its region; these include advance engineering, environmental technologies and marine technologies. The region will promote these through sectoral initiatives and support for industrial clusters. In the North East, the RDA has identified a number of potential key business clusters, in sectors such as high volume manufacturing, low volume manufacturing, process industries and chemicals. The RDA plans to establish Cluster Development Teams, which will draw



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up action plans for each cluster including priorities for indigenous and inward investment, infrastructure and expertise, and skills development and industry - academic links.



Case study:

RSO

RSO East Midlands put in place a comprehensive action plan to support the textile, clothing and footwear industry within its region, resulting in £4 million business won for local firms involved in building a strategic supply chain with a major French retailer (Decathlon), leading to £2 million worth of exports. Similar projects are under discussion with 8 other major retailers.



Action in Scotland

In a successful Scotland, knowledge, skills and innovation will be the key to providing secure employment and future prosperity. The Scottish Executive is working together with business and trade unions as well as the UK Government and Europe to promote enterprise and a stable and competitive environment. The Scottish Executive's aim is to create a knowledge driven economy which can meet the challenges of a highly competitive global environment. At the same time, it is working to promote economic development which is environmentally and socially sustainable.

Manufacturing continues to be a power house of the Scottish economy, and still employs some 300,000 people, over a third of whom are involved in the production of goods for export. Certain manufacturing sectors, particularly whisky, are crucial to the economic vitality of many rural communities in the remoter parts of Scotland.

Scottish manufacturers and exporters have performed resiliently in the face of recent difficult trading conditions. Output in the manufacturing sector in Scotland increased by 1.2 per cent in the year to 1999 quarter 2, compared to a 0.6 per cent decrease for the UK as a whole. Scottish Executive data shows that the level of Scottish manufactured exports increased by 6.4 per cent in real terms in the year to 1999 quarter 2.

The Scottish Executive is keen to ensure that the Scottish manufacturing sector remains competitive and innovative and flourishes as part of a knowledge driven economy in Scotland. The Scottish Minister for Enterprise and Lifelong Learning, Henry McLeish, therefore announced in June 1999 that the Scottish Executive would draw up a Scottish Manufacturing Strategy in partnership with industry and the trade unions. An initial consultation has been completed and meetings held with the key business organisations and the Scottish Trade Union Congress at which the priorities for the strategy were agreed. The aim is to publish the Scottish Manufacturing Strategy within the next three months.

The Scottish Executive "Programme for Government" published on 6 September 1999 includes a range of initiatives which will support and help develop the manufacturing sector in Scotland. These include:

- *the aim to help to create 40,000 new Scottish businesses by 2003, as part of a 10 year plan to create 100,000 new businesses by 2009;*
- *support for the establishment of a Scottish Institute of Enterprise by 2001;*
- *the transformation of ideas from Scottish laboratories into successful businesses;*
- *the creation of 20,000 Modern Apprenticeships by 2003;*
- *the initiation of a Scottish Labour Market Unit by the end of 1999*

to highlight the skills needed in Scotland;

- *the establishment of the Scottish University for Industry in the year 2000;*
- *the introduction by April 2000 of a new business mentoring scheme;*
- *the promotion of an entrepreneurial culture by increasing school activities; and*
- *the development of a website to provide easier access for businesses on local and national advice and funding.*



Action in Wales

The National Assembly for Wales is preparing a National Economic Development Strategy, the aim of which is to create a modern, thriving and competitive economy in Wales. Manufacturing industry plays an important role in the Welsh economy, producing 29 per cent of Welsh GDP. The Strategy will recognise the importance of the sector in the future. The Strategy will have at its core, skills, knowledge, quality, innovation, technology transfer and entrepreneurship, and will seek to develop the following key areas:

Skills Issues

- *The Council of Welsh TECs published, in February 1997, an Action Plan for Manufacturing Training in Wales. Implementation of the plan has been overseen by a Steering Group, comprised of Welsh TECs, Wales CBI, Wales TUC, Welsh Funding Councils, the Welsh Local Government Association, WDA and the National Assembly.*
- *Future Skills Wales Project - addressing what skills will be needed in the future, in partnership with employers, education and training providers, and then developing a range of actions to respond to the challenges. A Skills Task Force is being created to help develop an action plan.*

- *The Education and Training Action Group (ETAG) has produced an action plan for radical reform of the post-16 education and training system. If the proposals are adopted, business would play a major part in decisions about commissioning workplace training and have an input into determining the provision of post-16 education and training across the board.*
- *A reconstituted, industry-led Wales Management Council will have responsibility for establishing a more focused and coherent framework for delivering management development activities in Wales.*
- *Inside Welsh Enterprise is shortly to be relaunched for a three year period - an initiative for assisting companies with best practice procedures.*
- *The number of Modern Apprentices in training will be increased from around 9,000 a year to 14,000 a year by April 2002.*

Collaboration/Networking

A number of industry fora have been established to enable firms with common interests to meet to discuss common issues. These include:

- *the Welsh Electronics Forum, which is producing an Electronic Industry Strategy;*
- *the Opto-electronics Forum;*
- *the Automotive Forum;*
- *the Welsh Medical Technology Forum;*



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- Cardiff University Innovation Network;
- the Materials Forum for Wales; and
- the Printing and loading Forum.

Through Source Wales, the Welsh Development Agency (WDA) locates supply opportunities for Welsh firms and helps to develop the ability of these companies to meet the requirements of major buyers.

Enterprise

- Xenos Business Angels network has been introduced to help small companies in Wales to access venture capital.
- Venture Capital: the WDA is developing - with the private sector - a strategic package of schemes, consisting of direct investment to improve the supply of finance to SMEs through the provision of small risk capital for technology based businesses and subordinated risk finance.
- An Entrepreneurship Action Plan, with the aim of developing a stronger entrepreneurial culture to produce a step change in entrepreneurial activity in Wales is under development.
- 1,000 quality business start-ups a year are being actively encouraged and supported.
- Manufacturing enterprises in Wales in Assisted Areas continue to be well-supported under the Regional Selective Assistance programme.

- There is a perceived need for a Development Bank and the National Assembly for Wales is actively considering the case and options for establishing one to support the development and growth of small enterprises.

Innovation

- Know How Wales aims to stimulate more focused industry/academic collaboration, and improve the prospects of successfully commercialising the outcomes of academic research.
- SMART Wales is a comprehensive package of innovation grant schemes which supports a very wide range of innovations in small firms throughout Wales.
- The Welsh Design Advisory Service as a pan-Wales initiative provides first rate independent design and materials selection advice to Welsh companies.
- The Wales Information Society Initiative is being driven forward to ensure modern infrastructure and communications technologies are exploited to the full in all sectors of Welsh life.
- A wide range of work in support of innovation continues to be taken forward in a coherent way under the highly recommended Wales Regional Technology Plan.



Northern Ireland

Economy

The manufacturing sector is one of the main drivers of growth in the Northern Ireland economy and has consistently outperformed the UK as a whole during the 1990's. The number of employee jobs in the Northern Ireland manufacturing sector has increased by 1.5 per cent compared to a fall of almost 15 per cent in the UK since 1990. Northern Ireland has also maintained a faster rate of growth for manufacturing output between quarter 1 1998 to quarter 1 1999. Northern Ireland manufacturing output increased by 3.8 per cent compared to a fall in manufacturing output for the UK as a whole. In addition, productivity growth in manufacturing was 2.8 per cent per annum in Northern Ireland between 1990 and 1998 compared to 2.0 per cent for the UK as a whole. One of the main factors determining the recent success in manufacturing in Northern Ireland is the export performance of Northern Ireland businesses. For example, exports to the Republic of Ireland increased by over 10 per cent a year between 1992 and 1998.

Strategy 2010

The recent review of economic development policy in Northern Ireland; "Strategy 2010" - an economic development strategy for the next ten years - recognised the

importance of developing 'a highly attractive, dynamic and supportive knowledge-based economy in Northern Ireland.' The review made specific recommendations aimed at ensuring that both Northern Ireland businesses and the region's current and future workforce, are positioned to take full advantage of the knowledge driven economy.

The "Strategy 2010" review was developed as a public/private partnership to ensure that the business community played a full role in identifying the priorities for the region's future economic development. As recommended in the report, an Economic Development Forum has been established to oversee the monitoring and implementation of its recommendations. Action has already begun to implement key recommendations of Strategy 2010 to ensure that benefits flow as soon as possible.

The strategy review identified the ICT revolution as a key priority area. As a result, an Information Age Initiative has been established to prepare a strategic framework and comprehensive action plan, aimed at ensuring that Northern Ireland takes maximum advantage of the opportunities offered by ICTs. Other recommendations include greater integration of education and economic policy, more collaboration between schools and businesses, actions to encourage innovation and R&D activity and a networking initiative to demonstrate the value for Northern Ireland companies of

sharing knowledge to enhance competitiveness.

Strategy 2010 takes up the key themes of the Competitiveness White Paper and builds on the £315 million package of measures announced in May 1998 by the Chancellor of the Exchequer aimed at encouraging enterprise and investment. Key elements of the package include:

- *Enterprise: the introduction of 100% first year capital allowances for investment by small and medium sized enterprises in plant and machinery for use within Northern Ireland. This will provide a significant boost to the local economy and will assist small businesses to invest and grow.*
- *Venture Capital: the Viridian Growth Fund, a new £10 million fund announced in June 1999, will invest in SMEs in the manufacturing and commercial services sector that have difficulty in raising finance from existing financial sources. The new fund, which will complement the existing venture capital industry, will invest amounts in the range £10k-£250k split between equity and loan to help smaller companies in Northern Ireland meet their growth objectives.*
- *Innovation and R&D: the Northern Ireland Science Park Foundation, comprising representatives of industry, government and academia, was set up in March 1999 to take forward arrangements for a world class Science Park in Northern Ireland to make a*

substantial contribution to the regional economy through the commercialisation of innovative ideas emanating from the Northern Ireland research base.

- *People and Skills: a special fund will be used to address skills needs arising from regeneration of the economy. Significant successes have been achieved in re-skilling graduates and others to meet the growing demands of the software and IT industries. The National Initiatives on Workplace Learning, including the University for Industry and Individual Learning Accounts, will be actively pursued in Northern Ireland. In addition, a Skills Task Force has been established with the aim of ensuring that education and training programmes focus more on the creation of skills required to meet local economic objectives.*



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Manufacturing has always relied on developing and applying knowledge to maintain competitive edge. However, the increasing pace of change in new technologies and customer demand places even greater pressure on manufacturers; not only do they need to invest in their next generation of products and process, but they also need to keep abreast of the latest manufacturing techniques and processes to manufacture them competitively. New products and manufacturing processes are intrinsically linked; as well as designing better products, world class businesses design products that are easier to manufacture and processes that are easy to maintain.

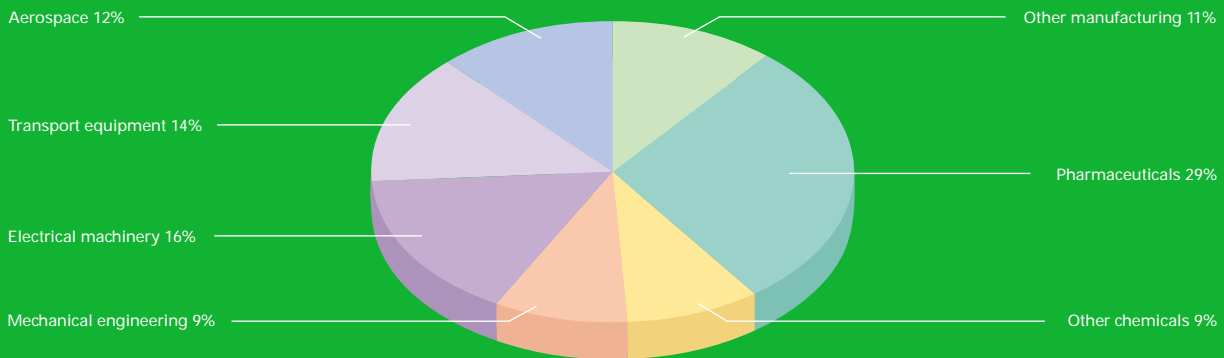
‘world class businesses design products that are easier to manufacture and processes that are easy to maintain.’

Manufacturers need to be able to exploit a wide source of ideas; creative thinking within the firm itself is an important source, whether in the R&D department, on the shopfloor or in the marketing department. Undertaking R&D within the business not only generates innovation, it also helps to develop the in-house knowledge and expertise necessary to understand and absorb new technologies developed outside the business. Many successful manufacturers also buy in research from specialist businesses, research bodies or universities, within the UK and overseas. They also draw on the experience of their

customers and suppliers, and collaborate with partners in developing a new product or process.

We need to do even more in the UK to encourage this flow of ideas to enrich the knowledge base of our manufacturing industries. More UK manufacturers need to work with our Universities and other Higher Education Institutions to use their research to develop products and processes for the future. UK manufacturers need to be demanding customers and alert suppliers if the supply chains they form a part of are to be globally competitive.

Manufacturing Business Enterprise R&D by broad product group, 1999



Source: Office of National Statistics

So how is UK manufacturing performing?








