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High Value Manufacturing in the South East

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SOUTH EAST ENGLAND DEVELOPMENT AGENCY
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EXECUTIVE SUMMARY

2.1 Introduction

We use the expression "HVM" as defined below, to encapsulate what is the most likely long-term future of the business of making products by companies headquartered in the UK. Our general aim is to shed light on this section of manufacturing, and to support it. We wish to create a community that is aware of itself in taking forward confidently this type of manufacturing. We wrote the 64pp report, primarily supported by SEEDA, of which this text is a summary for the perusal of HVM-UK Conference Series participants, to add to this process.

2.2 Defining High Value Manufacturing

2.2.1. *Definition of HVM*

CIR uses the trademark phrase 'High Value Manufacturing' or 'HVM' rather than the phrase 'high value-added manufacturing'. This was a deliberate non-standard choice of phrase by CIR in 2002, which has now taken root. CIR believes the recipe for HVM is not simply about linear 'value-add': it is a more wholesome function of time-to-market, IP and reinvestments, design, among other factors. CIR developed a working definition of HVM: "HVM is manufacturing where there is relatively high value created in the supply chain segment involved. In a corporate setting, HVM is usually characterised by higher-than-average expenditure on R&D as a proportion of sales, and/or is highly innovative with respect to product development, and/or is associated with above-average levels of intellectual property (IP) and or design inputs. HVM often applies to newer markets, where design or manufacturing processes may be fast-moving, new, unfamiliar, or not well tried and tested; and where prototyping, demonstration and lower volume production are all still valuable. Selected business sectors where this is often realised are: electronics and semiconductors; printing and displays; medical devices and biotechnology; aerospace; automotive and motorsport; new energy; new materials and nanotechnology; and communications technology."

2.2.2 Selection of appropriate Key Performance Indicators

The following are taken from the government's manufacturing strategy for reference:

Segment/'Pillar'	Key Performance Indicators
Promoting Science and Innovation	Innovation, investment, skills and productivity
High Skilled, High Performance Workplaces	Skills
Encouraging Intelligent Public Procurement	Overall Outcome: A more coherent, transparent and predictable public procurement process resulting in innovative bids from UK manufacturers and better value for money for the public sector.

Encouraging High Value Added Investment	Investment and profitability.
Promoting Best Practice	Output, productivity and skills.
Improving the Understanding of Manufacturing	Overall Outcome: Well publicised and received programmes of research that effects real changes in stakeholder attitudes towards manufacturing over the next ten years.

In 2002 the UK government published its manufacturing strategy in recognition of the fact that UK manufacturing output had been falling over the previous 2 years. The strategy was compiled by a multifaceted working party initiated at a manufacturing 'summit' chaired by the Secretary of State and held in 2001.

The introduction summarised the positions as:

Manufacturing is important. It accounts for a sixth of the economy, it employs around 4 million people and many more in associated industries and services. Manufacturing accounts for 60% of our exports and 80% of research and development, so is a key driver of innovation and technology uptake.

But manufacturing productivity in many other industrialised countries is higher than it is in the UK: around 30% more in France and Germany, and 55% more in the US. If UK manufacturers could match performance in these countries, the UK would be £70 billion better off. Returns on investments would be higher, jobs even better paid, and companies more competitive.

The strategy document went on to introduce the so-called 'Seven Pillars for Manufacturing Success'. These seven pillars are: Macro-economic stability, investment, science and innovation, best practice, raising skills and education levels, modern infrastructure, the right market framework. All but 'macro-economic stability' appear in the table above.

Image of Manufacturing

Stakeholders continued to feel there was a widespread poor public perception of manufacturing leading to problems in recruitment, reluctance on the part of financial institutions to invest in it and with schools having little awareness of the real opportunities in manufacturing. The document suggested that that we should investigate the issues. There should be promotion of a positive attitude within schools and a broader senior ministerial presence at key manufacturing events. Finally, a public relations campaign should celebrate success to counterbalance negative media reports. Further, the sectors we are writing about should be those, which will lead the way forward longer term. Good news does not easily sit well with the media, except as part of a 'build-up and knock down' strategy; this is merely to note this difficulty, but not to offer solutions now, beyond seeing that greater, skilled PR management is needed to handle this fact.

2.3 Global Perspective

Our 2006 report will cover this in much more detail.

We arbitrarily divide the manufacturing landscape in the world into two distinct categories, the existing 'developed world' economies and the 'emerging' economies. They are those who are seeking to regain what they had, and those who are seeking to retain the growth rate they have achieved. America clearly fits the first category together with Western Europe, whilst Asia, Eastern Europe and South America define the second category.

2.3.1 America

America has arguably just awakened to what it lost and, in 2004, President Bush commissioned 'Manufacturing in America, a comprehensive strategy review to address the challenges to U.S. manufacturers'. The stated goal was 'to help the American manufacturers compete and win in the 21st century' and the question posed to participants was 'How can government help manufacturers compete?' For diplomats reading it, this title may ring some alarm bells. But the resulting document stresses the role of manufacturing with the phrase '…a healthy manufacturing sector is key to better jobs, fostering innovation, rising productivity and higher standards of living in the United States.'

This led President Bush to announce a six point 'jobs and growth' agenda. These points are:

To make healthcare costs more affordable; To reduce the lawsuit burden on the U.S. economy; To ensure an affordable, reliable energy supply; To streamline regulations and reporting requirements; To open markets for American products; To enable families and businesses to plan for the future with confidence.

Advisors have spoken with US President Bush. He has taken on board that the energy supply cannot indefinitely be satisfied by fossil fuel extraction in which CO2 is not safely stored under ground. He has talked about the switch to the hydrogen, and possibly other, economies.

Of particular interest to companies involved in HVM is the stated approach to 'investing in innovation' that recognises the need to bolster further the development of new technologies that tend to increase productivity. The measures include a review of the federal R&D funding for generic technologies, engineering and the physical sciences to encourage better co-ordination and focus on innovation and productivity enhancing technologies. The key action is a review that has the following remit:

'The review should consider the need for additional investment in core R&D programs for generic technologies, engineering and the physical sciences, especially in interdisciplinary scientific endeavours. The model followed should be the same one used over the past 50 years to develop the major technologies influencing the U.S. economy today (semiconductors, computers, network communications, biotechnology and now nanotechnology). This model is based on government funding of basic science and early phase generic technology research, followed by massive investment in applied R&D by the private sector'.

2.3.2 European Union

The key policy statement reads:

'In the face of globalisation and intense international competition, the European Commission has launched a new industrial policy to create a better framework for conditions for manufacturing industries in the coming years. The manufacturing industry matters to the EU, it employs over 34 million people, it accounts for three- quarters of EU exports and over 80% of EU private sector R&D expenditure. The new EU industrial policy will complement work at Member State level to support a strong and dynamic industrial base. It includes seven new cross-sectoral initiatives:

An intellectual property rights and counterfeiting initiative (2006); A High Level Group on competitiveness, energy and the environment (2005); External aspects of competitiveness and market access (2006); New legislative simplification programme (2005); Improving sectoral skills (2006); Managing structural change in manufacturing (2005); An integrated European approach to industrial research and innovation (2005).

In addition, the commission brings forward seven new initiatives targeted at specific sectors:

Setting up a new pharmaceuticals forum (2006); Mid term review of life sciences and biotechnology strategy (2006/7); New High-Level Groups on the chemical industry and the defence industry (2007); European Space programme; Task force on the competitiveness of information and communications technology (2005/6); Mechanical engineering policy dialogue (2005/6); A series of competitiveness studies, including for the ICT, food, and fashion and design industries.

This industrial policy whilst laudable in intent and purpose is in danger of being too much dialogue too late and can definitely be seen as lagging behind the US initiative. However, the member states have been proceeding with national initiatives in pursuit of national interests that can be to the detriment of other member states.

2.3.3 Asia

To speak of 'Asia' is, of course, to make sweeping assertions about a large number of diverse nation states, cultures and economies. However, with respect to industrial strategies, one can consider them as essentially similar in that they have large populations coming from an essentially subsisting agrarian and hence low purchasing power background. This leads them to offer access to a large labour force and in turn a potentially large domestic market. Many of the principal nations, with the exception of Japan, have increasing GDP growth at a time when the world growth in GDP has been slowing down. There is an obvious division within them between established and emerging manufacturing centres. Asia boasts some well-known established manufacturing centres, built over the past couple of decades in Japan, India, Taiwan, Singapore and South Korea, and emerging low labour cost centres such as China, Indonesia, Malaysia and Thailand.

Today the developed countries have the majority of world trade with the EU and US accounting for some 51% of international trade, but it is not going to stay this way!

Economically, China has experienced average annual growth of almost 9% over the last 25 years and if carried forward means it will become the world's largest exporter by 2010. India registered 8.2% growth in 2004 giving it the second fastest growth rate in the world after China. Each of these two nations has been investing heavily in education with, for instance, graduations in India currently running in excess of 2 million per year with 5% in technology related subjects. These and many other 'Asian' nations are transforming from heavy state intervention in industrial strategy through ownership towards a strategy of positive state assistance to attract inwards investment and the establishment of private enterprise. China's growth has been so strong that it now strongly effects the global market for oil; academics in China are already thinking about new forms of energy, aware not only of the demand-supply relationship for oil pushing prices up, but also of the political stability implications of it.

Taking India as an example, the objectives of the Government Industrial Policy are:

- to maintain a sustained growth in productivity.
- to enhance gainful employment.
- to achieve optimal utilisation of human resources.
- to attain international competitiveness and
- to transform India into a major partner and player in the global arena.

Policy focus is on:

- Deregulating Indian industry;
- Allowing the industry freedom and flexibility in responding to market forces;
- Providing a policy regime that facilitates and fosters growth of Indian industry.

Amongst the many measures being taken to implement these policies in the HVM arena is the establishment of Electronic Hardware Technology Parks (EHTP) and Software Technology Parks (STP) aimed at building a strong electronics industry and with a view to enhancing exports. Under both schemes, inputs are allowed to be procured free of duties.

Along similar lines, the Chinese government has funded massive technology parks and provided state funding for the establishment of large R & D centres with tax and investment benefits. Construction companies are cash-rich and becoming more so.

The American paper referred above may apply universally: "Competing in a global marketplace puts a premium on government getting the fundamentals right to create an environment in which manufacturing can flourish. It means examining whether the government's actions and the structure of the market improve or hinder the ability of firms, in manufacturing and throughout the economy, to compete in an increasingly global marketplace."

Most governments around the world have awoken to this situation with many taking dominant roles in promoting that 'economic environment' and using the remains of their declining control economy powers to promote their capabilities. In these enlightened nation states, manufacturing has the image of salvation to remedy years of regression and poverty.

2.4 UK Perspective

The image of manufacturing in the UK is not perceived to be good. The lack of prestige for manufacturing makes it hard to attract the brightest individuals coupled with the inability to recruit and the lack of status afforded to science, technology and engineering make it difficult to enrol new UK students. Of grave concern must be the fact that, according to Professor Peter Dobson, '… a shortage of PhD students is developing with the number of UK nationals starting PhDs declining'. Given that the essential fact of High Value Manufacturing is the meeting of new science and industry, it goes without saying that if the source of scientists reduces then the size of HVM may well fall accordingly. Against this backdrop it is essential that all parties interested in the long term role of UK manufacturing, schools, academia, industry and government must utilise every opportunity to extol the virtues and the importance of science and HVM. Within this group, government alone has the authority to direct schools and academia whilst industry has the responsibility to influence. Without a concerted effort through this partnership we will fail to attract the calibre of entrants to industry that is required to survive as we enter the 21st Century.

2.5 South East England: Statistics and Outlook

There are nearly 20,000 high value manufacturing companies in the UK, with fifteen percent (just over three thousand) of those based in the South East. Amongst high value manufacturing companies, those who have the highest proportion of companies based in the South East include manufacturers of instruments for measuring, medical equipment manufacturers and pharmaceutical manufacturers. Between 22 and 23% of companies in these sectors are based in the SE, compared to only 15% of HVMs generally. Other HVM sectors which are strongly represented in the South East are the manufacture of ships and boats, the production of office machinery, computers and processing equipment, the manufacture of industrial process control and the manufacture of glass and optical and photographic equipment.

Table 1. Table showing manufacturing sectors with a stronger than average representation in the SE region.

Manufacturing Sector	*% of companies from the sector in the UK as a whole who are based in the South East*
Instruments for Measuring	22.6
Medical equipment	22.6
Pharmaceuticals	22.3
Optical and Photographic Equipment	20.5
Industrial Process Control Equipment	19.9
Ships and boats / Marine Tech	19.8
Office machinery, computers and processing equipment	19.5
All High Value Manufacturers	15.2

Geographically, sub-regionally, we see an interesting spread. Oxfordshire is most overweight HVMs, but a relatively smaller county than others in the political region. Hampshire is also considerably overweight HVMs, though this takes in all ships and boats companies, which may have offset the score upward if some of those are not HVMs in actuality. We have not performed a statistical significance test on the data, and the selection procedure for the inclusions was by arbitrary Sector Identification Code (SIC) rather than by comparing exactly what each company does with the HVM definition used by CIR.