Manufacturing investment in R&D has increased over the last 10 years by approximately 2 per cent on average and continues to increase. There are some encouraging indications in the 1999 R&D Scoreboard¹: several sectors have made healthy increases in their aggregate R&D; engineering and machinery increased by 12 per cent over 1998 and the UK pharmaceuticals sector continues to lead the world with an R&D intensity (R&D as a percentage of sales) of 15 per cent. The pharmaceuticals sector accounts for almost a third of R&D performed in manufacturing business enterprises.

Compared with our major international competitors, the UK position is mixed. Despite its improvement, the engineering and machinery sector still only has an R&D intensity of half that achieved by its competitors in the USA, Germany, France and Japan. Moreover, the UK has fewer large companies in R&D

intensive sectors, particularly information technology, communications and electronic engineering than any of its major competitors. In addition, overall manufacturing expenditure on R&D has been growing at a lower rate in the UK than in some of our key competitors (see table 2.1).

UK manufacturers compare well with their European competitors in terms of the proportion of businesses which introduce new processes or products. However, the proportion of their revenue gained from innovative products compares badly². This suggests that UK manufacturers are less effective in exploiting their new ideas. This may, in part, be explained by their level of commitment; businesses in other Member States were shown to dedicate more resources to innovation.

Table 2.1 Average annual increase in Manufacturing Business Enterprise R&D 1985-1996 (Based on constant prices)

	United States	2%
	United Kingdom	2%
	Japan	7%
	Canada	9%
	Italy	11%
	France	16%
	Germany	17%

¹ "The UK R&D Scoreboard, 1999", Company Reporting Ltd (Tel 0131-558-1400).

² The Second EU Community Survey on Innovation



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How can Government help?

We can help with investment in R&D

The Government recognises that it has a role in creating a climate which encourages investment in R&D.

Corporation Tax is now at its lowest ever level, CGT has been reformed and the Government has introduced enhanced first year allowances for SME investment in plant and machinery which are worth an extra £325 million over the next three years and which will allow SMEs to write off 40 per cent of all they invest in plant and machinery.

An important measure, we will introduce in the 2000 Budget is an R&D Tax Credit. The tax credit, subject to approval by the European Commission, will encourage SMEs to increase their R&D efforts. We would expect this single measure to result in a commensurate increase in R&D investment by those 4500 independent SMEs likely to benefit from it. A highly innovative feature being

considered is that those SMEs not paying tax, and therefore not able to realise the tax relief, would be able to benefit by receiving a discounted equivalent cash sum instead. Alongside this measure will be the publication of revised guidance on the definition of activity which will be considered to qualify as research and development for tax purposes, on which the DTI has been closely advising the Inland Revenue. This will result in a clarification of what we mean by R&D and help businesses to fully understand how they can benefit from the tax credit.

For many manufacturers, particularly smaller ones, the cost and resources required to identify and develop new technology and processes are a major barrier to investment. The Government helps individual and small businesses research and develop technologically innovative products and processes through the Smart scheme. Smart also funds external consultancy to improve the use and exploitation of technology. £108 million is available over the next three years.

Some manufacturing sectors have specific needs which are not best met by traditional support. For example, textiles for technical uses have diverse markets whose producers tend to identify with their customers rather than the processes used. The DTI is working with the manufacturers of technical textile products to increase their competitiveness through encouraging them to collaborate with Higher Education Institutes to increase access to research, stimulating networking and the spread of best practice amongst manufacturing businesses and raising awareness of relevant R&D undertaken outside the UK. We will also be fostering another burgeoning manufacturing sector - biomaterials. Biomaterials replace traditional materials with biologically active materials to improve product performance and customers benefit; for example, dressings that encourage wound healing or cultured knee joints which deliver improved physiological performance and enhanced therapeutic response. By Christmas, we will have started a number of activities under a

new "Building up Biomaterials" programme which builds on the achievements of several basic research programmes and encourages biomaterials businesses to work more closely with the science base.

The Government also recognises that manufacturers facing the challenge of sustainable development may need to invest in new technologies. The Sustainable Technologies Initiative, worth £7.8 million over three years, will help businesses develop the technologies to incorporate sustainability in their products and processes from the design stage. Support will be available not only to develop hard technologies but also to research social and economic factors which can be important to understanding the barriers to the take-up of sustainability. The Department will also be taking forward a new programme of work focused on increasing the ability of UK manufacturing industries to use recycled materials as a feedstock.

The Government is committed to increasing levels of recycling, as one key element of achieving



Case study:

Ciba Specialty Chemicals, Water Treatments Limited

Following a successful collaboration in a LINK project with the University of Huddersfield, Ciba Specialty Chemicals continued its relationship by jointly participating in a TCS Programme.

The business employs around 1,700 people in Bradford but recognised the need to gain access to the knowledge and skills of the University if it was to design and construct a prototype production plant. The aim was to produce on a pilot scale ammonium acrylate from acrylonitrile or acrylamide, allowing full evaluation of the process and providing data for the design of full-scale production.

Dr Ken Symes, Ciba's senior representative in the TCS Programme, said *"by working with the University we were able to complete a techno-economic feasibility study for full-scale production"*. The new bioprocess has the potential to result in a cleaner technology for the manufacture of a new intermediate; the quality of the new intermediate is also said to be higher and could be used in a wider range of products. *"It could also help to improve the competitiveness of the business"* said Ken Symes.

more sustainable development. There are, however, significant market and technical barriers to increasing the use of recycled materials by manufacturing businesses. DTI will be making available a £1.4 million budget to address these barriers and to take forward this programme of work over the next year. The funding will be committed to a range of projects, expected to

include R&D, standards development and best practice work. During this first one year phase of the DTI programme, we will be assessing the feasibility of continuing the work through a joint programme with DETR. The Government's ideas for the proposed joint programme, which would aim to promote an integrated approach to materials resource use and waste



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The **Foresight Programme**⁴ builds bridges between business, science and Government in order to improve competitiveness and quality of life. It aims to identify new opportunities in markets and science and technology over the next 20 years and the action the UK has to take to grasp these opportunities. Foresight works primarily through 13 Panels bringing together knowledge and expertise from business, academia, the voluntary sector and Government. Some Panels focus on specific sectors whilst others are potentially relevant to many parts of manufacturing industry. Every panel is considering education, skills and learning issues and the

implications of its proposals for sustainable development.

- *Manufacturing 2020*
- *Ageing Population*
- *Crime Prevention*
- *Built Environment & Transport*
- *Chemicals*
- *Defence, Aerospace & Systems*
- *Energy & Natural Environment*
- *Financial Services*
- *Food Chain & Crops for Industry*
- *Healthcare*
- *Information, Communications & Media*
- *Materials*
- *Retail & Consumer Services*

A cross panel E-Commerce Task Force is also looking at the impact of e-commerce on business process and supply chains, ten years ahead. In addition, a number of sectors, including from many “traditional” sectors such as ceramics, leather and the marine sector have completed their own Foresight exercises.

management, were set out in the new draft waste strategy “A way with waste”.³

We can provide access to publicly-funded R&D

The UK’s science and engineering base is undoubtedly world class. It is an important source of knowledge and highly-qualified people for manufacturing businesses. In the next three years, Government will spend over £20 billion on science, engineering and technology. In partnership with the Wellcome Trust, an extra £1.4 billion is being allocated to strengthen the science and

engineering base further over that period. As a result, the level of investment will be higher in real terms than at any time this decade. At the same time, it is important that we maintain the quality of research and ensure that those institutions which excel are rewarded with funding build on their success. The Research Assessment Exercise (RAE) addresses this and the 1996 RAE rewarded 18 Engineering Departments with its highest accolade - a 5 star rating. The

³ Available from DETR free literature; Tel 0870 226 236, product code 99EP 0254.

⁴ Further information on Foresight Panels is available from the Foresight Knowledge Pool at www.foresight.gov.uk or from the Foresight Directorate in the Office of Science and Technology.



Case study:

The Centre for Process Analytics and Control Technology (CPACT)

A unique multidisciplinary Centre formed in July 1997 through the Foresight Challenge Programme with 9 blue-chip, end-user and instrument vendor companies and an award of £3.25 million. CPACT aims to provide a 'one stop shop' for UK industry seeking advice and research on all

aspects of process control. The project involves the Universities of Newcastle, Strathclyde and Hull. Company membership has grown from an original core of 9 to 23 companies.

CPACT brings together scientists and engineers from academia and industry to research solutions to generic problems in process monitoring and control. The research is industry-shaped and provides routes to tangible scientific and technological benefits in the process manufacturing industries.

Research has led to benefits to member companies of over £1million per annum on a large scale chemical

production plant alongside other significant cost benefits through reductions in re-work and waste in batch manufacturing, fermentation processing, polymer processing and reactive extrusion.

"By combining the academic excellence of the member Universities, with technology vendors working in conjunction with leading UK blue-chip companies, CPACT provides an excellent window on the world of process control and chemical analysis" said Professor Roger Benson FEng and Chief Engineer of ICI's Manufacturing Technology.

RAE takes place every four to five years and the the next RAE will be conducted in 2001. As part of the Government effort to promote knowledge transfer from the research base into businesses, the Funding Councils are working with the CBI and other partners to ensure that key business representatives will be involved in the assessment panels and capture user and industrial perspectives.

The R&D Connections website (www.dti.gov.uk/ibb/researchuk) provides manufacturers with a simple and direct route to more than 750 UK experts and centres of expertise in the science & engineering base.

The easy-to-access website is structured by industrial sector and UK region. Sectors covered include automotive, aerospace, biotechnology, chemicals, electronics, healthcare equipment, ICT and pharmaceuticals. Extending coverage to other sectors is currently under review.

Key Government assistance for manufacturers to work with university research departments

is provided through LINK and its related programmes. LINK research partnerships address Foresight priorities and have the potential to lead to the development of innovative products and processes. The annual Government budget for LINK is some £37 million, which is more than matched by business. Foresight LINK Awards (FLA) complement LINK by promoting research partnerships outside the areas covered by current LINK programmes. The winning projects in the first round of FLA have included the application of the techniques of microengineering to laboratory processes and instruments, and researching the use of optical inspection systems for use in manufacturing.

A second round of FLA is currently underway and plans are in hand for a third and subsequent rounds. Both rounds one and two are supported with £10 million Government funding. Support for industry-led collaborative research programmes to promote more innovative manufacturing in aerospace, construction, road transport and

process industries are provided by the LINK Innovative Manufacturing Initiative which this year has been extended to integrated healthcare technologies.

Research in Public Sector Research Establishments (PSREs) is also a potential source of knowledge for manufacturers. The Government is determined that the wider applications of research in these establishments should be properly exploited. For example, the Defence Evaluation and Research Agency (DERA) has recently set up the Defence Diversification Agency to help civil sector businesses, including manufacturers, access the wealth of technological expertise within DERA. The Government has also commissioned and recently published an independent report into the commercialisation of PSRE research outputs. A detailed Government response will be published shortly.



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Publicly-funded research has other benefits for manufacturing businesses as well. For instance, the work that the National Physical Laboratory carries out to refine measurement systems enables manufacturers to work to ever smaller tolerances. Similarly, the Health and Safety Laboratory conducts research into the safety of manufacturing processes and their products.

We can foster networking and collaborative partnerships

A critical weakness in the exploitation of science, engineering and technology in the UK is the lack of coherence between researchers and new product developers. The new Faraday Partnerships are intended to help correct this. Building on the four EPSRC funded “pilot” Faraday Partnerships established in 1997, DTI, with support from EPSRC, aims to establish a network of up to 20 partnerships involving universities, research organisations and businesses which are recognised nationally and regionally as centres of expertise and collaboration in their sector or technology. Manufacturing involvement in the initial pilots has included using systems builders to provide complex electronic/mechanical hybrid assemblies for processing, sensing and actuation in products such as cars, aircraft and domestic appliances. The Secretary of State announced a call for proposals for four new Partnerships on 14 September 1999. We expect to identify the

winners in May 2000 following a two-stage assessment and selection process.

We can promote knowledge transfer through people

One of the most successful ways that the government assists manufacturing industries, is by helping businesses to obtain new technologies through the skills of young graduates working in partnership with a university or research organisation by using TCS (formerly known as the Teaching Company Scheme). Currently, there are about 640 TCS programmes running; 70 per cent in manufacturing businesses. The Government contributes to the cost of each programme and the graduate who works in the business for about 2 years implanting a technology or process that is new to it. Larger scale programmes can also be handled with several Associates working on separate but related projects. Independent evaluations have shown that TCS Programmes usually result in increased profitability, sales, quality and new markets. The annualised



Case study:

Corus Plc

Corus Plc (formerly British Steel) opened its continuous annealing process line (CAPL) at Port Talbot Works in July 1999. This represented the biggest single capital investment since privatisation of the company as British Steel in 1988.

Annealing restores ductility to the steel after it has been through the

cold rolling process. The recently developed continuous annealing technology reduces processing time from around six days to one day, and also means that a new, wider range of high strength steels can be produced.

The new generation of technology also makes it possible for Corus to achieve unprecedented levels of quality and consistency, essential requirements in a customer focused market place. Corus is fully committed to the needs of its customers in existing and developing

markets as part of an on-going drive for continuous improvement.

The product from CAPL ensures that Corus can meet new demands for applications where flatness of the steel is critical. Consequently, the company is going further to give customers a competitive edge in their own product design, production process, and in the performance of their products.

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increase in profit before tax for the business is on average of the order of £125,000 per project and each £1 million invested by the Government in TCS results in 70 new jobs and around £13.5 million of value-added. The number of TCS programmes will rise to about 1000 on a rolling basis as a result of a commitment from the 1998 Competitiveness White Paper.

We can help businesses access technology developments from overseas

Global manufacturers have a unique opportunity to combine knowledge and learning from different countries. Through its International Technology Service, the DTI extends this opportunity to other businesses. The Service helps UK companies to access and learn from management best practice and technology world-wide; by enabling and supporting business people to go on technological missions to see acknowledged best practice in action, seconding staff into leading overseas firms for up to

a year, helping businesses to acquire technologies by licensing or collaborative ventures with overseas businesses and offering a technological information service.

Overseas businesses also bring new technologies and practices into the UK through inward investment. Transfer of knowledge from these businesses has impacted on many manufacturing sectors and helped transform working practices in the UK. In order to meet the exacting requirements of these new customers, suppliers have had to make systematic improvements to their quality, cost and delivery performance, often with the direct assistance of the inward investor company. This has enabled many UK-owned manufacturers to become competitive in the world market in their own right. The UK currently attracts the greatest proportion of US and Japanese R&D facilities in Europe and universities in the UK are at the forefront of attracting R&D activities from overseas businesses.⁵ The Invest in Britain Bureau (a DTI/FCO

partnership) is committed to increasing its focus on attracting high-value projects, including those which support the development of strong sectoral or technology-based clusters, or build on centres of scientific excellence.

Millennium Product - The JCB Teletruk

With the Teletruk, JCB challenged the 60 year old concept that a fork lift truck should have a vertical mast when they replaced this with a forward reaching telescopic boom. The advantage of this innovation is easy reach into box vans and containers so that they can be fully loaded/unloaded from one side - the usual forklift method is one side at a time. This saves considerable operator time. Driver forward visibility is enhanced without a vertical mast; and the cab features seat belts, hip restraints and a programmable on-board computer which offers both a choice of cab environment, and transmission control.

We can promote good design

Successful manufacturers exploit design to create world class products and services. Design is integral to the innovation process itself, translating an understanding of customer needs and desires, bright ideas and new technologies into successful products. Design, properly deployed, draws together a wide range of business issues; form, function, materials, manufacturing processes, re-use and recycling, into a holistic approach to produce success.

Britain has a world class design base, which offers a great resource to our manufacturing businesses. The Government funds the Design Council to be the advocate for design at a national level. At the local level Government supports the delivery of design services and

expertise to manufacturers by Design Counsellors at Business Links. Design Counsellors help 4000 small and medium-sized business every year.

The innovativeness of British manufacturing is being identified and celebrated around the world through the Government's *Millennium Products* project, launched by the Prime Minister in September 1997. Managed by the Design Council, the project has awarded the accolade *Millennium Product* to 777 products created in Britain for the new century. *Millennium Products* are also providing a wealth of useful information on how the innovation and design processes can contribute to commercial success. The Government and the Design Council are working together to create a database "*Sharing Innovation*" which will be a means of spreading good practice more widely, and will have an important role in strengthening the teaching of design and technology in the National Curriculum.

⁵ "Britain's Research and Development Capability" Invest in Britain Bureau 1998, ref. IBB/PUB/R&D/1998 URN 98/620



Case study:

Jordan Plastics Ltd

Jordan Plastics Ltd collaborated with the School of Chemical Engineering at Queen's University Belfast (QUB) using the TCS scheme. In 1994 it recognised it needed the help of experts at QUB if it was to expand its business into the new generation of polyethylene-based films used in packaging products for the food industry.

Richard Jordan, Managing Director, says that by using the University's analysis skills they were able to understand better the operation and control of co-extrusion equipment and the processability of polymer resins. He also says "Since beginning our collaboration with QUB five years ago, and participating in TCS, Jordan Plastics has changed from being a follower to a leader. We acquired new knowledge in the selection of raw materials and also reduced waste, both of time and materials."

Jordan Plastics claim that, as a direct result of the TCS Programme, it has reduced reject/scrap levels by 50%, secured contracts with multi-nationals and increased productivity and annual turnover by 35%.



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Chapter 2

Creating & exploiting knowledge



Case study:

The Casting Development Centre (CDC) - Research and Technology Organisation working with customers and suppliers

APV Baker Ltd's continuous improvement programme identified the need for a new approach to the design and manufacturing process for a cast metal mixer barrel used in the food processing industry. APV's regular supplier, Vanguard Foundry Ltd (40 employees) began working with them and CDC to solve the problem. Vanguard's Sales Director, Mike Pool, said *"Technically it was a very difficult project. On our own we would have had to commit our people to a long process of trial and error. However, using CDC's test facilities and particularly their castings simulation software, gave us the confidence and capability to crack it. It also enabled us to move the agreed design into full commercial production."*

He added *"Using CDC as we did saved an enormous amount of time and effort and gave us and APV far greater confidence in the eventual outcome of the investment."*

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actively manage them to meet the exacting quality, cost and delivery requirements of today's manufacturing customers. Real and sustainable progress is possible only if you have knowledge of where you are starting from, where to target improvement activity, and can ensure that the resulting gains in productivity and quality are sustained.

Promote process measurement and control

To be successful in an increasingly competitive and globalised economy, manufacturing companies need to pay particular attention not only to their products but to the efficiency and design of their production processes. World class manufacturers design products that are easier to manufacture and processes that are easy to maintain. Effective and continuous measurement is also essential to develop a deep understanding of all aspects of the production function and enable a culture of continuous improvement to be developed. World class manufacturers understand their production processes and

The Motor Industry in the UK has collaborated through the Industry Forum to produce 7 measures of competitiveness, collectively badged under Quality, Cost and Delivery for use throughout the supply chain. These are also used by the Industry Forum in its own improvement activities with automotive suppliers. The measures are; non right first time, people productivity, stock turns, delivery schedule achievement, overall equipment effectiveness, value-added per person and space utilisation.



Case study:

James Leckey Design Ltd

James Leckey Design Ltd has just begun a collaboration with the University of Ulster's School of Electrical & Mechanical Engineering using the TCS scheme.

Sixteen years after it was formed, this business is the UK market leader in the design and manufacture of

supportive equipment for children with disabilities. Managing Director James Leckey says, "*working with the University and using TCS is the ideal catalyst for achieving our long term ambitions*".

Employing 60 people and an annual turnover of £2.3 million, this progressive business continually invests in new people, technology and processes to satisfy the increasing market demand and challenges of producing new and innovative products.

A winner of the "*Millennium Product*" accolade, the business nevertheless recognised the need to continuously improve its in-house design, development and manufacturing processes. In parallel with "*appropriate management changes*", James Leckey aims to ensure that every new product produced will embody all aspects of design for manufacturing. He also expects the TCS Programme to result directly in annual profit increases of £150k.

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Chapter 3

People & Skills

Chapter two looked at how manufacturers can create and exploit knowledge. However, acquiring and adopting technologies is not enough in itself. Manufacturers need to have the technical and management skills to carry out this exploitation. Indeed, research shows that the increase in the demand for skills driven by changes in technology and processes is greater for manufacturing than for any other sector¹.

Skills levels in manufacturing have an important role to play in explaining the performance gap with our major competitors. For example, research suggests that 22 per cent of the UK's performance gap in manufacturing productivity relative to Germany can be accounted for by skills differences, particularly at the intermediate level (NVQ Level 3). This compares to 17 per cent measured across the economy as a whole². Chart 3.1 shows that a slightly lower proportion of the manufacturing workforce have reached NVQ level 3 standard than the workforce as a whole.

There are also significant differences in skill levels between different manufacturing sectors. Some manufacturing sectors - for example the

chemical industry - have 60 per cent more higher skilled workers than the manufacturing sector as a whole, and employ proportionately more high

Chart 3.1: Adults (men aged 18-64 and women aged 18-59) qualify to at least NVQ level 3 by industrial sector England Spring 1999

Labour Force Survey, Spring 1999

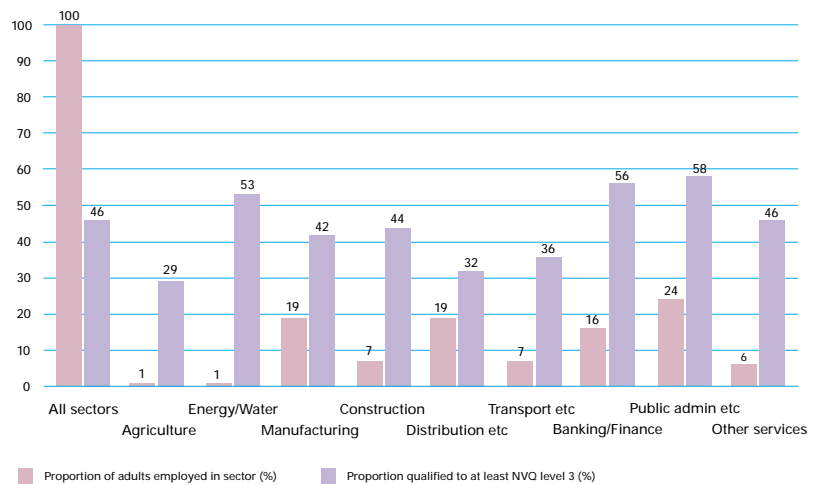
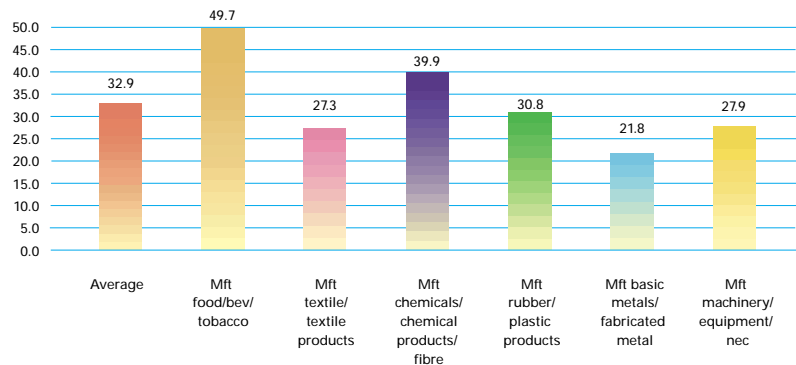


Chart 3.2: Penetration of Investors in People standard in manufacturing industry



“The company with the ability to learn and to act on that learning faster than anyone else has the ultimate competitive advantage.”

(Jack Welch, Chief Executive of GE International)

skilled workers than the rest of the economy. Conversely there are other sectors - for example food and drink, and textiles - with high proportions of low skilled workers both in relation to manufacturing and to the rest of the economy³. Moreover these sectors employ relatively low proportions of key intermediate skilled workers which researchers have identified as being complementary to the development of high value-added manufacturing capacity⁴.

The demand for skills is a particularly acute problem for some parts of manufacturing, and for certain categories of skills. Although manufacturing industries have one of the lowest incidence of hard to fill vacancies compared to other sectors, the shortage of suitably skilled applicants remains the principal cause of the vacancies that do exist. For example, the National Skills Taskforce⁵ reported that there was a shortage of ICT specialists, and that engineering industries were suffering more acute skills shortages than in many other parts of manufacturing. The successful use of advanced ICT

applications in all types of manufacturing, the increasing incorporation of electronics intelligence in a wide range of products, and the continued growth of the electronics manufacturing sector itself will be critically dependent on the availability of staff with relevant skills.

For manufacturing industry to improve its competitive position, its workforce will need to acquire more skills at a higher level, and to use the skills that they have more flexibly. And the investment in skills must address both immediate requirements and longer term needs. The Foresight Manufacturing 2020 Panel sees this as a priority for action.

The majority of British manufacturing businesses of all sizes already recognise this trend towards increasing skills needs, and many are already taking positive steps to address it. Many are already taking advantage of the increased supply of new graduates⁶. Many manufacturing businesses have reaped the rewards from achieving the Investors in People Standard, with take-up

in some sectors running significantly ahead of the industry average (see Chart 3.2). A significant number of larger manufacturing businesses have established corporate universities to help their employees develop new skills.

¹ *Skill Needs in Great Britain and Northern Ireland 1998*, IFF Research

² *Britain's Relative Productivity Performance*, O'Mahony M, 1999

³ *Britain's Relative Productivity Performance*, O'Mahony M, 1999

⁴ *Productivity, product quality and workforce skills: food processing in four European countries*, NIESR Discussion Paper 34, 1993

⁵ *Towards a National Skills Agenda*, National Skills Taskforce, 1998

⁶ "Graduate utilisation in British industry: the initial impact of mass higher education", *National Institute Economic Review*, no. 156 (May 1996)



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Chapter 3

People & Skills

How can Government help?

Tackling the skills needs of the IT, Communications & Electronics Industries

The Secretaries of State for Trade and Industry, and Education and Employment, announced a wide-ranging enquiry into the high-level skills needs of the IT, communications and electronics (ITCE) industries and how these can be met effectively, both now and in the future. The report from the ITCE Skills Strategy Group was published on 1 November.⁷ The Government is committed to working in partnership with business, the education system and other partner organisations to translate the report's recommendations into early and effective action. DTI has pledged up to £4 million over the next 3 years to support the ITCE skills agenda.