Table 2: Number of HVM companies, and total companies in each county

County	*No of HVMs*	*% of SE HVMs in the county*	*No of Companies*	*% of all companies in the SE from the county*	*Density of HVMs and ranking among counties*
Oxfordshire	237	7.7	16,600	4.20	1.83; 1st
Hampshire	685	22.2	49,250	12.5	1.77; 2nd
Buckinghamshire	241	7.8	25,600	6.5	1.20; 3rd
Berkshire	308	10.0	36,750	9.3	1.08; 4th
Kent	497	16.0	74,850	19.0	0.84; 5th
Surrey	574	18.6	89,650	22.8	0.82; 6th
Sussex	549	17.8	101,400	25.7	0.69; 7th
Total SE Region	3091	100	394,100	100	1.0

Table 3. Table showing the extent to which HVM activities within the south-eastern counties are concentrated within specific sectors.

County	*% of all HVM companies in the county that belong to one of the five largest sectors (as quantified by number of companies)*
Berkshire	49.2
Buckinghamshire	54.3
Hampshire	83.5
Kent	33.5
Oxfordshire	89.9
Surrey	36.0
Sussex	30.1

2.6 Recommendation, actions

Background

- In making recommendations for a subject as complex as HVM in a diverse region, it is always possible that the initiatives may already be underway but not immediately known to CIR.
- The existing Manufacturing industry has 'done lean to the point of emaciation' and the future strategies for Manufacturing both conventional and HVM must move on from internal navel gazing efficiency improvements and recognise that HVM has an economic scale that only National strategies can address. In saying this it does not relieve HVM's of striving for world class capability, that is the given to stay in the race!
- If the UK is to have a long-term sustainable High Value Manufacturing industry it is vital that actions are taken now! The science and technology is at a turning point that if grasped now will put the UK in pole position. That turning point or watershed is the adoption of nano technology in all its various guises. Nano is an all-embracing and enabling technology that has applications in all HVM products. If the UK adopted a genuine cross party, cross agency, cross industry strategy to ensure that the next generation of all designs incorporated the benefits of nanotechnology it will lead the world..
- Whilst there is investment money available for short to medium term projects the *real* issue is the funding of long term (7 –15 years) projects. Private funding in the UK just will not wait that long for returns.

HVM structure: networked, international collaboration, cleaner, ethical*:*

- Start up companies and Universities should consciously create 'Joint Venture clusters of similar start ups and research projects to share knowledge and the 'above the line' costs of say marketing, compliance, sales channel etc to avoid dissipation of efforts and money. These could be initiated by the RDA's or similar
- The government needs to think through the current panoply of bodies addressing Science and Manufacturing, These include the DTI, RDA's, University Councils, Research Councils, Professional Institutions, Trade Associations etc etc. They have vast duplication of boards and staff collecting data and all spending vast sums of money in terms of administration and actual grants to industry. The system needs to be streamlined, focused and strategically re-directed with the money saved re-invested in Science and HVM. The nation needs to adopt the role 'venture capitalist' for emergent technology companies.
- There must be a national strategy for enabling technologies such as nano that brings together all the body of knowledge and seeks to disseminate across industry sectors. In the mean time, the SE RDA needs to get on with the Regional Nano and Microtechnology Network plan and become the pilot for UK best practice.
- The 'Encouraging Intelligent Public Procurement' initiative needs to step up a gear with the strategic impact of the decision being taken into account on an equal footing to the economic circumstances. This is particularly so in medicine and defence spending that have historically been a great catalysts of technical innovation.
- There is a need for skilled 'intermediaries' to work with HVM's to ensure that both inward and outward licensing together with patent registration becomes easily understood, is beneficial to the UK strategy and is more easily affordable. This could become one of the front office 'cluster' services referred to above.
- The SE Regional Economic Development plan should become the catalyst for stimulating the growth of HVM.
- A national awareness campaign for the stimulation of science and maths as entry to HVM and in turn the attractive opportunities for the future of employment in HVM needs to be mounted.
- We need to reach out to the young people of today and show them the attractiveness of working in modern HVM as opposed to their 'smoke stack' view of it.
- Need to see tax benefits for those people willing to invest in long-term investment projects.
- Need to stimulate Apprenticeship training schemes through some form of Tax levy redeemable by those companies who invest in training.

- 'Cluster' training schools to be set up to link with the Apprenticeship and academic technical training schemes. Must increase the technician engineering pool.
- Bring back technical colleges to train the technicians in association with the above.
- Enabling technologies need to produce 'road maps' of where they are going and what other industries need to become involved. A technical elite knowing all is inadequate: we need buy in from all aspects of HVM.
- Need to improve the roads. Look at Germany, long distance road lorries are taken to their destination on flat bed trains and only travel on roads for the last part of their journey.
- Need to breed more inter-disciplined people, scientists who understand marketing, engineers who can speak foreign languages etc

The need for IPR and process 'recipe' retention

The current UK manufacturing strategies are based on the following political premises:

- Energy costs featuring oil at $60+ per barrel
- The Suez and Panama canals remain open
- America (and others) maintain an open market free trade stance
- China continuing to grow at around 10%pa, becoming increasingly dependent on imported oil

If any or all of the following 'fat-tail' or 'low probability' events were to happen, for example:

- Oil went to $150 per barrel
- Either or both of the canals were blocked for a prolonged period of time
- Barriers to free trade were erected by any of the major nations
- The present minor conflicts that exist around the world in very sensitive areas were to escalate to full scale wars with major blocs supporting opposing sides

Then, the mass importation of goods of any description from extended global supply lines would be either stopped or subject to re-evaluation in the light of soaring logistic costs. A very sobering thought!

It is routine for all companies to have a plan for localised events, fire, flood bombs etc. Eventualities on the scale above require national level planning. We must maintain the 'recipe' for all production processes, even if only at pilot scale, and arguably (although in the event of free trade barriers perhaps not so) ownership of the IPR to continue manufacturing. We must not allow HVM to go the way of the garment industry where, during the recent hiatus regarding import quotas, the Chairman of the Garment Manufacturers Trade Federation said that the UK no longer had the skills and knowledge, let alone the capacity, to fill the vacuum in the supply chain.

Whilst the above is the blackest of situations, at the national procurement level it is essential that investment in technology and new products is made in recognition of the possibility that the UK may have to produce the items on shore under certain circumstances. The person who recovers from a catastrophe the fastest, is the one who planned for it!

In any eventually, we do need to retain generic, older and new intellectual property for both products and processes.

2.7 Concluding remarks

- The DTI and the RDA have already made good progress but it needs to be better resourced and more forceful, with good ideas put to positive actions.

- We in the UK have the ideas and in most cases the people to start them off.
- Now is an opportunity for government, the DTI and the RDA's to give strong leadership in determining the place for Britain in the 21st century.
- It may not require a lot of 'new money', just the re-distribution of the existing funding that disappears into a 'bureaurocratic soup'.
- To do so will mean that a number of powerful people may have to check their personal and political beings and put the national requirement to the fore.

2.8 CIR Global High Value Manufacturing Report 2006

CIR's team is developing the work done in this regional context so that it provides a view of this topic not just regionally, but nationally in depth, and globally, as seen from the US, Europe, Asia-Pacific, in high and low cost regions, and across a broader range of subjects. This will be an authoritative report, based on knowledge obtained from nearly four years of consideration, conferences and consulting work on HVM. CIR seeks sponsors, supporters and purchasers of this report.

3. OVERVIEW OF HVM- GLOBAL PERSPECTIVE

3.1 The global market system and the competitive corporation

The turn of the century has seen the global corporation come to the fore in the world economy. It is no longer possible to easily determine the country of origin of volume products, nor indeed services such as call centres. Barriers to trade have fallen; free flow of investments and the growth of e-commerce have seen unprecedented global competition for products and markets. Against this backdrop large corporations have embraced globalisation, no where more so than in the 'high tech' arena.

The model for large corporations operating in the high volume technology field is to have clusters of technology 'centres of excellence' distributed across the globe with the location determined more by access to highly qualified staff and markets than the historic coincidence of where the company was founded. With the complexity of modern technology many companies are combining engineering and marketing into these centres of excellence with the formation of product groups, technology centred business units etc.

These technology centres are in turn often geographically apart from the production centres with their location criteria driven by cost of labour and logistics. In many instances these production centres are not owned by the corporation but are the expanded manifestation of the 'Contract Manufacturers' of the late 20th century coming higher up the 'food chain' to become responsible for the whole product rather than the parts that form the product.

To complete the picture of the global market, the selling and distribution systems have become highly regionalised as the importance of customer national identity coupled with local service and support becomes a critical feature in the overall sales process. Distribution or 'logistics' has also adopted a more sophisticated model and again may not be owned by the corporation but contracted out to specialists with economies of scale to have a global reach that would be uneconomic for individual corporations.

The three elements of design, make and sell are then framed within a corporate structure that dictates strategy, investment and branding and is responsible for the fiscal governance of the corporation.

This distributed framework of design, manufacture and supply has created the climate for a new competitive arena whereby larger corporations are instigating parallel developments in more than one centre of the world and effectively running product development as an internal competitive market. The centre reaching the 'goal' of successful product development then takes the 'charter' for that product introduction, the establishment of the supply line and the revenue that comes form such success.

This model of the competitive corporation is of significance to the UK for within the arena of High Value Manufacturing the ultimate goal is, in the main, to move to high volume to give the ultimate shareholder returns. How then will HVM, often focused around small 'start up' spin outs from universities, compete with the competitive corporation?

3.2 Consumer and business buyer attitudes: globalisation and the impact of consumerism

High Value Manufacturing products are the result of extensive investment in Research and Development and Market definition. This investment has to be recovered through the margin applied over and above the basic costs of manufacture and distribution if the HVM producer is to return good shareholder value. This model is sustainable so long as the customer continues to perceive real value in the goods or services received but rapidly comes under pressure as competitors produce similar products and the normal market price pressures begin to apply with buyers, both consumer and business, striving for ever reducing prices.

In consumer products this circle of innovation, competition, price reduction and mass consumption has seen complex changes in the methods of manufacture. Initially in the early and mid 20th century the developed nations responded by developing new methods of mass production using machines to replace labour and in the second half century the response was to move the centre of manufacturing to low cost labour areas in the Pacific rim and the 'old' Soviet Union' countries, utilising those high volume machines and practices developed in the initial response. As the price pressure has continued the reduction of cost moved on from labour and machines to the supply chain of component parts. These have been continually driven down with the initiative to do so moving away from the original developer onto the sub contractor. The result of this movement of initiative is that the centre of excellence for manufacturing of the goods has moved to the Sub Contractor and the relationship has moved from one of 'master and servant' to full partner. Thus can be seen the impact of 'capitalism' in both the share holder and the consumer leading to globalisation and the movement of manufacturing away from the UK.

In itself, this is not a bad thing, the shareholder sees dividend and growth and the consumer sees more value for each Pound spent. This only remains true, however, so long as there is elasticity or compressibility in the overall manufacture and supply chain. Once the 'low hanging fruits' of cost reduction have been harvested, where does the model move? In the Automotive industry the answer is that the centre of product development, marketing and ownership moves totally to the offshore source of manufacture as evidenced by the rise of Japanese and Korean cars and the leading edge of the Chinese motor industry coming to market through the acquisition of MG Rover. Thus the consequence of consumerism can be shown to have lead to globalisation and the demise of volume manufacturing in the UK.

How then should the UK respond to this model? Left to normal market forces, will all products follow this route? What should the strategy be to counter this model? Clearly a 'Canute like' denial or obdurate resistance to change is inadequate. A strategy recognising the intrinsic strengths of the UK whilst continuing to satisfy both shareholder and customer is required.

3.3 America, Europe and Asia Manufacturing Futures: The Landscape

The manufacturing landscape in the world can in simplistic terms be split into two distinct categories, the existing 'developed world' economies and the 'emerging' economies. More simply, those who are seeking to regain what they had and those who are seeking to retain what growth rate they have achieved. America clearly fits the first

category together with Western Europe whilst Asia with Eastern Europe and South America defining the second category.

3.3.1 America

America has arguably just awakened to the reality of what they have lost and in 2004 President Bush commissioned 'Manufacturing in America, a comprehensive strategy review to address the challenges to U.S. manufacturers'. The stated goal was 'to help the American manufacturers compete and win in the 21st century' and the question posed to participants was 'How can government help manufacturers compete?'

The resulting document stresses the role of manufacturing with the phrase '…a healthy manufacturing sector is key to better jobs, fostering innovation, rising productivity and higher standards of living in the United States'

The report is classically split in three sections, what has happened, what is industry doing about it together with what does industry want from government and the third section setting out a series of recommendations designed to address the challenges. These recommendations are seen as a first step towards drafting a comprehensive future strategy. In the mean time the challenges confronting American workers are urgent enough to prompt President Bush to announce a six point jobs and growth agenda. These are:

1. To make healthcare costs more affordable.
2. To reduce the lawsuit burden on the U.S. economy
3. To ensure an affordable, reliable energy supply.
4. To streamline regulations and reporting requirements.
5. To open markets for American products.
6. To enable families and businesses to plan for the future with confidence.

The US document lays great emphasis on competing – and winning – in a global economy. It recognises that the general economic downturn of the manufacturing sector first seen in mid 2000 may have masked the far more powerful underlying structural changes affecting manufacturing. With rapid advancements in technology, low barriers to trade and the entry of significant new competitors into global markets, the preceding 5 years had marked a rapid change for American manufacturers as they continued to adapt to the global market.

Within the report were many incisive statements that stressed the importance of manufacturing to the economy, typically:

'Manufacturing is crucial to the U.S. economy. Every individual and industry depends on manufactured goods. In addition, innovations and productivity gains in the manufacturing sector provide benefits far beyond the products themselves.

There is no dispute over the significant contribution that manufacturing makes to the U.S. economy and to America's standard of living. The sector continues to account for 14% of U.S. GDP and 11% of total U.S. employment.

Those statistics, however, do not adequately convey the importance of the manufacturing sector to the U.S. economy and to America's future. Manufacturing is an integral part of a web of inter-industry relationships that create a stronger economy'.

The report observes that over the past two decades, three separate, powerful trends have reshaped the manufacturing sector globally.

The first is the revolution in technology that has raised productivity and reduced costs world- wide. The second is the reduction in barriers to trade for manufactured goods and the third is the end to political divisions that have segmented markets for many years both coupled to the emergence of Russia, China and other countries in the worlds trading system.

Amongst the many recommendations are those in which the government has a key role to play. The principal six of these are:

- Enhancing Government's focus on manufacturing competitiveness.
- Creating the conditions for economic growth and manufacturing investment.
- Lowering the cost of manufacturing in the U.S.
- Investing in innovation.
- Strengthening education, retraining and economic diversification.
- Promoting open markets and a level playing field.

Of particular interest to companies involved in HVM is the stated approach to 'Investing in innovation' that recognises the need to bolster further the development of new technologies that fuel productivity gains. The measures being taken include a review of the Federal R&D funding for generic technologies, engineering and the physical sciences to encourage better co-ordination and focus on innovation and productivity enhancing technologies. The key action being taken is a review that has the following remit:

'The review should consider the need for additional investment in core R&D programs for generic technologies, engineering and the physical sciences, especially in interdisciplinary scientific endeavours. The model followed should be the same one that has been used over the past 50 years to develop the major technologies influencing the U.S. economy today (semiconductors, computers, network communications, biotechnology and now nanotechnology). This model is based on government funding of basis science and early phase generic technology research, followed by massive investment in applied R&D by the private sector'.

Of concern to UK HVM companies must be the recognition that an unsaid part of that 50-year-old model seen as key to the original recovery was the 'Buy America Act'. That virtually closed the doors of access to one of the world's largest economies for all products that could otherwise be manufactured within the USA. Coupled with a strong rising tide of political opinion in middle America that wishes for the U.S. to withdraw from international interventions such as Iraq and Afghanistan, we could see fundamental changes to the commercial scene in the next decade with the risk of America turning 'into itself' and closing its mind and its doors to the world markets.. One must also concentrate on the impacts of any energy strategy that would inhibit imports and thus adversely affect trade balances.

3.3.2 Europe

In marked contrast to the specific action plans in preparation in the U.S., the European Union has just announced (October 5th 2005) it's Industrial Policy under the title 'A new integrated industrial policy: to create the conditions for manufacturing to thrive'.

The policy statement reads:

'In the face of globalisation and intense international competition, the European Commission has launched a new industrial policy to create a better framework for conditions for manufacturing industries in the coming years. The manufacturing industry matters to the EU, it employs over 34million people, it accounts for three- quarters of EU exports and over 80% of EU private sector R&D expenditure. The new EU industrial policy will complement work at Member State level to support a strong and dynamic industrial base. It includes seven new cross-sectoral initiatives:

1. An intellectual property rights and counterfeiting initiative (2006).
2. A High Level Group on competitiveness, energy and the environment (2005).
3. External aspects of competitiveness and market access (2006).
4. New legislative simplification programme (2005).
5. Improving sectoral skills (2006).
6. Managing structural change in manufacturing (2005).
7. An integrated European approach to industrial research and innovation (2005).

In addition, the commission brings forward seven new initiatives targeted at specific sectors:

1. Setting up a new pharmaceuticals forum (2006).
2. Mid term review of life sciences and biotechnology strategy (2006/7).
3. New High-Level Groups on the chemical industry and the defence industry (2007).
4. European Space programme.
5. Task force on the competitiveness of information and communications technology (2005/6).
6. Mechanical engineering policy dialogue (2005/6).
7. A series of competitiveness studies, including for the ICT, food, and fashion and design industries.

The policy goes on to speak of focusing on investment in skills and equipping people for change and says that 'This industrial policy aims to support adaptability and structural change to boost the competitiveness of EU manufacturing, especially in the light of increasingly strong competition from China and Asia'. Elsewhere there is the recognition that 'EU trade is still concentrated in sectors with medium-high technologies and low to intermediate labour skills. Hence adaptability and structural change are critically needed if the EU is to maximise the gains arising from the integration in the world economy of China, India and other fast growing economies'.

This Industrial policy whilst laudable in intent and purpose is in danger of being too much dialogue too late and can definitely be seen as lagging behind the US initiative. However, the member states have been proceeding with national initiatives in pursuit, not unnaturally, of national interests that can often be to the detriment of other member states.

France has tended to look inwards with Prime Minister Dominique de Villepin recently reported as advocating 'economic patriotism' to protect France's corporate jewels against corporate predators. Paris has drawn up a list of 10 strategic sectors to be shielded which, in the words of the newspaper report, is almost certainly in violation of EU law. The article goes on to report that Hewlett Packard's attempt to cut 1200 jobs in France has failed when it bowed to 'pressure from the highest levels of French government' whilst in the UK plans to shed almost 1,000 jobs 'has not caused a flicker of protest. The unions suspect Hewlett Packard's strategy is to shift the work to Slovakia'.
In line with this event, the 'old Eastern Bloc' countries such as Rumania, Poland, Slovakia etc. have grasped the nettle of Contract Manufacturing, benefiting enormously from the back lash of the Asian SARS scare with outsourcing decision makers in the West favouring a low cost 'half way house' rather than the further at risk Chinese options. Many of these CEM's or Electronic Manufacturing Service (EMS) companies are U.S. owned, of immense size such as Flextronics with a $16B turnover. Commensurate with the image change from CEM to EMS they and many others are now coming up the 'food chain' to offer design services, complete product manufacture and full after sales support!

3.3.3 Asia

To speak of 'Asia' is, of course, to make sweeping assertions about a large number of diverse nation states, cultures and economies. However, with respect to Industrial strategies, one can consider them as essentially similar in that they have large populations coming from an essentially agrarian and hence poor background that means access to a large labour force and in turn a potentially large domestic market. Many of the principal nations, with the exception perhaps of Japan, have increasing GDP at a time when the world growth in GDP has been slowing down. There is an obvious division within them between established and emerging manufacturing centres. Asia boasts some well-known established manufacturing centres, built over the past couple of decades in Japan, India, Taiwan, Singapore and South Korea, and emerging low labour cost centres such as China, Indonesia, Malaysia and Thailand.
Today the developed countries have the majority of world trade with the EU and US accounting for some 51% of international trade, but it is not going to stay this way!
Economically China has experienced average annual growth of almost 9% over the last 25 years and if carried forward means it will become the world's largest exporter by 2010. India registered 8.2% growth in 2004 giving it the second fastest growth rate in the world after China. Each of these two nations has been investing heavily in education with, for instance, graduations in India currently running in excess of 2 million per year with 5% in technology related subjects. These and many other 'Asian' nations are transitioning from heavy state intervention in Industrial strategy through ownership towards a strategy of positive state assistance to attract inwards investment and the establishment of private enterprise.
Taking India as an example, the objectives of the Government Industrial Policy are:

- to maintain a sustained growth in productivity.
- to enhance gainful employment.
- to achieve optimal utilisation of human resources.

- to attain international competitiveness and
- to transform India into a major partner and player in the global arena.

Policy focus is on-

- Deregulating Indian Industry;
- Allowing the industry freedom and flexibility in responding to market forces and
- Providing a policy regime that facilitates and fosters growth of Indian Industry.

Amongst the many measures being taken to implement these policies in the HVM arena is the establishment of Electronic Hardware Technology Parks (EHTP) and Software Technology Parks (STP) aimed at building a strong electronics industry and with a view to enhancing exports. Under both schemes, inputs are allowed to be procured free of duties.

Along similar lines, the Chinese government has funded massive technology parks and provided state funding for the establishment of large R & D centres with tax and investment benefits.

Against this background the first wave manufacturers including those from the Japanese and South Korean auto industry are beginning to build plants outside Asia, even in high wage countries such as the UK and Europe, tempted by tax advantages, government incentives, hi-tech employee availability, and distribution efficiencies. Even more recently, manufacturers are taking advantage of manufacturer-friendly policies of the third wave of Asian growth - in China and some Indo-Chinese countries. Control of these plants has been maintained strongly in corporate centre and has seen the spread of best practice out from Japan to the developed West and the developing Asian countries.

It is therefore safe to assume that whilst Asia will remain a very significant manufacturing region, the general neglect of R&D is now being addressed, slowly yet surely, as the realities of the global economy sink in.

Manufacturing management in Asia is therefore at the cross-roads as Asian manufacturing moves from an industry dependent on low local production costs to research and development into new technologies utilising:

- state investment in education and infrastructure,
- a trained and skilled workforce,
- a leading position in best practice,
- a large domestic market,
- and an ever hungry world demand for high technology.

Against this backdrop it is essential that the UK adopt a proactive strategy to invest and succeed in HVM as the might of the 'Asian Tiger' moves rapidly towards the same goal.

3.4 The image of manufacturing as seen by Europe, the US and Asia-Pacific Communities.

Section 7 of this report deals with the image of manufacturing within the UK which, not to understate the position, is not good. To quote Nick Brayshaw of the DTI, "In the minds of younger people, and also their parents, manufacturing is dying and financial services are growing".

This is in marked contrast to most of Europe and certainly the US and the Asia Pacific Communities (APAC). In these communities Engineering in general and manufacturing specifically in APAC is seen as vital to the success of the nation. For the emerging and newly emerged economies such as China and India economic growth driven by burgeoning manufacturing industries is the key mechanism to lifting millions of people from poverty and stimulating a self fulfilling domestic market.

It can be seen from the foregoing that there is an international upsurge of interest in all aspects of manufacturing. Nation states and groups of nation states are recognising that the reality of global commercialism cannot be left entirely to private market forces. Governments have a role in fostering the appropriate environment and ensuring that long- term strategies are put in place to ensure that educational, taxation and regulatory policies act in favour of their indigenous manufacturing industries and do not present an unfair obstacle that competitor nations can take advantage of.

This situation has been succinctly captured in the US strategy paper on Manufacturing that applies universally:
'The Government's Role: getting the fundamentals right.

The changing nature of competition requires, correspondingly, a different way of looking at government policy. This means fostering an economic environment, both domestically and internationally, that encourages growth, rewards sound investment, controls costs and fosters innovation and rising productivity. It also means an aggressive international economic policy that ensures a level playing field by reducing barriers to trade and investment and vigorously enforcing the trade rules when violated.

Competing in a global marketplace puts a premium on government getting the fundamentals right to create an environment in which (US) manufacturing can flourish. It means examining whether the (US) government's actions and the structure of the (US) market improve or hinder the ability of (American) firms, in manufacturing and throughout the economy, to compete in an increasingly global marketplace.

Most governments around the world have awoken to this situation with many are taking dominant roles in promoting that 'economic environment' and using the remains of their declining control economy powers to promote their capabilities. In these enlightened nation states, manufacturing has the image of salvation to remedy years of regression and poverty.
Finally, returning to the section title, 'The image of manufacturing as seen by Europe,....' it may be food for thought to consider a newspaper article entitled "Britain on wrong road, says car chief", in the Daily Telegraph on June 29th 2005: By Andrew English:
"BRITAIN is playing a dangerous game in replacing its high-skilled manufacturing jobs with low-skill service jobs, according to General Motors Europe vice-president, Carl-Peter Foster.

“Talking about GM's decision to cut 12,000 jobs in its western European operation, he said that, unlike the UK, Germany had tried to safeguard high-skilled jobs.

“"In the UK it is different for two reasons. First, because there are low-paid service sector jobs available, whereas in Germany there are not and, second, because the UK has a funny belief that you don't need manufacturers.

"For years the UK political system hasn't worried what sort of jobs are created and the UK trend has been for sophisticated manufacturing jobs to be replaced with low-grade service jobs. I doubt that this sort of structure is right." Ten years ago, GM employed about 11,000 in the UK but today that number is just 7,500, most of them employed at the company's Ellesmere Port plant building Vauxhall Astras and at Luton building Vivaro vans.

Although Germany had been earmarked to take the brunt of the 12,000 redundancies in the latest round of cutbacks, there are still some 33,000 employees at its three plants in Eisenath, Bochum and Russelsheim. Mr Foster says that in Germany "sophisticated value-added is the name of the game". He distinguishes between high value service jobs such as those in the City of London and the unskilled employment ,such as that provided by supermarkets and burger bars.

“He says even America has woken up to the need to retain its manufacturing jobs. "If you look at the US, 10 years ago they were going this way as well, then a manufacturing renaissance began," Mr Foster said.”