⁷ "Skills for the Information Age" at www.dfee.gov.uk/skillsforce

⁸ *Ufi Pathfinder Prospectus, Department for Education and Employment, 1998*

⁹ www.bcf/testsite/training.html

Tackling skills shortages in engineering

DTI and DfEE are launching a new joint programme to help manufacturing businesses - particularly small and medium sized enterprises - tackle shortages of engineering technician skills. The objectives of this programme will be:

- *to improve the technical and managerial skills of engineering technicians;*
- *to encourage collaboration between small firms employing engineering technicians with similar training needs.*

First proposals to establish such business networks will be invited later this year. Successful proposals will receive support for up to three years. It is envisaged that a total of £1 million will be available and up to 15 proposals will be supported.

Raising investment in skills for the Future

The Government has already announced a number of programmes which will help

manufacturing industries raise their skill levels to meet their future needs;

- *The University for Industry (Ufi) will be launched nationally in Autumn 2000 to stimulate demand for lifelong learning amongst businesses and individuals. Its initial priorities include small and medium sized businesses, and the automotive component and environmental technology and services sectors. The Government has set a number of indicative targets for Ufi which include delivering Ufi programmes and services to 100 000 business start-ups and 50 000 SMEs per year within five years⁸. Ufi is calling on education providers, businesses, trade unions and voluntary groups to form consortia to establish around 1000 learning centres by March 2001. Up to 70 Development Learning Centres will test out various aspects of Ufi services and systems from November 1999. The establishment of each of these learning centres will be lead by the Hub for the area. Ufi has received 199 applications to form Hubs, including 69 from sectors, which it is currently evaluating. A number of manufacturing businesses are part of consortia bids within regions.*



Case study:

Leadership skills in manufacturing: IMI Norgren

A world leader in pneumatic control and factory automation, IMI Norgren's investment in leadership skills is delivering over £1.6 million in ongoing annual cost savings, as a result of their Operations Director, Roy Twite undertaking Cambridge University's Manufacturing Leaders' Programme.

To date 4 managers from Norgren's UK operations (which employs 1,700 people) have been through the programme - a Master of Studies degree course specifically designed for high fliers in all types of manufacturing businesses.

"We need to continuously raise our manufacturing edge. The days of relying on price increases have gone", said Steven W Cooper,

Norgren's President. "Developing our leadership skills is one way; Norgren Managers who have been on the course have sharpened up local leadership, developed a more strategic vision and driven it through faster than we could have without this training".

Contact:

Dr. Robin Daniels 01223 338186
www.mmd.eng.cam.ac.uk./leaders

- Graduate Apprenticeships, based on the successful Modern Apprenticeship model, aim to enhance graduate employability through the integration of higher level study with work-based learning. The Department for Education and Employment is contributing to the development of the frameworks which will assist manufacturing industries in addressing higher level skills needs. Current projects include chemical manufacturing, electronics and software, engineering and the steel industry. A wider roll out of the initiative is planned from April 2000 and fee remission will be available from September 2000 for employees of SMEs who undertake part-time higher level

study as part of a Graduate Apprenticeship.

In addition to these major initiatives, the DTI also supports a number of smaller scale programmes to raise skills levels in the manufacturing industry. For example, the Training Alliance for Surface Coatings, a National Training Organisation, has developed the Open Tech Learning Programme⁹ with DTI support. This is an Internet-based learning programme for people involved in the formulation, manufacture, surface coatings and glue industry.

Benchmarking best practice

The Government has supported the publication of the People Skills Scoreboard for the Engineering Industry. The Scoreboard provides an important reference document for many firms, particularly small and medium sized enterprises, by enabling them to benchmark their own performance, and contributing to planning of their own skills development activities. The Government is supporting the spread of this approach to other manufacturing.



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Chapter 3

People & Skills

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Case study:

Airdale Springs Ltd

Airdale Springs Ltd is a small manufacturing company in Keighley which employs 62 people. The company trades with a wide range of different industries and there are no standard products. Orders range in size from one to millions, have different precision requirements and a variety of delivery schedules, dictated by the customer. To meet these demands, Airdale's management team have put their people at the heart of their business strategy. An early

convert to Investors in People, the company has recently been reconfirmed as reaching the standard for the third time. Recent developments include abandoning job descriptions and assessing each individual against a series of 84 competences, which were developed in-house. This assessment forms the basis of the individual's development plan and merit-based pay. Airdale believe this will enable them to utilise the skills in their workforce better and encourage multi-skilling in the workforce.



Case study:

Learning Through Business Networks

GE Capital, working with Leeds TEC, Business Link Leeds, Leeds City Council Park Lane College and University of Leeds, have developed a programme to raise business-critical skills within GE, GE suppliers and other Leeds SMEs.

About 260 people will take part either from GE who need to upgrade their skills, from GE's suppliers who need help to meet the demanding quality standards, or from other Leeds' SMEs to help increase their business performance. The project will run to June 2000.

The programme focuses on team building and training in quality techniques, adapting proven large business techniques such as Six Sigma. A major priority for this programme is to reduce defects in every business process to fewer than four per million.

There are benefits for everyone involved in the programme. These include:

- *for individuals, retention of jobs and improved employability;*
- *for the SMEs, performance improvements stemming from exposure to world class standards;*
- *for GE, cost savings as a result of training investment;*
- *for Leeds partners, greater understanding of the demands placed on SMEs to meet large business quality standards.*

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Chapter 3

People & Skills

Promoting excellence

For skills at all levels, it is important to promote and celebrate excellence. The Government continues to support the National Training Awards and UK SKILLS in their promotion of skills competitions for young people. Always strongly represented in the National Training Awards competition, the manufacturing sector has regularly provided a quarter of all winners. Nearly half of the skills competitions holding the UK SKILLS seal of approval (or working towards it) represent skills needed by manufacturing. A further two competitions relate to IT.

Both National Training Awards and UK SKILLS identify and publicise role models who can demonstrate in real life what excellent skills and knowledge can mean in terms of personal and business success. They also demonstrate the benefits of creating a culture of learning within the company. In addition, early next year the DTI with DfEE and the Further Education Development Agency will publish a best practice guide to corporate universities.

A better match of demand and supply of skills

The recent White Paper *Learning to Succeed*¹⁰ also offers businesses, through the establishment of the national and local Learning and Skills Councils, an unprecedented opportunity to influence the development of the education and training system. Involvement in these Councils by business will help promote a better match between the demand for and supply of skills. The Councils will:

- *offer individual businesses, in conjunction with the Small Business Service, support in developing effective training plans, advice and support for Investors in People;*
- *develop new initiatives to improve the opportunities that people in the workplace have to develop new skills;*
- *develop new approaches to collaborative working between businesses and;*
- *disseminate best practice in work-based training, drawing on initiatives such as the People Skills Scoreboard.*

The National Training Organisations (NTOs) have a pivotal role to play in these new arrangements. NTOs are undertaking for the first time Skills Foresight activities, as the basis for thinking about future skills needs and how to meet them. Links are also being put in place between NTOs and the 13 Foresight Panels (see chapter 2), each of which has education, skills and training as part of their current remit. These activities will help address skills issues, such as qualifications, the supply of skills, and education and training provision, in manufacturing industries.

DfEE are strengthening the NTO network further through a new budget of £750,000 to promote a diverse range of projects to improve skills levels. These include a number of projects which will help manufacturing industries, including developing the Group Training Association network for the engineering manufacturing sector.

Further Education colleges also have an important role to play in tackling a key level of skills for manufacturers - intermediate level skills. As colleges are well

embedded in their local communities, they are ideal access points for small businesses. The Further Education Funding Council is establishing a Skills Working Group to complement the work of the National Skills Taskforce by focusing on the contribution colleges can make to meeting the national demand for skills.

Trade unions are already a key player in much current workforce development for manufacturing. They are uniquely placed to promote and champion learning in the workplace and are contributing to the development of Individual Learning Accounts. Their contribution is being encouraged through the Union Learning Fund. The AEEU, for example, began a programme in Humberside last year to train union learning representatives who promote training amongst the workforce and provide support for learners. It was so successful, it is now being rolled out to five other AEEU regions.

A new management mindset

Leading and managing manufacturing businesses in the knowledge driven economy will add new challenges to an already demanding task. To help define that task, and to begin to see how Government can help, the DTI ran its “Knowledge Edge” workshop in January 1999 in partnership with the Institute for Manufacturing, the Management Charter Initiative (MCI) and the Design Council¹⁰. The workshop found that for all businesses, including those in traditional sectors and for both large and small businesses, a new management mindset was required, including:

- *a willingness to be entrepreneurial;*
- *a focus on team work;*
- *partnership strategies embedded across the enterprise;*
- *a life-long commitment to learning.*

The priorities for management emerged as the capacity for leadership, entrepreneurship and the breaking down of barriers, within and between businesses and other organisations. This

was needed so that knowledge could be released, acquired and applied quickly and effectively in rapidly changing markets, driven by ever changing technology and ever demanding customers. The workshop said that to play its role the public sector also needed to adopt similar attitudes.

To respond to this, the Government has established the Management and Enterprise Council and asked it to report on the best way to take forward these issues at a national level in partnership with those most closely concerned. The national and local Learning and Skills Councils will also be given a remit to look at local provision of management development and training to ensure it meets the need of today’s manufacturing business.

¹⁰ “Learning to Succeed”, Department for Education and Employment, 1999

¹¹ The full report of the workshop can be found at www.bcf/testsite/training.html



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Chapter 3

People & Skills

Partnership

Partnership is an essential element in creating modern businesses which can produce quality goods to compete in world markets, and at the same time offer secure and rewarding employment.

The Government is working to create a new structure of employment relations, where a legal framework of minimum standards underpins a new, non-confrontational approach to relations in the workplace based on partnership. The essential complement to minimum legal standards is a much more widespread recognition of the benefits which can flow to all parties through the development of partnerships at work.

For too long, there has been a general assumption that management on the one hand and trade unions and the workforce on the other, have conflicting interests. In fact, the best of our manufacturing companies and unions have always recognised their common interest in creating successful businesses, and have co-operated to achieve that.

The need now is to strengthen and widen the move away from the old mentality of “them and us” and towards partnership at work.

Ultimately it is businesses, employees, and their representatives themselves who must drive this culture change, but the Government has a role to play in encouraging it. That is why the Government has launched a new Partnership Fund. Up to £5 million will be available from the Fund over four years, to support both projects which develop partnership approaches between employers and employee representatives as a means of solving business problems, and projects which make the benefits of good practice in partnership more widely known.

More information on the Partnership Fund can be obtained by calling the Helpline on 020-7215 6252

Domnick Hunter Group plc make autoclave filters at 4 manufacturing sites in the North East. The business's relationship with its workers is based on trust and respect. The Group Chief Executive comments, “the important thing is valuing people personally. If you do that, everything else generally falls into place...” The business is firmly committed to a process of continuous improvement - as one team member comments, ‘Every operative is responsible for their own quality. The business has hammered this aspect of partnership home, and there are regular quality meetings in the departments, at which all employees are involved.’

Take-up of the employee share ownership scheme is high, around 80 per cent of all employees have participated, and it is estimated that they own around 12-13 per cent of the business.

The outcomes are encouraging: between 1992 and 1997 turnover increased from £27.3 million to £65.8 million; profit before tax increased from £2.8 million to £9.6 million and people employed increased from 515 to 877.



Case study:

Symtol Engineering Ltd

Symtol Engineering Ltd collaborated with Durham University's Business School (DUBS) to bring reality to a vision of a modern self sufficient company. Mike Mitchell, owner and Managing Director of the medium-sized precision and fabrication engineering business in Blyth,

Northumberland, had been running it for 17 years. He recognised that to grow the business needed a flatter and more open management structure and style. It also needed a multi-skilled workforce empowered and trained to take informed decisions.

As a result of a TCS Programme with DUBS, the company's management style changed from being an autocratic one and staff are now encouraged to take and implement

their own decisions. Training is now planned, rather than ad hoc, and includes management skills, NVQs in engineering and certified welding. Symtol's annual turnover rose from £2 million to £5.5 million, profits rose tenfold, a new factory was opened, and the workforce grew from 40 to 110 people. Mike Mitchell said, *"I've become a businessman whereas before I was just the owner of a business"*.

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Chapter 4

Information & communications technologies

The knowledge driven economy is inextricably bound up with the huge ICT advances which have occurred over recent years.

- *The semi-conductor increasingly embeds knowledge within products and services. They are more “intelligent” in the way they react to their environment*

and customers’ needs. For example, up to a third of the value in a modern car now lies in electronics and software.

- *ICTs allow businesses to re-engineer both their internal processes and their supply chain relationships to strip out waste, improve quality and give better customer service.*

- *The phenomenal growth of the Internet is opening up new markets and new business models. SMEs in particular are benefiting from low cost access to a global market place which was previously only open to major companies with a global marketing and distribution infrastructure.*

Box 1: Using ICTs to transform the manufacturing value chain

- **Supplier relations:** The Internet gives access to a global pool of suppliers, allowing significant purchasing savings. Electronic communication with suppliers drives down the cost of procurement, facilitates just-in-time manufacturing and improves the quality of purchased materials and components.