4. THE UK POSITION

4.1 The image of Manufacturing in the UK

As dealt with in many sections of this report, the image of manufacturing in the UK is not perceived to be good. The lack of prestige for manufacturing makes it hard to attract the brightest individuals coupled with the inability to recruit and the lack of status afforded to science, technology and engineering make it difficult to enrol new UK students. Of grave concern must the fact that, according to Professor Peter Dobson, '… a shortage of PhD students is developing with the number of UK nationals starting PhDs declining'. Given that the essential fact of High Value Manufacturing is the meeting of new science and industry, it goes without saying that if the source of scientists reduces then the size of HVM may well fall accordingly. Against this backdrop it is essential that all parties interested in the long term role of UK manufacturing, schools, academia, industry and government must utilise every opportunity to extol the virtues and the importance of science and HVM. Within this group, government alone has the authority to direct schools and academia whilst industry has the responsibility to influence. Without a concerted effort though this partnership we will fail to attract the calibre of entrants to industry that is required to survive as we enter the 21st Century.

4.2 The Government's role

In 2002 the UK government published its manufacturing strategy in recognition of the fact that UK manufacturing output had been falling over the previous 2 years reflecting a long term decline in the manufacturing base.. The strategy was compiled by a multifaceted working party initiated at a manufacturing 'summit' chaired by the Secretary of State and held in 2001.

The introduction summarised the position as:

Manufacturing matters. It accounts for a fifth of the economy, it employs around 4 million people and many more in associated industries and services. Manufacturing accounts for 60% of our exports and 80% of research and development, so is a key driver of innovation and technology uptake.

But manufacturing productivity in many other industrialised countries is higher than it is in the UK: around 30% more in France and Germany, and 55% more in the US. If UK manufacturers could match performance in these countries, the UK would be £70 billion better off. Returns on investments would be higher, jobs better paid, and companies more competitive.

The strategy document went on to introduce the so called 'Seven Pillars for Manufacturing Success'. These pillars were:

Pillar 1: Macro-economic stability

Macro-economic stability has been a key priority for the Government. Stability has been hard won and must be preserved. It provides the basis for improved investment by giving us an assured basis for planning. CBI survey evidence shows that the hurdle rates of return companies expect from investment have come down significantly

reflecting the improved macro-economic environment. Our policy on the euro supports the maintenance of macro-economic stability.

Pillar 2: Investment

We must encourage companies to invest, to back innovation and to provide workforces with the equipment they need. UK investment stock per worker is well below US and German levels. Investment decisions are primarily for the market, but Government has a role. Apart from macroeconomic stability, measures include changes to the tax system which encourage entrepreneurship; assistance to investment in certain regions and by small companies; and encouragement of inward investment.

Pillar 3: Science and innovation

Innovation in its broadest sense, combined with best practice, skills and investment, is a key to competitive success and resource productivity. We aim to raise manufacturing innovation performance by making much better use of the excellent UK science base and by encouraging the transfer of technology from a wide range of UK and international sources. We promote key emerging technologies, foster knowledge transfer and encourage commercial R&D. Our measures have included the recently introduced R&D tax credit for large companies, and the continued expansion of investment in the science base. The additional funding for science and technology announced in the Government's Spending Review 2002 will help to drive this work forward.

Pillar 4: Best practice

Best practice enables innovation and investment to be turned into profitable products. Our policies include support for the new Manufacturing Advisory Service the expansion of the industry forum schemes, and the promotion of partnership in the workplace. At the manufacturing summit last December we earmarked an additional £20m for best practice activity.

Pillar 5: Raising skills and education levels

Improved skills levels contribute to higher productivity, better customer service, and to the exploitation of investment and new ideas. To this end, we have established the Learning and Skills Council, with overall responsibility for post-16 learning in England outside higher education. We are establishing the new sector skills councils with clear business leadership. On the supply side, our measures include steps to drive up standards in further education colleges; a major increase in the number of modern apprenticeships; and a range of measures to assist existing workforces to up-skill and to raise the status of vocational and work-related learning within the educational system.

Pillar 6: Modern infrastructure

The UK's infrastructure has suffered from historic under-investment. We have set out a 10-year plan to modernise the transport network at a cost of £181 billion. We are also taking forward a strategy to increase broadband penetration.

Pillar 7: The right market framework

Successful manufacturing requires competitive and dynamic markets, confident consumers and well-motivated employees. The UK scores well internationally on its regulatory environment. Our priorities are to strengthen further the competition framework through the Enterprise Bill, to work within the EU and internationally for free and

fair trade and to underpin an enterprise economy with sensible minimum standards in the workplace. Action is currently in hand to reform the planning system to meet business concerns.

The strategy document concluded with 'UK Prosperity depends on a successful and dynamic manufacturing sector. In partnership with industry and other stakeholders, we are determined to deliver results.

This statement is perhaps the most crux of the government's role, the recognition that it is only through partnership between government and industry that the decline in manufacturing can be arrested. It also recognised the responsibility inherent in any partnership, one party must take the lead role and it is government that is uniquely placed to be the leading partner.

4.2.1 2004 Manufacturing strategy and it's development since 2002

In 2004, the Secretary of State, Patricia Hewitt, invited Nick Brayshaw to co-ordinate stakeholder views on the Manufacturing Strategy under the title 'Competing in the Global Economy – The Manufacturing Strategy Two Years On'.

The report was wide ranging and concluded that 'The Manufacturing Strategy remains the right framework within which to co-ordinate action on manufacturing'. However, the review found a number of consistent themes emerged which formed the basis of an Action Plan to ensure the effective implementation and evolution of the strategy. Those themes are summarised as:

- The image of manufacturing

Stakeholders continued to feel there was a widespread poor public perception of manufacturing leading to problems in recruitment, reluctance on the part of Financial Institutions to invest in it and with Schools having little awareness of the real opportunities in manufacturing. It was suggested that the issues needed to be investigated further, there should be promotion of a positive attitude within schools and an increase in senior ministerial presence at key manufacturing events. Finally a public relations campaign should celebrate success to counterbalance negative media reports.

- Business Support

The DTI has reduced drastically the number of business support initiatives that were causing confusion to businesses. Stakeholders suggested that the RDA's should now be tasked with reducing the support schemes in operation at region and sub region level and the funding released concentrated on the most worthwhile initiatives.

- Manufacturing Advisory Service (MAS)

MAS received very positive reports throughout the consultation process and are clearly a success story. However, concerns were expressed that regional variations could dilute the successful national brand'. Further, there is a need to define clearly the respective roles of MAS and Business Link, and to ensure that referrals between the two organisations operate as fully and effectively as possible.

- Skills

There is still stakeholder confusion about who is to take forward the skills agenda with confusion regarding the respective roles of the Sector Skills Councils and the local Learning and Skills Councils. It was considered too early to reach definite conclusions about the delivery of the skills agenda but it was recommended that the priority

should be to maintain and develop business involvement in organisations such as the Sector Skills Councils. It was felt important to attract more high calibre young people into manufacturing. An idea that captured the interest of many was to write off the student loans of those who achieved Chartered Engineer status.

- Management and Leadership

Stakeholders in academia and consultancy argued strongly for better management and leadership in manufacturing as a prerequisite for transformational change in the sector. Emphasis should continue therefore to be placed on initiatives to improve those skills, complemented by action to increase manufacturing's share of university graduates. More networking and mentoring opportunities for management should also be encouraged with a number of MAS Regional Centres already doing good work in this area.

- Innovation

With innovation being seen as crucial to the future of the UK manufacturing industry it appears that whilst larger companies are capable of forming productive links with the science base, small and medium market manufacturers need the help of intermediaries to do this. In some regions the MAS has been successful in performing this role whilst in others individual organisations such as University manufacturing groups and Institutes have been successful. The recommendation is to build a national network of intermediary organisations with common identity, methodology and targeting. Additional consideration should be given to setting up a national database to allow manufacturers to locate providers of technological expertise and capability.

- Public Procurement

A consistent and widespread perception of manufacturing stakeholders was that other EU countries seemed to find ways of favouring their own industries in public procurement, whereas this did not happen in UK procurement. Stakeholders were certainly not arguing for 'Buy British' policies, but for public procurement processes to operate in a way that enables UK industry to compete on a level paying field while ensuring competition and value for money for the taxpayer. Whilst the matter had been discussed at the round table on procurement in 2003, there was a perception that little progress has been made since then therefore the DTI and Treasury should revitalise this agenda.

- Capital Investment

UK manufacturers for many years have not invested nearly enough in capital equipment for their businesses. Although this was recognised as mainly an issue for industry to address, a consistent message from stakeholders was that Government should also consider what further steps can be taken to stimulate capital investment, particularly early in the business cycle.

- Regulation and Red Tape

There was widespread concern among stakeholders about the impact of regulation on UK manufacturing competitiveness. Much originates in Brussels, but the UK approach to implementation was also an issue: particular mention was made in the context of the Emissions Trading scheme and the Working Time Directive.

UK manufacturers compete in a global marketplace and face competition from low cost competitors in industrialising economies who are often subject to far lower regulatory burdens. Policy makers in both the UK and Europe must ensure that regulation does not hinder the competitiveness of UK manufacturing.

- Measures

Part of the confusion in the debate concerning the real state of UK manufacturing stems from a lack of clarity about the measures used to report the sector's performance. There is a need to develop a small, simple and broadly understood set of measures that can be reported upon on a regular basis and which can be used to assess our progress on the agenda for the future – the creation of a highly competitive manufacturing sector, focused on high value-added goods and services, and employing a skilled and flexible workforce.

As a result of the review, a Manufacturing Strategy Action Plan was produced which sets out the priorities for activity over the next two years by Government, industry, trade unions, the RDA'a other stakeholders in key areas where they can most effectively work together to ensure the future success of UK manufacturing.
The Action Plan covered a wide range of priority areas and, most importantly, ascribed an Overall Outcome and Key Performance Indicator to each, under the headings of:

1. **Promoting Science and Innovation**

Overall Outcome: The generation of world class research activities leading to the creation of globally competitive, high added value, products and processes.

Key Performance Indicators: Innovation, investment, skills and productivity

2. **High Skilled, High Performance Workplaces**

Overall Outcome: Raising demand for, and better use of skills in UK Manufacturing, through more responsive training and education at national, regional and local levels, thereby raising productivity.

Key Performance Indicators: Skills

3. **Encouraging Intelligent Public Procurement**

Overall Outcome: A more coherent, transparent and predictable public procurement process resulting in innovative bids from UK manufacturers and better value for money for the public sector.

4. **Encouraging High Value Added Investment**

Overall Outcome: Improve the investment performance in the UK manufacturing industry.

Key Performance Indicators: Investment and profitability.

5. **Promoting Best Practice**

Overall Outcome: UK manufacturers continuously improve through the adoption of global best practice.

Key Performance Indicators: Output, productivity and skills.

6. **Improving the Understanding of Manufacturing**

Overall Outcome: Well-publicised and received programmes of research that effects real changes in stakeholder attitudes towards manufacturing over the next ten years.

Key to the success of the strategy and action plan is the establishment of a Manufacturing Forum that is led jointly by Government and Industry. The role of the Forum is to ensure the effective implementation and evolution of the Manufacturing strategy. The Forum brings together Government, industry, trade unions, Regional Development Agencies, and other stakeholders to support manufacturing. It first met in December 2004 and has made progress

in most areas but of key note is the progress on Key Performance Indicators that allows qualitative and quantitative assessment of the climate of the UK's manufacturing sector. Working with stakeholders including the TUC, CBI and EEF and drawing on the expertise of KPMG they have produced and published the first set of KPI's that:

- Are specific to manufacturing
- Are measurable over time
- Allow continuity and annual updating
- Can provide an international comparison of the UK's performance.

The KPI's are:

- Output shows the level of value added of the sector. It is calculated by subtracting the value of inputs form the value of outputs and is indexed using 1990 as the base year.
- Investment shows the level of new investment in the sector and is indexed using 1990 as the base year.
- Innovation uses Business Enterprise Research and Development spend in manufacturing businesses as a proxy for innovation in UK manufacturing and is indexed using 1990 as the base year.
- Productivity uses labour productivity, on the output per hour measure, as a proxy for total productivity in UK manufacturing. It is calculated by dividing total manufacturing output by total hours worked, and is indexed using 1993 as the base year.
- Profitability is measured using the rate of return. This is calculated by dividing total industry profits by total industry capital, and is expressed as a percentage.
- Skills shows the proportion of qualifications at different levels held in the UK workforce.

4.2.2 2005 view reflected at the CIR HVM SE conference at Harwell

UK Manufacturing output has now dropped to 16% of the UK GDP although it still accounts for 55% of UK exports and employs directly some 3.5M people equating to 15% of UK private sector employment. Of these 400, 000 or 11% are within the South East. It was also noted that for every 3 people in manufacturing there are 2 more in support services e.g. security, cleaning etc so the economic and social consequence of manufacturing is more accurately proportional to 25% of total UK jobs.

In addition to a gross reduction in size, the shape of UK manufacturing is changing with the older 'Smokestack' industries closing and modern High Value Manufacturers opening mostly requiring less manufacturing operatives and more technical/scientific staff.