General Electric’s lighting company in the US replaced its people intensive purchasing system with Internet technology. The results have been that time to issue a request for quotation cut from 7 days to 2 hours, purchased materials costs cut by 20 per cent and purchasing labour costs cut by 30 per cent.

- **Product design:** Computer Aided Design improves quality, speeds up design cycles, and reduces time for new product developments.

The wings for the next Airbus are being designed using knowledge-based software. British Aerospace and its partners - linked by intranet - are using Computer Aided Design to work together on the designs in real time. BAe estimates that design processes are now 25 times faster.

- **Product manufacture:** Computer Aided Manufacturing improves quality, speeds up production cycles, and reduces time-to-market for new product developments.

Photofabrication Services have introduced a real-time system for monitoring the progress of sheet metal through a multi-stage chemical etching and treatment process, leading to a 60 per cent reduction of work in progress with further reductions anticipated¹.

¹ *How automatic identification can work for you, DTI April 1998*

‘A vital aspect of ICT’s role in driving innovation is the way they enable manufacturers to focus on key business activities.’

These technological advances are helping manufacturers to transform the way they operate at every stage of the business process, as illustrated in the box below. This also shows how hard business benefits flow directly into the bottom line.

A vital aspect of ICT’s role in driving innovation is the way they enable manufacturers to focus on key business activities, using networking technology to create collaborative partnerships with other organisations. Chapter 5 discusses in more detail how ICTs are underpinning new methods of

collaborative working in the manufacturing sector.

- **Distribution:** Use of ICTs dramatically reduces the time needed to process orders by 50-90 per cent for most businesses according to an OECD study. It also reduces the need for expensive stock-holding: the OECD estimates that e-commerce means an overall inventory reduction in the US of \$250-350 billion (or about a 20-25 per cent reduction in current levels).

Caledonian Industries manufacture and supply cushion packaging and sealing gaskets. By using an integrated stock, planning, materials and production control system they can respond very quickly to changing patterns of demand and be aware of stock levels at any time. Benefits include increased customer satisfaction, production estimates now accurate to within 3 per cent, and greatly improved controls over material costs - the biggest single cost in their business.

- **Marketing and Sales:** A digital shop front is much cheaper to maintain than a physical one, and a web-site allows even the smallest SME to operate as an open-all-hours, global business.

Wigan company Optimum Designs - which produces padded clothing for contact sports - now provide secure on-line ordering from their web-site. Turnover has increased tenfold in 12 months, with new orders flooding in from around the world.

- **After-sales care:** Use of “smart databases”, plus 24 hour access to the business via the Internet, enables manufacturers to offer a better tailored, faster and more convenient customer care service.

Plade, a specialist plastics manufacturer in Glasgow, spent £10,000 redeveloping its web-site to provide a full customer support service, including remote diagnosis of product faults. This helped generate over £900,000 export business last year, up from £230,000 in 1997/98.



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Chapter 4

Information & communications technologies

As can be seen in Chart 4.1, within the UK, the manufacturing sector compares favourably with other industrial sectors according to measures such as the number of companies providing employees with access to the Internet.

Internationally, however, the picture is mixed. As can be seen from Chart 4.2, in terms of ownership of hardware such as PCs, UK businesses compare favourably with our overseas competitors. However, a smaller proportion provide employees with access to the Internet or conduct transactions on-line than in the United States, Canada and Japan. The situation is worse for smaller businesses, with small (10-99 employees) and especially micro-sized (1-10 employees) businesses rating far below our main international competitors.

Chart 4.1: UK businesses providing employees with Internet access by sector (weighted by employment)

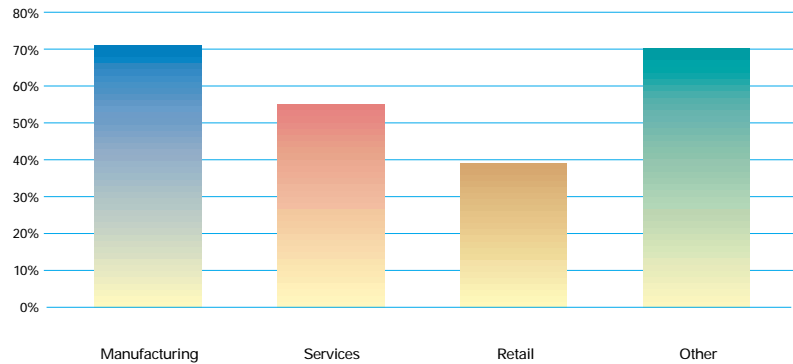
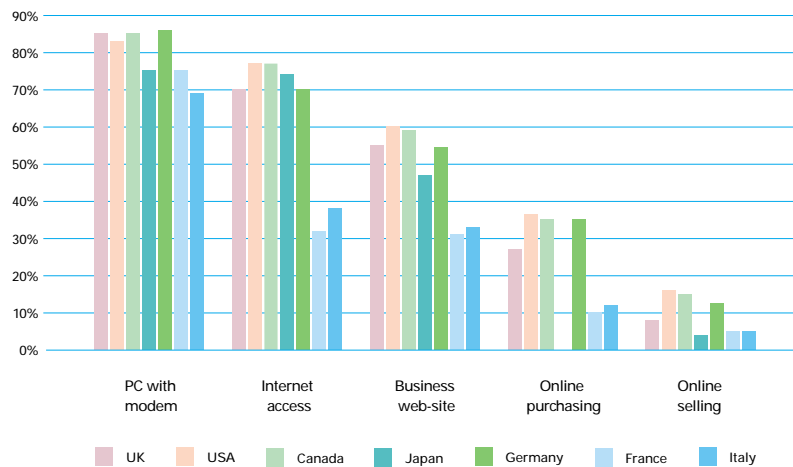


Chart 4.2: Uptake of ICTs by manufacturing businesses (weighted by employment)





Case study:

The National Microelectronics Institute (NMI)

The National Microelectronics Institute (NMI) is an excellent example of collaboration between semi-conductor businesses. It is facilitating the development of a health and safety "Passport" to cover the 2000 plus supplier personnel who visit manufacturing sites each year. Estimated savings to the sector of some £2 million per annum are expected.

Many suppliers to the industry visit multiple UK sites throughout the year. These visitors are required by law to be given Environmental Health & Safety training as part of their hosts' legal responsibility, whilst they are on site.

Training normally takes the form of an induction, which is very similar across most of the sites. The "Passport" incorporates elements of industry best practice to produce a single programme that is delivered every two years. Successful completion of the training will result

in the "Passport" being awarded.

Site visitors with a valid "Passport" will therefore only require additional site-specific training.

Training and assessment will be delivered at one of four regional UK sites and will utilise Computer Based Training to facilitate effective learning and presentation. Long-term plans to address the mobility of engineers within Europe and the U.S. are also being considered.

How can Government help?

Against this background, the Government has set ambitious targets for improving the ICT performance of SMEs in the UK. These are, by 2002 to:

- *have increased the number of SMEs using network technology to connect to the digital marketplace from 350,000 at the beginning of 1998 to 1.5 million;*
- *have 1 million SMEs not just connected but actually trading on-line; and*

- *help bring the smaller businesses, with less than 100 employees, up to the level of the best of the international competition.*

These targets are being underpinned by a significant expansion of DTI's Information Society Initiative (ISI). An extra £20 million will be made available over the next three years. The ISI offers independent, expert, jargon-free advice to small businesses through a national network of local support centres based in Business Links and their

equivalents in Scotland, Wales and Northern Ireland.

In addition, DTI is working with BT, Microsoft, Intel and Compaq to raise the ability of the much wider range of small business advisers throughout the public and private sectors (including in banks, accountancy businesses, consultancies, IT supply companies etc.) to offer effective advice on how to integrate ICTs within a small business. This advisor skills initiative to be launched next year as Technology Means



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Chapter 4

Information & communications technologies

Business is being piloted through eight training and accreditation centres around the country, with full national roll-out early next year.

Helping your business win in the digital economy

The small UK manufacturers used as case studies in Box 1 received support through the Information Society Initiative:

- **Peter Moran, Managing Director of Optimum Designs:** *“Without having contacted the Local Support Centre I would never have got the web-site up and running. I wouldn’t have known where to start. Now that the ordering system is set up I just switch it on in the morning and see where our new customers are. People access the site and place credit card orders from all over the world. The system is secure - safer than conducting transactions over e-mail and more efficient than traditional means. It has also given the company a professional modern image.”*
- *“I feel the real prize for us has been the fact we’re involved in e-commerce. Last year our exports increased by over 400 per cent largely because of ICT and we’re likely to match that figure this year. The ISI/Information e-Commerce*

awards were a fantastic reference point as we were able to measure our effectiveness against the experience of others.”

MD of Plade

Find out how your business can benefit by:

- *calling the ISI Business Infoline on 0345 15 2000*
- *e-mailing info@isi.gov.uk*
- *visiting our web-site at <http://www.isi.gov.uk>*

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Case study:

Echopilot

Echopilot is a small marine electronics company with 30 years' experience of manufacturing navigation instruments aimed at the leisure boating market. The use of microcontrollers has enabled them to launch a new range of highly competitive products.

They are just one of many small UK businesses that have been helped by the DTI's "Microelectronics in Business"

programme, by making them more aware of the competitive advantages of using microelectronics technology in the products they design or manufacture.

Echopilot developed the Forward Looking Echo Sounder (FLS) for the marine market - basically the FLS provides knowledge of potential hazards beneath the water ahead of the vessel. Benefits of the microcontroller-based design approach include computing power that enables the FLS to process enormous amounts of incoming data, typically 200,000 calculations are performed every second to provide a graphic display of the required data to the ships crews, and the facility to

customise the product to meet national language requirements for the export market. Major product enhancements can be made at low cost because the microcontroller provides a base upon which modifications can be made without subjecting the overall product to redesign.

Echopilot has an annual turnover of around £1m, much of which comes from exports. Echopilot's management team, Susan Phillips and husband Mike, believe that their technology driven strategy has secured its future in the highly competitive international leisure boating market sector.

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Chapter 5

Networks and best practice

Building networks and exploiting best practices are a key way for manufacturers to make the most of their investments and the capabilities of their people and technologies. They are increasingly important because:

- *the rate of change demands rapid innovation and new technology often beyond what one business can achieve on its own;*
- *supply chains are changing – becoming networks that increasingly exploit commercial sources of knowledge by licensing research, design and technologies;*
- *business development is often strongest when businesses cluster together, creating opportunities for better returns on investment;*
- *large manufacturing projects often require international alliances; and*
- *sharing or trading knowledge across boundaries helps businesses gain competitive advantage.*

In some sectors, collaboration will involve large numbers of small and medium-sized suppliers working with a large Original Equipment Manufacturer (OEM) customer. In others, it may involve a small group of businesses working with a common group of customers or suppliers. It may even just mean individual businesses applying best practice to their customer relations. The groups of businesses involved will sometimes be sectoral, sometimes regional or local. With businesses competing increasingly on innovation and customer service, every manufacturer can gain from work in this area.

Many of the larger manufacturing businesses, especially the OEMs, have led the way in this, creating more effective supplier networks. But there is still room for improvement. The 1998 CIPS/Anderson Consulting study “Integrated Supply Chain Management - Work in Progress” showed that less than 25 per cent of UK businesses have a comprehensive supply chain strategy and over 15 per cent of those who do believe it

is not integrated with their overall business strategy. While 95 per cent of firms believe ICT will play a key role in improving their relationships and communications in the supply chain, only 26 per cent of businesses are current users, with 51 per cent planning to use.

Some manufacturing sectors have undertaken considerable work on supply chain improvement (e.g. Automotive and Aerospace), but more need to take up the challenge. Knowledge management is beginning to have a major impact on the structure of supply chains and the relationships within them. Supply chains and partnerships are becoming more volatile and fluid, and less dependent on proximity.

Last year’s Competitiveness White Paper emphasised the importance of clusters, but clustering has been a feature of manufacturing for many years. Examples include traditional manufacturers based on steel production around Sheffield, ship-building on the Clyde and Tyneside, and furniture

“Building networks and exploiting best practices are a key way for manufacturers to exploit investments and the capabilities of their people and technologies.”

production around High Wycombe. More recently clusters of motor sport manufacturers have developed in Oxfordshire, and suppliers to the offshore oil and gas industry in Aberdeen. New technology clusters, centred on the knowledge base at leading universities are now common, these include satellite communications around Surrey University, and communications technology software around Cambridge.

How can Government help?

Supply chain improvement

The Industry Forum Adaptation scheme is providing funding for other sectors to adapt the motor industry's successful supply chain improvement model.

Early beneficiaries include:

Oil & Gas

All the major trade associations in the oil and gas sector have joined together to lead a programme to improve efficiency through better management of the industry's supply chains. Industry

benchmarking has shown that cost savings can be significant when relationships between the operators, contractors and suppliers are focused on adding value. By providing training programmes based on world class expertise, shared learning of experiences from other sectors, and collaboration on non-competitive activities, the programme aims to achieve savings of £1 billion by 2002.

Aerospace

Led by the Society of British Aerospace Companies (SBAC), the sector is introducing a programme of Master Class Workshops to improve methods of manufacture to eliminate waste and improve overall productivity. The objective is to improve performances on quality, cost and delivery by 30 per cent overall by 2010, with 80 per cent of aerospace companies to have been involved in the programme.