Whilst productivity in manufacturing is growing at twice the rate of the economy as a whole, and output is growing at about 1% p.a., the UK is still outperformed by Germany and France. Arguably this disparity is brought about because during the late 20th Century the UK shed jobs to improve its productivity but, because of the EU social laws, Germany and France could not utilise this strategy so had to improve their efficiency through innovation and investment. Current potential relaxation of EU laws may now give them an opportunity to go along the head count reduction route as well, leaving the UK deficient in skills and capital investment and few surplus heads to reduce.

Putting this dual message of decline and rise in perspective, UK manufacturing share of GDP has fallen from 30% in 1973 to 16% in 2003 but at the same time output has risen by 18%. The most concerning trend within this however, is that Manufacturing Order books have shown a reduction over the last 2 years.

UK exports to China have increased by 35% but with the Chinese economy growing at over 10% p.a. this growth must be put in context within the grand scheme of growth. Of this growth, over 2/3 is driven by increased demand for manufactured goods by the West or, looked at another way, 70% of the Chinese growth is from increased demand and NOT just replacing European capacity. This situation will take an interesting turn in future years because with over 1.3B consumers in China, as their wealth grows there will be a huge market for own consumption.

Against this backdrop the main pressures on UK manufacturers can be seen as:

- Sterling is strong against other currencies particularly the Dollar and the Euro..
- There has been greater competitive penetration of export markets by Asian countries.
- The Cost pressures have intensified, putting profit margins under severe pressure.
- Energy costs are increasing and look set to continue to do so.
- Sea freight costs have increased 3 fold since 2001.
- Metal costs have doubled since 2001.

UK manufacturers have responded to these pressures and are continuing to so but the issues facing UK manufacturers' ability to do so are:

- Weak investment growth compared with ROW with Tax and Capital allowances inadequate compared to many emerging economies.
- The challenge of globalisation, whilst there is tax relief on imports this is of no benefit to the UK producer.
- Off-shoring activities continue to reduce the indigenous Supply Chain capacity.
- In some sectors the UK is at a 'Critical mass' disadvantage to international competitors
- An acute Skills deficit with over, ½ the UK manufacturing work force being essentially unskilled and most worrying, an aging work force with 2/3 of skilled workers being over the age of 45 and 70% of vacancies requiring level 3 technician level staff.

Deregulation of some key areas leading to aver increasing competition.

Amongst all the 'gloom and doom' of the statistics however, the good news is that delegates truly felt that the 'penny has dropped with the DTI' and that they are actively promoting UK manufacturing with the Key initiatives mentioned above i.e.:

- Government Manufacturing Strategy
- Manufacturing Forum involving ALL stakeholders
- Manufacturing Advisory Service perceived to be really making a difference.
- Manufacturing Skills Academy Business Plan is being raised.

In summary, the Government has woken up to the fact that manufacturing is an essential part of the economy, that there is a constant challenge to become more competitive and that the UK needs to do more to protect and develop the sector in a positive and open manner. In conclusion though there was still a feeling regarding the Government role that "action is needed – not words".

4.2. a. Picking Sectoral Winners as a Strategy

When looking at investment the one truism is that UK industry cannot afford to invest in all sectors and still make returns in a sensible time frame for the shareholders. It is therefore absolutely vital that government and industry work together in the selection of target sectors for investment by picking 'winners'.

As any investor or gambler will know, picking winners is the result of identification of opportunity, thorough investigation of options and forecasts and delivery of the 'item' to time/price/quality promised coupled with an element of luck!

Since HVM occurs at the point where science meets market need it follows that three specific chains of investment must occur before manufacture in fact occurs:

1. Investment in science/research at the university level
2. Investment in true marketing at the industry level
3. Investment in development at the industry level

For UK HVM to be successful it is vital that these investment chains are linked in some form of overall strategic framework. Within large, often multi-national, conglomerates that can afford to sponsor university research, fund their own marketing and development, this strategic framework comes from their own long range planning process and budgets. Even within this environment, not every project started comes to fruition, a pipe- line of innovative ideas feeds though a 'funnel' to produce a much smaller number of resultant product launches, in other words there will be failures and failure is not necessarily bad. The only companies who never fail at R&D are those who don't do it.

What, however, smaller companies need is the ability to have simple access a similar framework of funding, to know what research is being effected and how they can play a part within it. This is now potentially available

through the Promotion of Science and Innovation section of the Manufacturing strategy via a number of initiatives such as:

- the KTN (Knowledge Transfer Networks), designed to stimulate innovation in the UK through higher levels of research and development and knowledge transfer
- the STEP (Shell Technology Enterprise Programme), designed to help small businesses develop their potential by using the skills of undergraduates to work on specific projects

These and several other programmes are available via the Business Link and are plainly a step in the right direction. The apparent shortcoming though is that they are targeted at essentially the smaller company/project with larger projects being dealt with under the Exceptional development projects scheme whereby up to £500,000 is available to businesses with qualifying projects.

The other route open for large projects is via an EU framework programme in which the EU invites bids through calls for proposals in the technologies nominated in Framework Programmes (FP's) [currently FP6]. This source of funding is potentially large at €19B for the years 2002 to 2006 but spread over 5 years, open to all member states and acknowledged to be a complex and time consuming process the probability of success is slim.

Access to funding for R&D though is but one part of the problem, potentially as high costs can be incurred in marketing in this global arena for which there would appear to be a relatively small amount of assistance. As stated in the introduction to this section, HVM is about picking sectoral winners for which marketing data is essential to provide the balancing part of the Return on Investment equation. On the assumption that the current DTI initiatives are heavily biased towards science, a future initiative aimed at support to the marketing data would seem to be an essential proposition.

In the mean time under Action Plan item 1.5 the RDA's are tasked with developing clusters and regional knowledge transfer and innovation networks that reflect regional priorities and enable linkages to national and international networks. This framework could concentrate on sharing 'cluster' knowledge from industry and academia to share market data and possibly pursue a more proactive stance to this issue.

4.2 b. The Role of Government in R&D Support

As indicated in the above section the Government has established a framework for linking Academia and Industry, assisting Research and Development via the Eight research councils that have been established and also by simplifying the plethora of previous initiatives.

They have also extended the R&D Tax relief schemes albeit that these apply principally to Capital purchases.

Elsewhere within the Manufacturing Strategy reference was made to 'Encouraging Intelligent Public Procurement' with the objective of achieving 'a more coherent, transparent and predictable public procurement process resulting in innovative bids from UK manufacturers and better value for money for the public sector'.

So what more can government do in this field?

Most of the above assistance is essentially passive i.e. the government has created an environment in which aspirant entrepreneurs can find out about research and vice versa. What is needed if the UK is to succeed against

international competition from 'directed' economies is a more proactive approach to stimulating R&D and the resultant HVM products. One possible approach could be an emulation of the system already in place in the Department of Health whereby it commissions R&D programmes that are considered vital to improvements in medicine and health. If each of the major ministerial departments stimulated cutting edge research in their sector of responsibility, perhaps linked to specific clusters of universities and companies that either specialise in that field, or in the enabling technology that could be used within that field, then a more dynamic approach to R&D would appear.

4.2 c. Comment on the Government's current Manufacturing strategy

The Government's current manufacturing strategy is undoubtedly a step in the right direction. Having launched the original document in 2002, commissioned the Nick Brayshaw review in 2004 and implemented the Manufacturing forum immediately thereafter, a great deal has been achieved in a short period of time. These initiatives must, however, only be considered the opening skirmishes in the global economic war. Each of the established economies in Europe and the US are fighting back from recession, the emergent economies of the so called 'BRIC' (Brazil, Russia, India and China) are strategising to ensure that their manufacturing industry becomes pre-eminent in the world. The UK must ensure that it has an adequate High Value Manufacturing base to ensure that we do not by default mature Napoleon's dream and become a nation of shopkeepers peddling goods produced elsewhere. The strategy needs to be implemented at a faster pace and once this essentially enabling framework is in position, a more national framework of industrial investment needs to be instituted.

4.3 Suggestions for a changing model in light of the conflict between the need for long term strategy and short term share holder return.

The key to success in the global manufacturing arena is long term vision. There are some that would say that the UK has lost the battle for high volume manufacturing with, for instance, no UK owned volume car plant. Yet the highest productivity car producing plant in Nissan is in the UK!

The inference to be drawn from this and many other examples of world wide best practice operating on a daily basis here in the UK is that we have the work force, we have the operational management and we have the engineers so what has gone wrong? The answer may well lie in the different attitudes towards financial returns on investment with the needs for long term investment in products with high initial capital and R&D being subjugated in favour of products with lower R&D costs and shorter returns.

Whilst in no way advocating state control or ownership, the state must accept that the long term economic success of the country is the responsibility of the state and not the free market. If this statement is accepted, then the nation must contribute either directly or indirectly to the costs involved in developing the enabling technologies that will provide a continuous base for growth in the future. The nation must adopt the role of 'venture capitalist' for emergent technology sectors and using equally robust methods of 'due diligence' to ensure the rigour of the case,

invest in direct research and the sustaining processes to take the technology through to economic fulfilment. The structure for achieving this investment framework and the inevitable source of tax burden to achieve need to be established but if not, the manufacturing economy will continue its downward passage. The world playing field is not level and cannot become so in the foreseeable future so, in the manner in which manufacturing has had to learn from the world those aspects of best practice that represent lean manufacturing, government must adopt the best practice in investment methods that achieve the end goal of a prosperous nation.

The future High Value Manufacturing model then becomes:

- A partnership between Government, Academia, Finance Institutions and Industry sponsoring technologies and products that utilise the cutting edge of science.
- HVM UK capability comprising rapid prototyping and low-volume production linked as required to off shore capability as and if volume demands.
- Innovation and Investment being recognised and rewarded to offset the risk of 'short termism' of shareholders. ROI will be Years, not Quarters.
- All necessary steps taken to protect our IPR.
- The promotion 'Science', 'Engineering' and 'Manufacturing' as key and prestigious roles in our society and to encourage our brightest graduates & PhD's to enter HVM.

5 General overview of high value manufacturing in South East England

In this section we consider intra regional location of prominent HVM sectors.

At least one of our interviewees, said that the cluster effect would benefit people who wanted to manufacture in those cluster sectors. The availability of a secure workforce is an advantage of locating in South East England; and there are good international communications there.

There are nearly 20,000 high value manufacturing companies (HVMs) in the UK1, with fifteen percent (just over 3,000) of those based in the South East. Amongst high value manufacturing companies, those who have the highest proportion of companies based in the South East include: manufacturers of instruments for measuring, medical equipment and pharmaceuticals. Between 22-23% of UK companies in these sectors are based in the South East, compared to only 15% of southeastern UK HVMs generally. Of the 23 different HVM sectors, others which are strongly represented in the South East are the: manufacture of ships and boats, production of office machinery, computers and processing equipment, manufacture of industrial process control and manufacture of glass and optical and photographic equipment.
In this analysis, sectors such as aerospace and defence, and motorsport and automotive (see below), which may be dominated by a few larger companies, will not show up as important as they really are, since this analysis is not looking at revenues but numbers of companies. We do not yet have data or estimates generally on revenues for the companies in our datasets. The CIR working definition of HVM, that we have given earlier, is such that the boundary for manufacturers is blurred; and this is unavoidable without considerable company analysis on an individual basis.[2]

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[1] This figure comes from CIR Ltd analysis. CIR looked at the full list of Standard Identification Codes used by Companies House (CH). It also purchased and referred to the CH database. This enabled CIR's analyst to select SICs that would likely include HVM companies. This in turn was based on expert knowledge and the CIR High Tech Company Definition (April 2005). It is possible both that some firms have been left out, and some included that are not involved in manufacturing within the lists used in this report. More indepth work on a per company basis is needed to shed more light and give more strength to the data.

[2] We have decided to remove glass manufacture from the tables in this study, though this may of course not always be the right thing to do. This same rule may apply generally. An example of high value British manufacture is the Moulton, which sells for £2000. Bicycles may not be seen as high value, high tech.

Table 1. Table showing manufacturing sectors with a stronger than average representation in the SE region.

Manufacturing Sector	*% of companies from the sector in the UK as a whole who are based in the South East*
Instruments for Measuring	22.6
Medical equipment	22.6
Pharmaceuticals	22.3
Optical and Photographic Equipment	20.5
Industrial Process Control Equipment	19.9
Ships and boats (Marine tech)	19.8
Office machinery, computers and processing equipment	19.5
All High Value Manufacturers	15.2

Figures from the ONS reveal the South East spent £4.7 billion on R&D in 2003; this is higher than for any other region, 6% higher than in 2002 (Economic Trends, ONS, 2005). The East of England had the next highest level of expenditure on R&D, spending £4.2 billion on R&D in 2003.

5.1 Clusters of commercial activity in the South East England

From the databases, HVM conference, and other sources of information, we established that the most competitive or groundbreaking sectors (relative to the UK average, rather than clusters by any academic definition) for the South East were measuring equipment including laser-based equipment, medical devices, biotechnology, nanotechnology, motorsport, automotive, ships & boats (marine), and office machinery, computers and processing equipment. This last category comes from the raw data SIC lists, but which straddles the more familiar "ICT" division. Electronics and semiconductors in the design and test section of the supply chain also had notable companies present in the South East, but indications are that they may not have great depth there, except perhaps in semiconductor SMEs around Oxford and within government laboratories or defence projects.