Other initiatives

ACTIVE (Achieving Competitiveness Through Innovation and Value Enhancement) was launched in 1997 in the engineering

construction sector as an industry-led supply chain initiative to achieve a reduction of 30 per cent in the cost of major construction projects. ACTIVE is owned and financed by its stakeholders who are 50 of the largest UK client, contractor and supplier organisations in the industry. The DTI has provided support to involve SMEs in the programme.

The Regional Supply Network and its equivalents in Scotland, Wales and Northern Ireland helps UK businesses to apply supply chain best practice, leading to long-term sustainable competitive advantage. Regional Supply Offices carry out sectoral projects targeting major potential customers, manage supplier location and assessment functions for new projects and inward investors, and provide training programmes in purchasing and supply.



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Networks and best practice

RSO Devon and Cornwall is currently involved in the planning of a £75 million Millennium project in Cornwall involving a series of temperate and tropical glasshouses in a disused china clay pit. The RSO is managing the vendor assessment programme, which aims to identify at least 30 new suppliers. It is expected that the project will create 300 new jobs, safeguard a further 200 jobs, boost tourism and establish a large business infrastructure within the area to support the project.

including BAe, BT, Xerox, Mitsui Babcock and Varian Medical.

A report will be published by DTI in March 2000 and a national showcase will be held by June 2000 which will demonstrate the impact the Campaign is making on national competitiveness, including in manufacturing.

Many sectors and leading UK businesses are recognising the value of business learning from business. Recent research

findings on supply chain learning and the work of the Competitiveness Working Party on Workforce Development have been published in the *Learning through business networks* report.¹ Key factors that enable successful and sustainable improvements have been identified from case studies in the manufacturing sector.

¹ Available on www.dti.gov.uk/mbp

Spreading Best Practice

The CBI-led “Fit for the Future” Campaign, supported by DTI, was initiated by the CBI National Manufacturing Council. The campaign has strong representation from the manufacturing sector and is designed to increase massively the transfer of best practice by encouraging businesses to learn from each other. The Campaign is providing a network for the above activities to share experience. It is working with national, regional and sector organisations. It is also attracting strong support from individual manufacturers,



Case study:

Research into the use supply chain to transfer learning and best practice has identified the key enablers for sustaining improvement:

- *leadership and senior management commitment;*
- *motivation to learn in a relationship where trust develops;*
- *active intervention with clear objectives and targets; and*
- *shared measurable benefits.*

An example of this shared learning and benefits is shown by both the Oil & Gas and Aerospace sectors. The core activity in sectors is supply chain improvement, but from meetings it became clear that many smaller businesses found the costs of the vendor assessment procedures to be expensive in time and resources, often each OEM had differing requirements. As a result of analysis, agreement to develop a common assessment procedure has been developed. Reducing costs for contractors and sub-contractors and increasing the overall efficiency.



Case study:

Brake Engineering Ltd

Founded in 1981, Brake Engineering has become the aftermarket leader in brake components. To maintain this position and improve their competitiveness they asked Industry Forum to undertake a MasterClass in their drum and disc area.

Working with a team identified by Brake Engineering, the Industry Forum Engineers were able to

reduce tool and equipment changeover time by 50%. This was achieved through eliminating waste and introducing new working procedures which meant that the machine spent less time being idle.

In addition, the Brake team gained first hand experience of continuous improvement techniques that they can implement without external intervention.

Managing Director Stephen Wills said, *"We now have a motivated workforce that actually wants to become involved in improvements. We have had our investment back in two months and learnt how to apply the practice in other areas ourselves"*.

Best practice programmes

DTI provides a number of programmes which help manufacturers identify and adapt best practice. Inside UK Enterprise offers the opportunity to experience, at first hand, the implementation of best practice through a programme of visits to exemplar organisations, 80 per cent are from the manufacturing sector. The Benchmarking Index provides both a free Internet service and a low cost facilitated service for smaller businesses to compare 80 aspects of their performance using a database of over 2,000

businesses that are competing and/or best in class organisations. The database is the largest of its type world-wide, and 70 per cent of the database is drawn from manufacturing. CONNECT for better business is a CD-ROM based service using interactive modules to promote an awareness of best practice issues. The modules aim to provide organisations with the motivation to improve their performance by learning from the experience of others across a wide range of business and management topics. The Foresight Programme (see Chapter 2) helps identify best

practice for the future through pooling and sharing knowledge and expertise for future competitive advantage. It provides a means of bringing businesses together to address the generic issues facing the sector; putting one end of an extended supply chain in touch with the other and promoting interaction across sectoral boundaries to stimulate innovation.

Guidance on the most cost-effective way to respond to the environmental challenge is provided through the Environmental Technology Best



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Networks and best practice

Practice Programme (ETBPP). It offers businesses independent and authoritative advice on how to reduce waste, emissions and use of resources and by doing so, save money. It does this by encouraging manufacturers to participate in waste minimisation clubs, seminars and workshops; by disseminating best practice guides; by benchmarking environmental performance and by encouraging networking with businesses that demonstrate best practice through hosting visits to their own sites. The Government has agreed to support the Environmental Technology Best Practice Programme (ETBPP) for a further five years to continue to help UK businesses to save money and reduce their impact on the environment. Independent and authoritative advice on saving money and reducing carbon emissions through energy efficiency is offered by the Energy Efficiency Best Practice Programme (EEBPP). The two programmes operate a combined free helpline (0800 585794), which provides information on energy efficient technologies and energy management, and cost-effective environmental technologies and techniques.

Access to European collaborative programmes

European programmes are a source of substantial funding for collaborative activities. Launched in 1985, EUREKA encourages and assists collaboration between European businesses, research organisations and universities. Its aim is to improve the productivity and competitiveness of European industry in world markets. EUREKA projects cover all technologies and have strong links to developing market opportunities. By mid-June 1999, 1,450 projects with over 3,000 participants had been completed or were underway, representing an investment of 20 billion Euros (£14 billion).

The 15 billion Euro (£10.5 billion) FIFTH FRAMEWORK PROGRAMME is the European Union's major initiative for support of technological research and development during 1999-2002. It focuses on improving competitiveness, developing sustainable technologies and enhancing the quality of life. There are four themes in the 5th Framework, including the Competitive and Sustainable

Growth theme which is aimed primarily at manufacturing industry. Its 2.7 billion Euro (£1.9 billion) budget is funding collaborative projects in areas such as innovative products and processes, aeronautics, land transport and marine technologies, materials research, standards measurement and testing. The UK is a major player, with 1,200 organisations from the UK's manufacturing industry participating in the first call for proposals.

The European Space Agency also manages collaborative technology programmes which, following a lead from the UK, are increasingly dedicated to commercial competitiveness and market opportunities. Co-funding with industry is becoming the common practice in these programmes and there is an important emphasis on ICT related activities, such as technologies to enable multimedia transmission by satellite. The programmes are co-ordinated with the European Union to avoid duplication.



Case study:

Stone Foundries Limited

Stone Foundries Limited (now part of a privately owned group) is a leading manufacturer of high integrity magnesium, aluminium and copper based cast products for the Aerospace, Defence, Motor Sport and Nuclear Sectors.

Stone, (140 employees; Turnover £10 million), collaborating with their aerospace customers, sought to

reduce costs to keep competitive in a ferocious marketplace. Key objectives were to improve the quality, effectiveness and consistency of their processes together with a reduction in product costs, changeover times, rework and waste in the foundry. A key feature of the programme was to improve their IT infrastructure (e-commerce) and applications (CAD, Product Modelling) and to adopt knowledge management using agreed

standards to share information within the business and with their customers.

Tangible benefits have already been achieved, site turnover has increased by over 10%, and the company is convinced better profitability will follow. The business has a stable platform from which to operate, and increased confidence to tackle complex projects with their customers.

Promoting Information and Communication Technologies within manufacturing

Increasingly, leading-edge manufacturers are using ICTs to transform the way they do business and in which they collaborate with partners. In particular many of them are using the Internet to develop close knowledge-based links with:

Customers: For example, Cisco, by giving its customers full access to its technical design and shipment information databases through an interactive web-site, has improved the productivity

of its customer service department by some 200 per cent.

Suppliers: For example, Bombardier-Shorts, the Belfast aerospace company, has been able, by using Computer Aided Logistics (CALs) and sharing databases with its suppliers, to achieve a 50 per cent reduction in its product development cycle; 80 per cent reduction in first article re-work and first time fit for wing to fuselage connections.

Competitors: For example, the major US automobile manufacturers have collaborated

in developing an extranet, known as ANX, to bind together the entire US automobile supply chain. ANX is expected to produce annual cost savings approaching \$1 billion for the global industry.

However, the strategic benefits of collaboration are often even greater than the significant costs savings. CISCO, for example, have found that their Internet-based customer interface not only cuts cost but helps build long-term customer relationships through improved quality of service. And the US automobile manufacturers



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behind ANX are seeing significant competitiveness gains in terms of greatly reduced time-to-market for new product developments.

As part of the expanded Information Society Initiative described in Chapter 4, the Government is committing £8.5 million to help pump-prime collaborative projects using ICT, working with small businesses, larger businesses at the head of major supply chains and partner organisations at local and sectoral level.

right:

Quest International

Knowledge management for manufacturing businesses

Manufacturing has always relied on its knowledge of complex design, materials, technologies and processes to bring products to market. The concept of total product life cycle support, which includes design, manufacture, maintenance and disposal, often over decades, needs tools and techniques reliant on knowledge management. Today's ICT is making it feasible for smaller manufacturers to offer this.

UK engineering businesses, working with UK CALS Industry Council have led the way in efforts to create

international standards and assessment tools enabling knowledge management in the collaborative product design and development processes.



Case study:

Kort Propulsion is a small marine engineering business specialising in propulsion and steering systems. The business recognised their industry had "too many suppliers and not enough customers". They used the DTI Benchmarking Index to assess their performance and the analysis resulted in key decisions to increase capital and marketing investments.

This has led to a 30% increase in turnover from new markets, but this was not the only change to be stimulated by benchmarking. In reviewing their management structures they realised that all decisions were made at the top, where 70 years of experience was held. They are now creating a knowledge base, codifying the "black art" of naval architecture, getting the knowledge out of their heads and into wider use in the business. Staff now have increased responsibility, allowing the top team to improve the business's knowledge base and train their staff to use it.



Case study:

Based on research into knowledge management practices in complex engineering projects, valued in excess of £200million, the **UK CALS Industry Council (UKCIC)** has identified 18 core skills requirements for ICT infrastructure, people and processes that contribute to success in knowledge management of complex engineering projects. These have

been incorporated into an electronic business assessment tool (e-BAT).

Building on the pilot tool, the development team is extending the knowledge base enabling more companies to assess themselves and develop electronic business strategies for design and manufacturing projects in the engineering and defence sectors.

“The concept of total product life cycle support, which includes design, manufacture, maintenance and disposal, often over decades, needs tools and techniques reliant on knowledge management.”

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Chapter 6

Competitive modern markets

Studies show that productivity growth is higher in businesses which face competition, that more R&D is undertaken in competitive industries and that openness and international competition have positive effects on efficiency and productivity¹. Open and competitive markets drive innovation and growth, helping manufacturing businesses gain a competitive edge in domestic and international markets. They help ensure that businesses themselves can obtain higher quality, better service and lower prices for the supplies they need. The Government places high priority on promoting competition in all markets. It is doing so through effective competition law, and by acting to remove barriers to entry and constraints on innovation.

Competition Policy

The Government is modernising the legal framework to allow free and fair competition to thrive, while clamping down on those who seek to impair such competition.

The Competition Act 1998, which comes fully into force on 1 March 2000, represents a significant strengthening of the laws dealing with anti-competitive behaviour. Based on EU law, it will prohibit agreements that are significantly anti-competitive, such as price fixing, and abuses of a dominant market position, such as predatory pricing.

The merger regime is another key component. The Government believes that merger regulation would be significantly improved if the vast majority of decisions were taken by independent competition authorities rather than politicians. Business is entitled to know that decisions will not be influenced by short term political considerations. And businesses need clarity and stability in order to plan and

execute commercial decisions with confidence and efficiency.

The Government is currently consulting on a radical new framework for merger control. Under these proposals a new competition-based test would replace the current general public interest test for assessing mergers, and the independent competition authorities would be given responsibility for making decisions against this new test.

¹ *The efficiency of firms: What difference does competition make?* DA Hay and G S Liu, *The Economic Journal*, Vol 107, No 442, May 1997.
Haskel, J (1991) "Imperfect Competition, Work Practices and Productivity Growth", *Oxford Bulletin of Economics and Statistics*, Vol 53, No 3 August, pp265-280.
Disney, R, Haskel J and Heden Y (1999) "Entry, Exit and Survival in UK Manufacturing". Unpublished
Nickell, S.J. (1996) "Competition and Corporate performance" *Journal of Political Economy*, Vol 104 No.4 pages 724-46;
Fairburn J.A. & Geroski P. (1989) "The Empirical Analysis of market Structure and Performance" in Fairburn J.A. & Kay J. (eds) *Mergers and Merger Policy* (Oxford: Oxford University Press) Pages 175-92;
Bank of England (1997) "Openness and Growth" *Conference Proceedings* (London: Bank of England).