The safety of this section's results would be improved by an analysis of each company's actual business, rather than their own chosen sector classifications within the standard codes. This is because companies see every reference to themselves as an opportunity, and some sectors will be 'more attractive' than others; SMEs, the most numerous category of company considered, can often be categorised loosely. An example of this, from another field is when "internet companies" turn out to be "internet cafés" and are thus not particularly IPR rich or to be lumped with other technology companies, in general.

A considerable proportion of interviewees were skeptical about the existence of clusters or the benefits that their businesses realised because of clustering. However, nanotechnology/materials clusters around Oxford, Bristol & Bath (South West!), and Southampton were mentioned, with mention of the Southampton being 'oriented towards the photonics/optical markets', which are complemented also by relevant Southampton University departments. There was mention of high-tech clusters around Oxford (and its Universities), and in particular of an instrumentation (particularly superconducting and lasers), bio-science, nanotechnology/materials, and semiconductor based business clusters. From a technology perspective as well as market, these clusters begin to overlap in this cross-disciplinary, competitive world.

5.1.1 Motorsport and automotive

A number of respondents mentioned that there was a motor sports cluster. Indeed BMW, Rolls Royce and TAG McLaren are all building new factories in the Home Counties.

The UK motorsport industry has dubbed its main concentrations of activity "Motorsport Valley[3]". This 'Valley' actually ranges from Hampshire in the South East, through Oxfordshire, Buckinghamshire, Bedfordshire, then Cambridgeshire and Norfolk in the neighbouring East of England region, and indeed up into the East Midlands too. The South East makes up a good proportion of the following statistics for Motorsport Valley: 6 of the 10 Formula One teams, 3 of the world rally teams, many suppliers of engines, transmissions and components. There are 2400 companies in motorsport, employing some 40k people, £GBP 5bn sales a year, of which £GBP 2.2bn is export business.

If you couple the above paragraph with the presence of BMW MINI at their plant employing 4.5k people at Oxford, one sees that there is still considerable expertise present in this Motorsport Valley. Skills transfer between automotive road cars and motorsport. Indeed, also on into certain other sectors such as aerospace, defence and other often large-scale engineering projects in Oxfordshire and the surrounding counties. Nearby Prodrive now employs 900 people, most of whom are in the South East, and which straddle these engineering disciplines of F1 and automotive.

5.1.2 Aerospace and defence

Aerospace (and defence) is an important sector of HVM for the South East too. Sector firms in the region have £7bn of revenues. These firms have global prime customers. There are also unique small firms. The SE England considers itself well-positioned for changing nature of the market. Farnborough Aerospace Consortium (FAC) is a business development organisation to help firms win business in this global market: lead-times are falling, and innovation and commercial exploitation are sharpening. Now there are fewer 'primes'; they want fewer interfaces (suppliers). The FAC said at the CIR HVM Conference in November 2005: "We are in a unique place currently to

3 this group has been associated with previous CIR HVM conference sessions on this sector

take advantage of the new business models. Ways of doing business are changing through small agile innovative companies with complementary capabilities close coupled to research centres." The FAC believes the sector can grow by £3bn in the next 5 years through products for space and autonomous systems, and protection of the environment, a key opportunity for the sector, coupling with the new energy sectors.

5.1.3 Nanotechnology and materials

The authorities are well aware of the importance and future potential of these key activities: "South East England, in particular, the area stretching from Oxfordshire to Southampton, Hampshire, is one of the most concentrated centres of high technology research in the country[4]."

In micro-technology and nanotechnology and nanomaterials, the markets seen as important will be for: replacement materials, additional functionality, carrying other components and completely new products as yet unknown, perhaps without the classic "killer application" there for the venture capitalists to get hold of. Educating investors as to the risks and rewards of the sector are thus crucial. Once again, nanotechnology is a truly global market, which will still benefit from local 'critical mass'[5] of suppliers and manufacturers. We mention the Micro- and Nanotechnology Network organisation (MNT) that is run by PERA in recognition of the activity and importance of this sector. Professor Peter Dobson, speaking at the CIR HVM Conference in November 2005, talked about the importance of matching expectations in this sector, though his comments have wider application than in this sector only: "We need to match expectations of scientists, engineers, investors, and the public who would buy the products at the end of the day. In nanotech and nanoscience the gap is even bigger than normal. On the one hand, there is a great deal of 'overhype': but the sector can help stop the decay and rot in physics and chemistry through the optimism associated with it. On the other hand, there are concerns of people on impact on environment, which should be taken seriously but not serve to overdamp the optimism and enthusiasm the sector still commands."

5.1.4 Bioscience and pharmaceuticals

The bioscience, technology and pharmaceuticals markets, inexorably, will play an important part in the future of consumer products across the world, in developed and developing countries alike. The markets are not free of controversy; but most consumers will take on the risks associated with these high value products, and are doing so increasingly over time. The marketing of such products is based on the simple premise that they save, prolong or improve (quality of) life, and there are fewer more powerful messages available to marketers.

[4] Taken from a Nanotechnology Report to SEEDA.

[5] No pun intended.

The South East is overweight companies in this sector. One "Big Pharma" company in particular, Pfizer, has a large base in the South East at Sandwich, in Kent. This is, according to Pfizer: "the European Headquarters for Research & Development, and the Pfizer Global Manufacturing main site. Both are major partners for the Pfizer business worldwide. The organisation occupies a 340-acre site close to the ancient cinque port of Sandwich in Kent. There are approximately 3,600 staff based at this site, 2,700 of whom are currently employed in R&D. The remaining 900 people work in the manufacturing division."

This size of company may have a local HVM supplier network of its own in the Kent area.

We have mentioned the emergent bioscience cluster around Oxford.

5.1.5 Instruments, medical, electronic & optical equipment (incl photonics)

The instrumentation cluster, particularly for superconductors and magnets, is the most established Oxfordshire high tech, high value manufacturing cluster, with bioscience described more as "emerging". Some of these companies are: Siemens Magnet Technology, Magnex, and GE magnet group. There are many other smaller ones.

As Jonathan Flint, CEO of archetypal HVM company Oxford Instruments plc, said to CIR: "It is dangerous to look at HVMs in isolation: in general this doesn't usually happen. There is usually an HVM supply chain feeding into that HVM. And often that can be *local*. There are a number of tech clusters that are mutually supportive in the Oxford area. There is a superconducting cluster here. These companies share staff, technology, work together and also *compete*! There is a nanotech and bioscience cluster development. This is a feature of HVM having a HV local supply chain."

As we have said, photonics is strong in the Southampton area in Hampshire, and one can name HVMs like Southampton Photonics (VC funded by Amadeus Capital) and Pulse Photonics.

Medical equipment is certainly strong in the Oxford area through companies like Oxonica plc, Elscint Cryomagnetics Ltd, Oxford Magnet Technology Ltd, PFI Systems Ltd, RES Med (UK) Ltd, and Somatech Medical Ltd to name a few.

5.1.6 Information and Communications Technology (ICT)

The South East has one of Europe's largest clusters of ICT companies situated along the M4 corridor in the Thames Valley. Some of the companies are long standing UK start ups such as Vodafone but many are companies established as the UK or European head quarters for large global multi-nationals such as Oracle, Nokia etc.

The sector has a wide range of product diversity with the obvious splits between hardware and software with end applications ranging from mobile telecommunications and associated products through to digital media companies. There are considerable cross-overs between ICT and electronics through aerospace and defence companies and large institutional projects.

Many of these companies are gathered in clusters with the principal clusters being:

- Surrey & Hampshire – Software & telecom
- Brighton, East Sussex – Software & media
- Buckinghamshire – Electronics & hardware

Many of the regions universities have large departments associated with Telecommunications technologies with amongst others:

• The University of Oxford undertaking primary research across a broad swathe of ICT technologies.
• The University of Southampton undertaking research in fibre optics at its Optoelectronic Research centre.
• The University of Surrey undertaking research in mobile and satellite communications systems.

In addition to the universities, the regions have several science parks with some being in turn owned and managed by universities such as Surrey, Southampton and Oxford.

5.2 Statistical presentation for South East England

Both Oxfordshire and Hampshire have a far higher proportion of HVMs than the other counties. Eight percent of South East based HVM companies are based in Oxfordshire, even though only four percent of all southeastern companies are based in the county[6]. Meanwhile, 22% of southeastern HVMs are based in Hampshire, while the county only has 12.5% of southeast-based companies. Berkshire and Buckinghamshire have a slightly higher proportion of HVMs than you would expect, given the number of companies in these counties.

Table 2: Number of HVM companies, and total companies in each county

County	*No of HVMs*	*% of SE HVMs in the county*	*No of Companies*	*% of all companies in the SE from the county*	*Density of HVMs and ranking among counties*
Oxfordshire	237	7.7	16,600	4.20	1.83; 1st
Hampshire	685	22.2	49,250	12.5	1.77; 2nd
Buckinghamshire	241	7.8	25,600	6.5	1.20; 3rd
Berkshire	308	10.0	36,750	9.3	1.08; 4th
Kent	497	16.0	74,850	19.0	0.84; 5th
Surrey	574	18.6	89,650	22.8	0.82; 6th

[6] This extra density of companies related to higher technology (in manufacturing) is actually mirrored almost identically around Cambridge, where that area also enjoys double the density of activity on average of the rest of the region taken as a whole. To be fair, one should go on and find out how big the effect is for every equivalent University in the region before suggesting this is an "Oxbridge Effect".

Sussex	549	17.8	101,400	25.7	0.69; 7th
Total SE Region	3091	100	394,100	100	1.0

5.2.1 Berkshire

Nearly half of all high value manufacturing companies within Berkshire come from three sectors, these being pharmaceuticals manufacture, the manufacture of instruments for measuring and the manufacture of office equipment, computers and processing equipment. Meanwhile, in the country as a whole, these sectors constitute, only 26% of HVM companies (compared to 46% in Berkshire).

The automotive sector and the medical equipment manufacturing sector are also well represented within the county. Other significant sectors include aircraft and spacecraft, industrial process control equipment, and interestingly, ship-building and sports boat manufacture.

5.2.2 Buckinghamshire and MK

Like Berkshire, HVMs from a number of sectors are well represented within the county. Automotive and related manufacturing, medical equipment, chemical products, pharmaceuticals, office machinery, computers and processing equipment and well as instruments for measurements all have a significant number of companies operating within the county. Milton Keynes is a South East Growth Area; it is highly interested in HVM. It seeks to benefit from its position halfway along the Oxford to Cambridge Arc, but also be seen as a generator of excellent technology companies and HVMs in its own right. It also benefits from its proximity to London. This, notwithstanding the areas' spectacular growth in population since the 1960s.

5.2.3 Hampshire and the Isle of Wight

As mentioned previously, along with Oxfordshire, Hampshire has a disproportionately high number of HVMs, relative to the size of the county. Nearly fifty percent of all manufacturing of ships and boats within the south east happens in Hampshire, reflecting its coastal location and rich history. The manufacture of ships and boats & marine technology is the biggest sector in Hampshire as evaluated by the number of companies, with 140 boat and ship manufacturers in the county. Instruments for measurement are another key sector with 110 companies in the county, constituting just over 20% of the South East region's measurement instrument manufacturers. The other notable characteristic is that nearly 40% of all aircraft and spacecraft manufacturers in the south east are based in Hampshire. This high proportion reflects the importance of Farnborough as a hub for the aerospace industry. The sector of photonics is also known to be strong in Hampshire, though this is not a category in the SIC lists we have used.

5.2.4 Kent and Medway

Once again, the automotive sector, office machinery, computers and processing equipment, and instruments for measurement, feature most prominently in terms of the number of companies. Although Kent has a lower proportion of HVMs companies relative to its size than some counties in the south east, it has companies from a wide spectrum of HVM sectors. There is not a strong concentration of companies from any one sector, with the five biggest sectors, as quantified by number of companies, constituting only one third of all HVM companies in the county. This compares to figures as high as 90% for Oxfordshire, and 30% for Sussex (see Table 3 below).

Table 3. Table showing the extent to which HVM activities within the south-eastern counties are concentrated within specific sectors.

County	*% of all HVM companies in the county that belong to one of the five largest sectors (as quantified by number of companies)*
Oxfordshire	89.9
Hampshire	83.5
Buckinghamshire	54.3
Berkshire	49.2
Surrey	36.0
Kent	33.5
Sussex	30.1

5.2.5 Oxfordshire

52 companies in Oxfordshire produce instruments for measuring, making this sector the biggest HVM sector in the county, as measured by number of companies. The automotive/motorsport sector and the production of radio, television and related equipment are the next biggest sectors measured by number of companies, both with 27 companies operating in the county. Indeed, just over half of companies involved in the production of radio, television and related equipment within the South East region are based in Oxfordshire. Meanwhile, the medical equipment sector and office machinery, computers and processing equipment sectors are also significant within the county, both with over twenty firms based in Oxfordshire.

5.2.6 Surrey

35% of the 37 precious metals production companies in the south east are based in Surrey, and approximately a quarter of the 70 optical and photographic equipment manufacturers, and office machinery, computer and

processing equipment manufacturers. For comparison, 23% of companies within south east are based in Surrey. Like Kent and Sussex, high value manufacturing companies in the region are from a variety of sectors, with no one sector being particularly dominant.

5.2.7 Sussex

Although 26% of companies in the south east are based in Sussex, only 17.8% of the region's high value manufacturers are based there. Sectors with the largest numbers of companies in the county are instruments for measuring, office equipment, computers and processing equipment, medical equipment, the automotive sector and ships and sports boats. This reflects the large size of these sectors generally, rather than their having a particularly strong representation in Sussex.

There are a few sectors, for example, the motorbikes and bicycle sector and paints, print ink and mastics sector, which are well represented in the county compared to other regions. However, these sectors are relatively small, compared to say, the pharmaceuticals sector.

6. BUILDING BIGGER, MORE SUCCESSFUL BUSINESSES: KEY INSIGHTS FROM BUSINESS LEADERS IN THE SOUTH EAST

6.1 Distinct business models for HVM

The business models prevalent within the SE HVM sector are largely a question of maturity and capital investment. Where the businesses are mature and the processes well defined the HVM companies base their business models on what they have in position and an economic decision with respect to profit. Where the company is relatively young or the science they are embodying is new with initial investment being in R & D, the model is based more upon the capital required to establish HVM processes and access to external partners who have the process capability. In both cases the availability of staff and the protection of IP are key issues that need to be addressed.

a. Categories of product and market

With an area as large and industrially diverse as the South East it is difficult to categorise products and markets.

However, some of the HVM sectors are seen as:

- Advanced Engineering
- ICT
- Healthcare Technologies
- Automotive and Motorsport; Aerospace and Defence
- Marine Technology
- Environmental Technology
- Transport

Of these, Advanced Engineering and ICT are potentially enabling technologies for application within the other groups that could mean considerable cross sector markets are available. Of particular interest is the application of micro and nano technology and their associated materials and measurement requirements that are being supported from the Universities within the region.

b. The licensing decision

Most of the people questioned recognised that licensing of production was an important aspect for developing the scale of their business but there was a general concern about the protection of Intellectual Property. This would appear to be from anecdotal inputs rather than hard evidence. There appeared to be scant regard for patenting with at least one response being “we just move on to the next generation”.

This is an area where perhaps ‘intermediaries’ could assist HVM in the South East by improving awareness of methods of licensing, the applicability of patents and introductions to reputable licensees.

c. The delocalising decision

The 'delocalising' decision is realistically the recognition that both the process and the design are at the point of maturity whereby the original designer does not need to become involved in the either the production of the product or the function of the process. This point is a major milestone in the evolution of any company but with an HVM company being so close to the development of the underlying science can often be an inhibit to moving production away from the academic centre, let alone the commercial centre.

This was particularly prevalent with those companies originating as spin outs from universities who felt that the ability "to tap into the skill sets available in academia by using academics as consultants are vital to a small company who cannot afford to maintain a broad palette of skill sets within the organisation".

Within the questionnaire respondents it is significant that a majority of the smaller companies were at the point where true R&D spend was proposed to remain static in monetary terms whilst as the business grew over time they expected to spend more on production processes. This expenditure is aimed at volume expansion and making the processes more robust. At that point several felt that they would establish remote facilities within the UK either by purchasing companies with similar technology or by setting up in a green/brown field situation with access to grants, alternative costs of labour, housing etc.

There was also a strong feeling that they would not move to a 'production-less' model with one company director commenting: "Co-location of R&D and production is important during the pilot phase, but irrelevant further down the road. In the age of the internet, personnel and inertia are the brake on how far you can diffuse geographically, especially for the high value parts of production. In order to have the continuity of personnel, we intend to keep the high value aspects of production nearby."

d. The offshoring decision

In this section the questions asked were an extension of the 'delocalising' section above and specifically aimed at moving production and/or design to another country/continent.

Responses to the offshoring question were understandably diverse, and depended very much on the sector and what stage in development products were at.

Selected quotes show the linkage between the various sub headings within this section :

"Our highest aspiration is to undertake all aspects of value chain in UK. The next best model is to maintain high value parts of the value-chain in the UK and to outsource the lower value aspects. One of the obvious barriers is to outsourcing is the need to protect ones own intellectual property."

"When a technology becomes mature & the IP content is not critical, I would almost always put it offshore. There is a huge history and infrastructure of manufacturing overseas, which we just don't have in the UK. Also it's sometimes cheaper to locate offshore. However, if the technology is the core of the business or there are high

levels of intellectual property involved, or you are developing new process's, then I would not locate manufacturing offshore."

"Would not consider relocating manufacturing off-shore as manufacturing labour is only a small percentage of total cost of manufacture."

"We have just set up a manufacturing unit in Shanghai. There are two reasons. The first relates to Chinese market share. It is much easier to sell from an indigenous Chinese plant. The second reason is because the costs are significantly less than here in Oxford."

"We would not considering locating our manufacturing operations offshore because we find we don't need to. Our products rely heavily on a high level of expertise. Price is not the major factor to our products. Our resources are knowledge and expertise."

"Because it is often difficult to transport, it will often be advantageous to locate production facilities near the customer."

"Not at this stage because any capability we set up would be for low volume production and would have to be closely linked with our fabrication facilities. If we did something very large, then we would consider transferring production overseas."

Of note in the above comments are those regarding the use of offshoring as a means of market entry particularly when coupled to products that are of any significant size or requiring local 'customising'. The decision is a complex one and will inevitably be an amalgam of technical capability, cost of labour, logistical costs and commercial/trading benefit. Whilst cost of labour is mentioned here, in general in HVM this is more the cost of technical support resources rather than the direct labour content.

e. The outsourcing decision

Within this context, outsourcing is the procurement of materials and/or sub assemblies as opposed to the production of the end product. Almost all respondents felt that having their supply chain fed from local supply partners was vital to their business. The presence of a strong outsourcing community was felt by several respondents to be a key strength of the South East region and contributing to their own success.

This situation is particularly prevalent where the spin out company is using other spin outs from the parent university as part of their supply chain establishing an interesting and inter-relating food chain.

In general outsourcing is seen as a means of obtaining those elements of the product not intrinsic to the product technology and would include metalwork, PCBs etc.

f. Opportunities for 'Cluster Co-operation'

There are undoubtedly clusters of companies within the South East, most having a loose locational link with the university promoting the science upon which the HVM is based or was the original research base from which the HVM company 'spun out'. At present there is evidence of informal cluster co-operation within sector but of potentially greater significance is the opportunity for cross sector co-operation within the region. A previous section from an earlier SEEDA report shown below clearly illustrates the opportunity for diverse applications of both nano and micro technologies.

Priority

Application of Nano- and Microtechnology

Property and Construction

The application of nano- and microtechnology in construction is in the manufacture of cheaper, stronger and lighter materials with greater thermal stability. The control of such properties is possible when sophisticated manufacturing techniques are used.

Marine Technology

Nano- and microtechnology have a particularly strong potential in the marine technology industry with the use of composites materials in boatbuilding and marine equipment. Nano- and micro-composites can be added to existing materials in order to augment their properties. Because of their size, nano- and micromaterials, used as part of a composite, can be added to the parent material without altering its basic properties.

Aerospace and Defence

Nano- and micromaterials on account of their unique properties have a wide range of application in the aerospace and defence industries, particularly as composites in the development of tools, equipment and machinery.

Advanced Engineering

Nano- and microtechnology has a wide range of application in engineering, one of which is as additives in rocket fuel. The addition of nano- and microparticulate additives to fuel has been known to significantly enhance engine performance. Also, nano- and microcomposites are being increasingly used in the automotive industry on account of their unique properties.

Healthcare Technologies

Healthcare is one of the most widespread applications of nano- and microtechnology, ranging from novel drug design and discovery to sensors, medical imaging and surgical implants.

Environmental Technologies Nano- and micromaterials because of their size and particular characteristics will make manufacturing and industrial processes more energy efficient.

Media Technology and Telecommunications Nano- and micromaterials have unique optical properties which opens up a whole new market in optical switching. The use of nanomaterials in the telecommunications industry means faster and lower power semiconductors and communication systems with higher transmission frequencies.

Transport There is increasing use of nano- and micromaterials for display devices in the transport industry. Optical characteristics of nano- and micromaterials can be controlled more easily on account of their size.

This opportunity has been clearly identified in the past and the report 'Nanotechnology in South East England, An opportunity for economic development' by Dr Dinali de Silva and Dr David Kingham significantly recommended that 'SEEDA should, as a matter of urgency, commission further work to examine the area of nanomaterials in more detail and to develop a business and action plan for a "Regional Nano- and Microtechnology Network".

The report went on to recommend the establishment of a regional Nanotechnology centre which would be responsible for, amongst other aspects, the promulgation of nano opportunties across the region.

Of useful note at this juncture should be the concern expressed during the HVM survey regarding potentially damaging health and safety legislation based upon premature concerns regarding the science. Whilst those concerned recognised the issues involved there was a strong feeling that the UK should not adopt a virtuous and risk averse posture that would not be adopted and enforced across the world.

6.2 Value-add strategies, strengths and opportunities.

The strengths and opportunities are dealt with at some length within Section 9 of this report, however, it is essential to stress at this juncture the real opportunity that exists within the South East for pursuing the cluster co-operation cited above. There are real, commercially viable enabling technologies being developed within the South East but to realise this opportunity will entail leadership and strategic vision on the part of the RDA. There should be specific emphasis placed within the Regional Economic Development Plan to pursue and catalyse action that will, as recognised in the 2002 Action Plan, entail working across the sub regions, bringing together companies that are not in immediate proximity but from other parts of the region.

7. THE DEVELOPMENT OF SUCCESSFUL BUSINESSES: KEY INSIGHTS FROM BUSINESS LEADERS IN THE SOUTH- EAST

7.1 Image of Manufacturing within the UK and SE more generally

"The use of the word 'Manufacturing' within the UK is often associated with smokestack industries, the word 'Engineer' with people who fix office machines and 'Technician' with any other manual function". This is an obviously trite statement but one that has an element of truth within it and must be addressed if HVM is to succeed within the UK and the SE.

Recruitment into the sector is vital if the HVM is to grow but Manufacturing suffers from a poor image, especially amongst the young. To quote Nick Brayshaw of the CBI, "In the minds of younger people, and also their parents, manufacturing is dying and financial services are growing".

Many feel the problem is getting worse: "Fewer young people are getting into manufacturing, engineering and general issues of making things, whether high value or not. Young people are more into soft skills – research etc. Unless somebody does something, this is probably set to continue" and
"Recruitment difficulties are likely to get worse as the number of people doing physics/engineering declines and the standard of A levels falls."

In the light of these comments it is vital that those within both government and industry take every possible opportunity to address the issue by stressing national importance of HVM and assisting with both direct and indirect investment in the sector.

7.2 Manufacturing and Investment

a. Barriers to Funding

In general the respondents did not cite investment funding as a problem, the reverse being true if anything.
The general feeling was characterised as "there's a history in the UK of investment for long run return, from fuel cells to technology businesses. The financial markets in the UK are the most sophisticated in the world. Investors understand long run rewards. There is adequate long-run risk capital. What's forgotten is that if an investor makes a long run investment, then because of the risk involved and because the investment will not be realised for a significant time, then there needs to be a commensurate level of reward. If you want someone to invest for a long period, they will need a risk premium; they need a big pay back" and "I don't think it's a big issue for smaller companies that relate to the presence of investors who have an appetite for innovation. There are a small number of venture capitalists that are prepared to back high- risk projects, although they do expect big returns"

b. Private Equity

With a predominant number of small start up companies being financed from family and/or Private equity sources at the early stage of their development, lack of equity at this stage in the company development is not a problem. The problems commence when there is a need to take the company to the next stage of development and invest in the large sums of money needed for capital investment. One comment illustrating this was: "Because we're a family company, we don't have shareholders to satisfy, so we don't have to make profits. Our problem is that we haven't had enough profits to plough back in. We need to put in high levels of capital in order to replace the equipment; our turnover is half a million (GB£), but a new piece of equipment can cost around £300,000".

In response to the question of short termism a typical response was: "Yes, there is some pressure. I talk to the City all the time and they want results and want to see them as quickly as possible. However, some CEO's blame the City for failings within their business. The City isn't totally unreasonable. What it is saying is that if you're investing my money we want to know when we'll get it back and how much we'll get back. They have customers who they are answerable to".

c. Public Listing

Taking a company through Initial Public Offering to Public Listing is clearly a goal for all entrepreneurs and investors to achieve for it is at this stage that they can perhaps have access to those larger sums of money required for investment in further growth. It is, however, necessary to recognise that this represents a watershed in the style and personality of the investor. When Private Equity and Venture Capitalists invest in high technology HVM companies they do so as an 'informed' investor. Once open to the public for investment this picture changes with the profile varying from private individuals to pension schemes and other corporate investors. These people may well be under informed regarding the sector and the tension between declared profit, growth and investment becomes apparent

7.3 UK Transport and Communications for Manufacturing Competitiveness

There was an underlying feeling with the respondents that whilst the location within the SE was ideal in terms of proximity to universities, the financial institutions of London, the major transport hubs of Heathrow, Gatwick, the Channel tunnel and ferry ports; the reality of local transport partially negated these benefits.