“Open and competitive markets drive innovation and growth, helping manufacturing businesses gain a competitive edge in domestic and international markets”.

Single Market

The environment for business in the UK is to a large extent shaped by frameworks agreed at European level. Europe's agenda needs to be re-oriented towards the promotion of high technology, high value-added business activity, it needs to cut back on regulation which stifles business growth, whilst maintaining confidence in markets and it must re-focus the use of EU funds on business support in areas such as innovation and R&D.

The Single Market is the corner-stone of the EU's economic policy. The Government is currently negotiating with EU partners, a new, strategic framework for addressing remaining areas of weakness in the Single Market, such as openness of public procurement, levels of state aids, proper protection for intellectual property and opening up markets through removing remaining technical barriers to trade. Progress in these areas is critical to the health of our manufacturing exporters. We will be consulting closely with industry in seeking to shape a satisfactory outcome.

Last year a task force set up by the European Union under the chairmanship of Chris Evans of Merlin Ventures, produced a report on the simplification of the environment for business within the EU. The key recommendations of that report, covering issues such as access to finance, streamlining regulation, education and training, have been endorsed by EU Member States and the UK will be pushing for speedy implementation. The aim is to provide an environment for business in the EU which matches the best in the world.

We shall be following this up at a special meeting of heads of Government at Lisbon next March which will discuss employment, economic reform and social cohesion. We shall be pushing for conclusions which spell out an action plan for enterprise within the European union, focusing on the knowledge driven economy and enterprise as the way to create the jobs of the future. We shall be working to ensure that the interests of manufacturing are fully reflected in those conclusions.

International Trade

Trade in manufactured goods has increased thirty times over the last fifty years. By 1997 it accounted for nearly three quarters of world trade. It is no coincidence that this expansion has followed a dramatic fall in trade tariffs on industrial goods since 1948, when the first General Agreement on Tariffs and Trade was concluded.

However, there is more to be done to maintain and improve the free flow of manufactured goods. Tariffs are still high in some sectors, particularly textiles, clothing, footwear and leather goods. The Government strongly supports further tariff reductions in all sectors by all members of the World Trade Organisation (WTO). We will work to achieve this as part of the next WTO Round of trade liberalisation negotiations.

As tariffs have fallen, other, less obvious restrictions and distortions to trade have become more prominent, such as mismatches in national standards, technical regulations and conformity assessment procedures. Such measures are covered in the WTO's Technical



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Competitive modern markets

Standards

Product standards accelerate the spread of innovation and best practice throughout industry, especially to small business. Standards also help to open up markets, remove technical barriers to trade, reduce the costs of meeting national specifications and unusual conformity assessment requirements.

Developing standards can involve a lot of hard work, and because so much standards-making is European or international, it takes time for a consensus to be established. This means that traditional methods of preparing standards can be too slow for faster product cycles. The Government is therefore reviewing with the British Standards Institution what can be done to accelerate standards-setting, for example by making greater use of electronic documentation and the Internet.

Barriers to Trade Agreement.

The Government believes that the next Round should look at how the operation of this Agreement can be improved.

Our aim is to:

- *ensure that countries regulate only to the extent necessary to protect public health and safety and other legitimate objectives;*
- *encourage governments to keep technical regulations and conformity assessment procedures simple, wherever possible; and*
- *achieve greater recognition and use of international standards as distinct from conflicting national or regional standards, while at the same time encouraging the development of adequate international standards in areas currently without them.*

The Government has a wide range of other objectives for the next Round; those most relevant to manufacturing include simplification of trade procedures; ensuring the WTO responds to the needs of the new Information Age; and creating a framework for international investment and competition.

Communications and e-commerce

The Internet is now the fastest-growing market-place in the world economy. The growth of Internet shopping (with 20 per cent of the UK population now accessing the Internet at home, and more than 10,000 coming on line every week) is allowing manufacturers to bypass traditional retailers and sell direct to consumers. Even more significant for manufacturers is the way e-commerce is revolutionising business-to-business markets, which account for some 80 per cent of total e-commerce.

The Government has set itself the target of making the UK the best place in the world in which to trade electronically by 2002, and published a detailed forward strategy on e-commerce on 13 September setting out how this target will be met. This strategy builds on steps that have already been taken, including:

- *putting in place the light-touch regulatory regime needed to build trust in electronic commerce;*

- *introducing greater competition in telecommunications, laying the foundations of a world-class infrastructure available to all at competitive prices; and*
- *using the Government's own market position to drive forward the emerging UK e-commerce market.*

Sustainable distribution

Even though more and more business transactions are taking place electronically, the physical movement of goods and people will continue to play an essential part in the efficient operation of the manufacturing sector. The Integrated Transport White Paper, published in July 1998, set out measures to tackle traffic congestion and pollution and increase choice in transport, including the transport of goods. They include making better use of the transport infrastructure we have; for example, through better traffic management, congestion relief measures as well as a targeted programme of trunk road improvements and using freight facility grants to

↓ Case study:

The National Metalforming Centre - helping industry to meet the challenges of the future

The Centre was established this year by the Confederation of British Metalforming to help the forging, sheet metalworking and fastener sectors achieve global competitiveness. It is part of their long-term strategy to take advantage of the increasing demands and opportunities that businesses face today.

It promotes the adoption of best practice - provoking and stimulating change, particularly in process technologies and workforce skills development. Participation through web-based data and information exchange encourages problem solving through multi-disciplinary and cross-industry teams. On-site support includes expertise in process simulation software and computer based training systems.

Neil Marshall, Director General says, "The key to the future is to build enduring and profitable partnerships between producers, end-users and suppliers and to get the most from our excellent centres of academic research. I believe the Centre and what it provides is the ideal vehicle to help us achieve that."

encourage the transport of freight by rail.

DETR has published a strategy for sustainable distribution for the 21st century. Central to the strategy is an expanded best practice programme designed to analyse and promulgate information on best practice in manufacturing, services and retail distribution. Recent work has included a major benchmarking survey of food distribution, in which some 40 major retailers

and distributors participated, the results of which were published in June. The overall aim of the programme is to identify operational practices and technologies which contribute to efficiency and competitiveness, at the same time as addressing the environmental and social factors relevant to distribution activities.



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Chapter 6

Competitive modern markets

Consumer strategy

Strong, knowledgeable consumers are an important asset to business. They help markets work more effectively. Consumers who assert their needs clearly and make informed choices, spur business on to become more competitive. In return, they get better products at lower prices.

The Consumer White Paper, published in July 1999, sets out how the Government will reinforce this virtuous circle. This includes providing better information for consumers and

In July 1999, the Consumer White Paper announced the creation of an industry-led body, TrustUK, to identify web sites meeting best practice standards in consumer protection through an e-hallmark. In August 1999 the Government consulted on the Electronic Communications Bill, which will ensure legal equivalence between on-line and off-line ways of doing business, and encourage an industry-led, self regulatory initiative to approve providers of the "trust services" which make e-commerce possible. The Government hopes to secure Royal Assent for this Bill by April 2000.

encouraging responsible businesses to follow good practice.

Intellectual property rights

When manufacturers invest in R&D, they want to be sure they will have the opportunity to secure a reasonable return on investment. Intellectual property rights (patents, designs, trade marks and copyright) give businesses the confidence to exploit their ideas commercially, while at the same time spreading knowledge and innovation.

The Competitiveness White Paper set out an action plan which promised affordable and accessible intellectual property rights. This is already taking effect. Fees at the UK Patent Office have been reduced on average by 20 per cent - an annual saving of £12 million to industry. Increased provision of patent, design, trademark databases and published specifications through the Internet, is making information more accessible.

Cutting red tape

The Government acknowledges that regulation can be a significant burden on manufacturers and a potential barrier to entry for new businesses. A tough new approach to regulatory control was announced in the Modernising Government White Paper in March. The Government's aim is to eliminate unnecessary regulation and minimise the burdens imposed by necessary regulation.

One of the key roles for the new Small Business Service (see Chapter 1) will be to provide co-ordinated information for small firms on their regulatory obligations. This will include developing an electronic gateway into information provided by regulators. The SBS will also work with regulators to ensure they provide information and guidance tailored to the needs of small businesses.



Case study:

Smart Fibres Ltd

Smart Fibres Ltd are an excellent example of the benefits of university/business collaboration which translates the scientific and technological knowledge in our universities into commercial success.

The business was spun-out from Carbospars Ltd, the carbon fibre yacht mast makers, to manufacture optical fibre strain sensing systems developed during the LINK Photonics MAST project. Since the conclusion of the project, Smart Fibres have further developed the generic system, so that it is suitable for a potentially wide range of applications, including

the civil engineering industry: for the load monitoring of bridges and roads, and in the offshore industry, for the monitoring of oil risers and pipelines.

Damon Roberts, Managing Director of Smart Fibres says, "The success of the strain reading system owes its origins to the LINK scheme. It was through this scheme that the research and development arm of BAe, together with the academic facilities of Aston University were encouraged to work with an SME to disseminate knowledge. We, the SME, were able to influence the project to achievable goals, leading to commercial development. The

project successfully brought together the companies and created new openings for all concerned".

Smart Fibres have already installed their system onto a steel cantilevered structure within the Millennium Dome and have a contract to develop an extremely sophisticated system for aircraft load monitoring, in conjunction with British Aerospace. There has been intense media interest in the project, including a BBC feature on Smart Fibres for their engineering-based world service program and the Open University has used the project as the subject of a lecture on optical fibre strain sensing.

Environmental efficiency

The Government encourages action by manufacturing businesses to assess their environmental impacts, and set targets for improvement. It promotes the take-up of the European environmental management system (EMAS), and the international standards organisation's system ISO 14001.

Looking to the future, the Government is sponsoring work on the development of a sustainability management system to help integrate sustainable development into the plans and operations of businesses.



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Competitive modern markets

Climate change

A key challenge for manufacturers in particular over the next decades will be the need to respond to climate change. The UK has a legally-binding target under an international agreement to reduce emissions of six greenhouse gases by 12.5 per cent from 1990 levels in the period 2008-2012. The Government also has the aim of reducing carbon dioxide emissions by 20 per cent from 1990 levels by 2010.

The Government announced in the March 1999 Budget, a new climate change levy on the supply of energy to businesses. This is intended to encourage improved energy efficiency and thus contribute towards reduced emissions, but in a way that safeguards business competitiveness. The Government therefore proposes to recycle its revenues in full via a cut in employer national insurance contributions; to provide support for promotion of energy efficiency, including a system of 100 per cent first year capital allowances and use of renewable energy; and to offer

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energy-intensive industries, 80 per cent discounts on the levy rates if they will commit in negotiated agreements to targets to improve their energy efficiency or deliver emissions reductions.

In the longer term it will be important to develop market-led solutions to climate change, with the minimum possible Government involvement. There will be new business opportunities - new markets, goods and services - which will flow from climate change in the decades to come.



Case study:

T G Eakin Ltd

TG Eakin Ltd is working with the School of Pharmacy at Queen's University Belfast (QUB) using the TCS scheme. After 25 years, Eakin's ostomy and wound drainage products are sold in more than 20 countries, growth having been achieved through existing products. With QUB's help, it now aims to build its business by developing new products and upgrading its current range.

Tom Eakin, founder and Managing Director of this small family business in Comber, Co. Down, Northern Ireland, expects significant benefits from accessing the University's knowledge of adhesive and non-adhesive hydrogels for medical applications. *"Although we only started the close collaboration with Queen's just a few months ago, already I sense this will be a very fruitful relationship".*

By the end of the 2 year TCS Programme with QUB, TG Eakin Ltd expects to have established best practice for bringing future products to market, improved employee training, and developed and enhanced the scientific reputation of the company.



Case study:

Columbia Staver Limited

Columbia Staver Limited, has secured global supply contracts with Asian multinationals and have been very successful in launching a new concept in thermal management products through the DTI funded Pacific Rim Electronic Business Association (PREBA) scheme.

PREBA is a joint initiative between the DTI and the UK electronic components industry. It is aimed at encouraging and facilitating long-term customer/supplier relationships between UK-based suppliers and Pacific Rim electronic equipment suppliers.

From its inception in 1972, Columbia Staver has been innovative in both product design and production technology. This has led to the development of the THERMOFAB range of heat dissipators. These were

developed as a low cost, lightweight alternative to conventional extruded heat sinks. The automated THERMOFAD range of products has placed Columbia Staver, not only in a position to compete in Europe with imported products from the Far East, but, as a supplier to global Asian multinationals.

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Annex A

Summary of support for manufacturers

Regional and local help

- Regional Selective Assistance and promotion of inward investment, where manufacturing is the main recipient of DTI help.

Contact relevant Government Office below:

Government Office for East Midlands: 0115-971-9971

Government Office for the East: 01223-346700

Government Office for London: 020-7217-3328

Government Office for the North East: 0191-201-3300

Government Office for North West:

Manchester Office:

0161-952-4000

Liverpool Office:

0151-224-6300

Government Office for South East: 01483-882255;

e-mail: reception.gose@go-

regions.gov.uk

Government Office for South West: 0117-9001700;

e-mail: goswbris@rednet.co.uk

Government Office for West Midlands: 0121-212-5050;

website: www.go-wm.gov.uk

Government Office for Yorkshire and the Humber:

0113-280-0600

In Scotland, for those areas such as regional selective assistance and export and inward investment promotion, where manufacturing receives help from the Scottish Executive, rather than DTI, the initial contact should be: Scottish Executive, Enterprise and Lifelong Learning Department, Central Enquiry Point: 0141 242 5505/8.

In Wales, contact; Business Services Division, the National Assembly for Wales, Cathays Park, Cardiff, CF10 4NQ on 01222 823914

In Northern Ireland, contact the Department for Economic Development (DED) on 02890 529900, website: <http://www.nics.gov.uk/dedhome.htm>

- Promoting enterprise and investment through the Small Firms Loan Guarantee Scheme and the newly-launched Enterprise Fund.

Enquiries for Small Firms Loan Guarantee Scheme:

0114-259-7308/9

e-mail: david.moore@sfsheffield.dti.gov.uk.

Enterprise Fund contact the **SME Finance Unit** on 0114-259-7325.

Cross-sectoral help

- Substantial support for export promotion. Manufacturers represent about 40% of the customers for (and a greater proportion of the assistance provided by) the Government's help for exporters under the Trade UK banner.

Contact:

Trade UK Customer Service Team on 020-7925-7810 or

Phil Purser, Trade UK on

020-7215-4612

e-mail: phil.purser@xpd3.dti.gov.uk.

- New funding to support the development of more sustainable technologies.

Contact:

April Vesey, DTI, on

020-7215-5824.

- New funding to increase the ability of UK manufacturing industries to use recycled materials as a feedstock.

Contact: **Bernadette Bickerton,**

DTI, Environment Directorate on

020-7215-5824.

- Funding the Design Council (which is also managing the Millennium Products project).

Contact: **Design Council,**

34 Bow Street, London,

WC2E 7DL.

Tel: 020-7215-5200 or

Gerry Carter, DTI, Business

Link Directorate on

020-7215-3856, e-mail:

gerry.carter@rsme.dti.gov.uk.

- Working with the CBI on the Fit for the Future national best practice campaign.

Contact: **Mark Swarbrick,**

Management Best Practice Unit,

on 020-7215-3899, e-mail:

mark.swarbrick@rsme.dti.gov.uk.

or

Fit for the Future.

Contact: 0870 600 2513
e-mail: fitforthefuture@cbi.org.uk
web-site: www.fitforthefuture.org.uk

- Providing funding towards knowledge base/industry technology transfer activity through programmes such as TCS.

General enquiries contact:
020-7215-3868.

TCS contact
Mark Griffin, Management
Best Practice, DTI on
020-7215-3867.

- Providing access to overseas knowledge through the International Technology Service.

Contact: **Andy Carter**,
Management Best Practice,
DTI, on 020-7215-4119.
e-mail: andy.carter@rsme.dti.gov.uk.

- Supporting business-to-business best practice programmes such as Connect for Better Business, The International Technology Service, Inside UK Enterprise, the Environmental Technology Best Practice Programme and the UK Benchmarking Index.

Contact: **Connect for Better Business and UK Benchmarking Index - Winning Moves** on
01782-371800;

Inside UK Enterprise -
01730-235015,
web-site: www.iuke.co.uk;

Environmental Technology Best Practice Programme -

Mark Griffiths, DTI Programme
Manager on 020-7215-1051 or

Environment and Energy helpline on 0800-585794.

- Supporting BLOWISE, a programme to help companies obtain competitive advantage by using biotechnology to develop cleaner and more sustainable products and processes.

Contact: **Jacky Wood**,
Chemicals & Biotechnology Unit, DTI on
020-7215-4123
e-mail: jacky.wood@bprh.dti.gov.uk.

- Extending the People Skills Scoreboard and working with business and the professions to improve the development and use of engineering skills.

Contact: **Colin Swan**, **Management Best Practice, DTI** on
020-7215-3901.

- Promoting the use of e-commerce through the Information Society Initiative.

Contact: **Dr Mike Porteous, DTI**
on 020-7215-1730, e-mail:
mike.porteous@ciid.dti.gov.uk.

- Assisting manufacturing SMEs take up advanced design techniques through the Electronics Design Programme.

Contact: **Michael Shortland Associates on the Programme Hotline** on 020-7215-1909;
e-mail: info@e-design.org.uk;
web-site: www.e-design.org.uk.

- Supporting individuals and SMEs wishing to acquire, research or develop technology innovative products and processes or buy external consultancy to improve their use and exploitation of technology under the expanded Smart scheme.

Contact: *relevant Government Office.*

- Publishing the R&D and Capital Expenditure Scoreboards.

Enquiries, contact: **Dr Paul Boasman, Innovation Unit, DTI**
on 020-7215-1830. Publications
are available from DTI orderline.

- Protecting intellectual property through the establishment of intellectual property rights.

Contact: *central enquiries at the Patent Office* on 0645-500505
(local rates).

- Supporting technical standards and infrastructure through the British Standards Institution and the National Measurement System.

Contact: **BSI - enquiry line**
0181-996-9000;

National Measurement System
- **Alastair Hooley, DTI** on
020-7215-1405, e-mail:
alastair.hooley@tidv.dti.gov.uk.

- Supporting the Foresight programme, which brings together business and the science and engineering base to identify

Annex A Summary of support for manufacturers

future needs, opportunities and threats in wealth creation. Manufacturing 2020 is one of its three Thematic Panels.

Contact: **Dr Kerry Mashford, Manufacturing 2020 Panel, DTI** on 020-7215-6752, e-mail: kerry.mashford@osct.dti.gov.uk.

- Improving co-operation and collaboration between researchers and new product developers through support for Faraday partnerships.

Contact: **Laura Adlington, Management Best Practice, DTI** on 020-7215-3868.

- Supporting collaboration and knowledge transfer between academia and businesses through the LINK scheme, which includes the Innovative Manufacturing Initiative.

Contact: **IMI Support Group, EPSRC** on 01793-44395.

Building sectoral capabilities

A wide range of measures, of which the largest include;

- Improving the competitiveness of the vehicle and automotive components industry through the Society of Motor Manufacturers and Traders' Industry Forum.

Contact: **David Yuill, DTI** on 020-7215-1396.

- The Department has invited proposals to replicate the Industry Forum model in up to 10 other sectors.

Contact: **Philip O'Neil, DTI** on 020-7215-1657.

- Supporting the Foresight Vehicle programme, now established as the UK's pre-eminent automotive R&D programme.

Contact: **Jon Maytom, Automotive Technology Team, DTI** on 020-7215-1957.

- Supporting ACTIVE, an industry-led supply chain initiative to achieve a reduction by 30% in the cost of executing construction projects in the onshore process engineering and energy industries.

Contact: **Chris Regan, Engineering Industries Directorate, DTI** on 020-7215-1979, e-mail: chris.regan@eam.dti.gov.uk.

- Supporting the regional chemical initiatives, which aim to improve the competitiveness of the industry and promote inward investment into these locations.

Contact: **Mike Selleck, Chemicals and Biotechnology, DTI** on 020-7215-1893.

- Providing launch investment for the civil aerospace industry and running the Civil Aircraft Research and Technology Demonstration Programme (CARAD).

Contact: **Dr Ray Kingcombe, Engineering Industries Directorate** on 020-7215-1115.

- Supporting the British National Space Centre (BNSC), which funds a number of projects to maximise UK benefit from the exploitation of space technology.

Contact: *the information centre* on 020-7215-0901; web-site: www.open.gov.uk/bnsc/bnschome.htm.

- Piloting the Manufacturing for Biotechnology initiative to help biotech businesses enhance their manufacturing potential.

Contact: **Peter McDonald, Biotechnology, DTI** on 020-7215-1430, web-site: www.dti.gov.uk/mfb.

- Fostering the developing bio-materials sector through the "Building up Biomaterials" programme which builds on the achievements of basic research programmes and encourages businesses to work more closely with the science base.

Contact: **David Friday, Chemicals and Biotechnology, DTI** on 020-7215-1475, e-mail: david.friday@bprb.dti.gov.uk.

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An agenda for action

Now is the time to push forward in order to support manufacturing. As part of our agenda for action, we shall do the following;

Area-based support

- Create a UK-wide £180 million Enterprise Fund to stimulate the availability of finance for SMEs, particularly at the 'equity gap' end of the market (will include Small Firms Loan Guarantee Scheme, Regional Venture Capital Funds, a national High Technology Fund and support for innovative proposals from the finance industry to meet the needs of fast-growth businesses), to be in place by the end of 1999.
- Work closely with Regional Development Agencies in England to improve the competitiveness of the key sectors in their regions.
- Take forward consultations with the Regional Development Agencies about the potential for developing a network of regional centres for manufacturing excellence and productivity.
- Continue to develop the work of existing Business Link partnerships to provide a range of information, advice and counselling to manufacturing businesses. This includes a particular focus on supply chains. In Wales, Business Connect is being strengthened under the guidance of a new management board.
- Develop a Wales Entrepreneurship Action Plan to produce a step change in entrepreneurial activity in Wales.

- Develop, through the Welsh Development Agency (WDA) and the private sector, a strategic package of venture capital schemes, consisting of direct investment to improve the supply of finance to SMEs through the provision of small risk capital for technology based businesses and subordinated risk finance. The National Assembly for Wales is committed to ensuring that an independently managed development bank or similar fund is established early in the 2000-2006 European funding period, to provide SMEs with flexible and sustained finance for development.
- In Northern Ireland, establish the new £10 million Viridian Growth Fund (to be operational later this year).
- Establish in Northern Ireland, a University for Industry in 2000, in line with the national timetable.
- For the position in Scotland, see page 20.

Creating and exploiting knowledge

- Develop in year 2000 an R&D tax credit for small and medium-sized firms, extended to those SMEs not yet in profit.
- Publish in collaboration with the Inland Revenue, clear guidelines on research and Development for tax purposes.
- Increase the number of TCS programmes from about 640 to about

1000 at any one time, 70 per cent in manufacturing

- Establish a new "Building up Biomaterials" programme to build on the achievements of several basic research programmes, and encourage biomaterials businesses to work more closely with the science base.
- Run the Sustainable Technologies Initiative, worth £7.8 million over three years, to help businesses develop technologies to incorporate sustainability in their products and processes from the design stage.
- Help increase the ability of manufacturing businesses to use recycled materials as a feedstock through a new programme worth £1.4m, to be committed to projects over the next year.
- Consider extending the coverage of the R&D Connections web-site.
- Develop a vision of manufacturing in the next 20 years and provide practical guidance to help prepare manufacturing industry for the future, through the Manufacturing 2020 Foresight Panel.
- Support the Institute for Mechanical Engineers' Manufacturing Excellence Awards.
- In May 2000, announce support for 4 new Faraday Partnerships involving universities, research organisations and businesses recognised as centres of expertise and collaboration in their sector or technology.

People and skills

- Support up to 15 proposals to help manufacturing SMEs cluster together to tackle shortages of engineering technician skills through a new joint DTI/DfEE programme worth £1 million.
- Earmark £1 million over three years for collaborative projects with the University for Industry, including specific projects for manufacturing
- Address higher skills needs in manufacturing by expanding the Graduate Apprenticeship model.
- Strengthen the National Training Organisation network, including a new budget of £750,000 to promote a range of projects to improve skills levels.
- Provide through DTI up to £4 million over the next 3 years to address high-level, skills needs, in IT, communications and electronics.
- Provide £5 million over the next 4 years to support projects which develop the partnership approach between employers and employee representatives.

Information and communication technologies

- Increase small businesses' access to advice about ICT by providing an additional £20 million to the Information Society Initiative.
- Raise the ability of small firms advisors to offer advice on how to

integrate ICTs within a small business, through an advisor skills initiative, "Technology Means Business" in 2000.

Networks and best practice

- Demonstrate the impact of the Fit for the Future Campaign on manufacturing and other sectors by holding a showcase event by June 2000.
- Extend the Industry Forum Adaptation Scheme to oil and gas, aerospace and up to eight other sectors.
- Extend the Environment and Technology Best Practice Programme to help manufacturers save money and reduce their impact on the environment.
- Establish local partnership and supply chain development programmes to promote collaborative projects using ICTs.

Competitive modern markets

- Bring the Competition Act into force on 1 March 2000.
- Following consultation, consider introducing a radical new framework for merger control.
- Ensure the next WTO Round of trade liberalisation negotiations removes barriers to trade which manufacturing still faces in the global market

- Work to provide an environment for manufacturing within the EU, which matches the best in the world, by securing adoption of a new strategy for the Single Market by end 1999 which reflects manufacturers' needs; working for an action plan for enterprise at the Lisbon Special Summit in March 2000; and ensuring implementation of the BEST report, including a progress report by the end of 2000.
- Ensure effective implementation of the recommendations in "e-commerce@it's best" to make the UK the best environment in the world for e-commerce by 2002.
- Following the establishment of the SBS, develop next year, a gateway for small businesses to enable them to access the information and advice they need to run their businesses more effectively - including information and advice about regulations.
- Continue to promote competition in the development of UK communications infrastructure and services to ensure that the UK has the broadband networks it needs to take full advantage of new digital services. For example, through making radio spectrum available for new fixed and mobile broadband services.
- Secure Royal Assent for the Electronic Communications Bill by April 2000.



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