The major trunk road system radiates from London like the spokes of a wheel, making cross- country access difficult. The motorway systems during peak commuting times become totally overloaded with the M25 being used by London commuters to circumnavigate the capital making the use of such roads problematic in terms of journey times.

The local traffic around major towns was felt to be little better with the feeling being that the road infrastructure is poor and that specific initiatives around Oxford for example had failed, illustrated by comments such as:

"Most important - Improve road communications – just to stop this nonsense about restricting traffic and huge parking charges, it is necessary to wake up to the fact that we've got the worst road network in Europe! Improving

road communications would provide a massive boost, it is probably the biggest overriding factor that could foster HVM in the South East"; and:

"Companies will want to expand into a region where they can have a factory, but not be too far away. House prices and getting in and out of work are important. Railways and buses are not the answer – people have to drive – people live where they live [i.e. they don't necessarily live on the routes covered by buses/railways]".

If HVM is to be a dominant factor within the South East economy this issue has to be addressed. There is an ever-increasing use of heavy goods vehicles to service the 24x7retail industry delivering 'just in time' food and other stocks to sales outlets that carry no stock. Whilst totally laudable from the profit view point for those large retailers, the congestion caused to those people travelling for the purpose of HVM will inexorably throttle the HVM economy. It is interesting to contrast this with Germany where many inter-city lorries are in fact transported fully laden by rail and only go on to the roads for local distribution.

The issue of transport infrastructure was raised at both the Oxford and Cambridge CIR HVM conferences. Whilst of itself, road congestion does not prevent High Value Manufacturing occurring within the region, it represents a high level of frustration to the quality of life of the workforce and the entrepreneurial people needed to sustain long term innovation and development. It ranks alongside the cost of housing as an inhibit to attracting the real talent required to grow HVM in the South East.

7.4 Manufacturing and services infrastructure in the UK.

The manufacturing and services infrastructure in the UK was felt to be a strong point for HVM's. Whilst this has already been partially covered in section 6, the strength and the responsiveness of the local supply chain was felt to be crucial for those companies involved in R&D. The following quote is typical of the responses:

"Outsourcing is important, manufacturing outsourcing in particular. The advantage of being based in the UK is that the UK is particularly good for the speed of response during R&D, with it being possible to access a wide variety of components and materials. This also applies to the rest of Europe as well really. We get glass from Europe, while aluminium extrusions are made in Britain. The UK trades extensively with the largest trading bloc, giving it a big development advantage compared to the United States. The UK economy is much more open. The US is good for certain parts of R&D, but you can't even get hold of an aluminium extrusion for ten days, whereas in the UK you can get it the next day".

For most of the companies the benefits of flexibility and speed during R&D outweighed the high cost of direct labour. It was recognised that as the products came into full- scale production this could become an issue but in general, with labour being only a small part of the cost build up in a typical HVM product, it was not felt to be a major problem.

For those companies involved in products closer to the original science, the support from universities and access to both people and process capability was an important factor in their choosing to remain in the South East.`

7.5 Transfer of UK skills to HVMs.

The response to the questions regarding access to skills was a little surprising. Since many of the respondents were in companies that had spun out from universities there was not felt to be a shortage of PhD level skill but more that of development engineer and technician. Whilst the further one went away from university localities PhD's did become an issue, that same shortage of engineers, technicians and general labour with the right attitude was still felt to be a key issue. Not only was the actual shortage a problem, there was a general feeling that the burden of training falling on industry was an unnecessary cost burden that should be the responsibility of government. Typical responses included the following:

"Skills are important, however, because we have a new product it is more important to have people who we can train effectively through our own technical programme. We need people with aptitude to train in our own 'technical college' so that we can pass on what we've learned in R&D when we move into operations. Our manufacturing process is fairly unique. We develop our own machinery to assemble it and therefore need to develop our own skill set. If we were in biotech, we'd need people with biotech degrees. Our technology is low tech – we don't need people with a degree level qualification, but with an aptitude for learning and the right attitude to work".

"We must put in place a training programme, we need skilled people and those people who are currently training technicians will be reaching retiring age in next 5 years. We are currently playing right into the hands of the Chinese. We need apprentice training schemes – these might be for grads – we need high grade mechanical and electrical engineers, as well as biotechnologists & IT. We should kick the ball off with IT interface work, train a generation or two who can couple computers up to experiments or processes".

"A shortage of PhD students is developing. The number of UK-nationals starting PhDs is declining. There will be a lag effect before this gets serious. The problem is that PhD students are not well funded, and the careers available in fields related to their PhDs are likewise badly paid, when compared to salaries available in the City".

"The idea that you need an MBA to be a manager is highly questionable. MBA's seem to be too idealistic and impractical when it comes to the real thing. The best way of getting good at management is to learn on the job. Sales and Marketing managers are particularly important. I seriously believe that a good sales/marketing team is the make or break of a business. The whole thing will collapse no matter how good the technology if you don't have successful a successful sales and marketing team. I base this on 15 or 16 companies I have knowledge of. MBA's are often the "cuckoos in the nest".

"Firstly, PhDs, we need to improve grad student remuneration or we will lose capabilities completely, and we need to address the number going into research and increase it.
Secondly, we need to do something about skills shortages at technician level. The government appears to be doing nothing really concrete. It is spending money on advertising learning and skills. However, I am not aware of training schools being set up in useful sectors, for example skilled machinists, electrical engineers or biotechnologists".

"There are many people qualified for and applying for media related jobs for example, but if you wanted a skilled machinist, I doubt you'd get an application. Kids in school don't see working as a highly skilled technician as an attractive option. It somehow lacks "that cool image".

These comments are offered together with some suggested specific action items:
1. Bring back technology colleges, with all the updates now available in 2006 that train vocational transferable skills. These centres should provide the basic skills and education necessary for industry to put the finishing touches to become industry specific, not start at the beginning.
2. The 'Modern Apprenticeship Scheme' underway with the Learning and Skill Council whilst laudable, should be given much higher visibility and become more of a responsibility for industry to support. Whilst it had many downsides, the 1960/70's approach of Industry Training Boards and a tax levy that could only be mitigated by supporting training and apprenticeship schemes could be a role model to consider.
3. Outreach to the public, especially the school age public. We need to convince people that [high value manufacturing] is an attractive thing to go into, that it is not simple or straightforward and that it will payoff in the end; that it will be exciting. It is a complex story but it something that has to be got across to the whole country.

7.6 Perceived Barriers to Manufacturing

It is probably fair to say that there were no perceived barriers as such, merely large hurdles. Notable amongst these was the hurdle of legislation and the environmental requirements emanating from Brussels and the UK government. The IPPC in particular was a concern with the double fear that the UK would, as usual, 'play the game' whilst the rest of Europe and the World paid only lip service to the requirement.
Comments regarding legislation in general included:

"Government regulation is a major problem for us in seeking to establish these facilities, the impact of IPPC and the associated costs will be very significant. Until recently cash flow has been a very major problem and remains significant. At this stage this is very strongly influenced by the taxation related to our licence fees and depreciation on expenditure on the new capital facilities as we try and establish these new facilities. Potential competition from overseas will be a problem, particularly in the light of the costs associated the items referred to above".

"Legislative approval is a key. Nanotechnology deals with very small particles, ten to one hundred nanometers in diameter. Most powders are 1+ micron in size, so these particles are 1/100th of that size. Chemicals, for example Titanium Dioxide have different properties when they are in nanoparticle form. The concern that Health and Safety have is that nobody knows how these particles will behave. This leaves three options. The first is to ban the use of nanoparticles until you know what is happening, the second (at the other extreme) is to treat nanoparticles in the same way as larger ones. The third option is something in the middle. We spend lots of resources working on achieving an outcome in the middle ground, so that we have regulation that is useful. If the UK/EU were to ban work with nanoparticles that would be terminal."

7.7 Barriers between R&D and Manufacture

The principle barrier between R&D and Manufacture returns to the issue of co-location and available skills. With complex process related to early science it is essential that the design transition team is adequately staffed from bothsides, those who have developed the product/process and those who are going to take the responsibility forward into main stream production. For good transition to occur there must be good communication which means that there has to be a common language and a base line technical understanding together with time in the development environment for the production people to become totally familiar with the plant and processes. An 'over the wall' approach to HVM products will most definitely not be applicable.

A secondary barrier is that of capital. With some plant costing over £500K the decision to make the break from an R&D facility to a full blown manufacturing factory is a big decision for a small company to make. Greater tax breaks on capital investment would significantly help this process.

7.8 How does Silicon Valley support advanced manufacturing people?

The following passage encapsulates how important "advanced manufacturing" remains in the Silicon Valley cluster:

"Manufacturing remains a dominant industry in Silicon Valley. The stunning growth of semiconductor manufacturers and suppliers like Intel, AMD, National Semiconductor, Applied Materials have caused workforce shortages that can only be met locally if the education programs are relevant to the demands of advancing rigor and technology. The industry is meeting global competition by employing high-tech, high-value added processes in its local design and manufacturing operations, while moving low-skill, low-wage work offshore. Because of these global changes, tremendous opportunities exist for young people with the sophisticated computer-aided design and manufacturing skills needed to meet industry needs. Simply put, Silicon Valley has labour force needs and wants to expand opportunities for high-skill, high-wage employment for its youth."

We notice in the above, something not often mentioned in the UK: "high wage". There is a keen understanding of the market dynamics of labour in the text. They know that making sure the skilled workforce is happy financially is an important message to get over. And people should be rewarded for taking the risk of working in SME

innovation HVMs, as well as be compensated in many cases for the cost of living near world class Universities in many cases in the South East's case.

The South Eastern region doesn't have the same problem of large, successful manufacturers rapidly depleting workforces, but the issues of higher cost and the deferring of low cost, high volume commodity manufacturing offshore is the same of both regions. How is Silicon Valley addressing these issues? Silicon Valley has an organisation called: Workforce Silicon Valley: WSV is organized around six learning collaboratives (organizational structures designed to foster collaboration between industry, high schools, and higher education around the common goal of preparing students for high-skill, high wage work), which represent high-growth, high-employment industry clusters. They unite industry, high schools, and higher education around the common goal of preparing students.

The South East might have a number of "Learning Collaboratives" to work with people and organisations with an interest in economic growth through building bigger businesses, retaining and nurturing high-value manufacturing skills, and understanding strengths. Benefits of such initiatives according to WSV are:

For Business

- Facilitate networking between industry partners, high school and higher education
- Strengthen educational partnerships with industry
- Enhance opportunities for student and faculty internships at local businesses and organizations
- Identify industry workforce needs and skill levels for integration into project-based learning at schools.

For Educators

- Facilitate networking between high school and higher education, and industry partners
- Allow partners to share curriculum, career pathway development plans, and project-based learning units
- Assist partners in developing the articulation process between high schools and community colleges
- Promote student educational plans among high schools and community colleges for workforce preparedness
- Create partnerships for grant-writing opportunities

If the above is in place, then this will instil more confidence in investors in a given region.
Given the political and informational separation of the counties and economic clusters in the region, there may need to be more than one collaborative here in the South East England. In the various subregions, these might be brought under the umbrella of "Workforce HVM South East: Nano or Aero or Bio or Instruments or Marine"… however, CIR Ltd also recommends direct interaction and involvement of private companies with the communities and schools of the "workforces", as was done by entrepreneurs both before and since the introduction of welfare state systems of allocation of public money, though in different levels of labour costs and competitiveness. UK

engineering companies used to provide many services for whole communities, even houses and hospitals! This may now be out of reach given the nature (speed and uncertainty) of global markets. According to one of CIR's managing director interviewees, as late as the 1960s and 1970s, those in schools in the region would be well aware of the activities of many private companies who would engage with them well before they left school.

8. OVERVIEW OF STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

8.1 South East England Generic Value Proposition

The generic value of HVM within the SE is undoubtedly the strong link to the scientific community in terms of academia and both government and private funded research establishments. The very existence of these centres of excellence is perceived to give the following benefits:

- Access to world leading scientific opinion regularly tested by symposia, conferences, Doctoral dissertations etc
- A recruitment pool of highly qualified staff with applicable PhD and degree qualification who already live in the area.
- Thriving science parks and innovation initiatives supporting technology and HVM related business.
- Spin out businesses from the universities giving rise to sectoral clusters e.g. photonics and fibre optics around Southampton, biotech around Oxford.

With nearly 25% of the UK's HVM's in the field of metrology, medical equipment and pharmaceuticals resident in a region that in turn has an annual GDP of £140B i.e. larger than a number of countries including Denmark, Norway and Ireland, the SE can indeed be considered 'world class'. This economic strength makes the SE an ideal centre for the ongoing development of High Value Manufacturing that is in turn leading the renaissance of the UK as a manufacturing nation.

8.2 South Eastern Region strengths-weaknesses-opportunities-threats analysis (SWOT)

In all aspects of SWOT analysis it is difficult to scale or graduate the relative features of strength against a weakness. The effect on both is time dependent with ability to counteract or influence depending on timing and reaction to the event. Time and no response can quickly turn a weakness into a threat and ultimately a failure. Equally, opportunities and threats depend almost entirely on the pro-activity or reaction to them with some companies planning to offset threat potential at the earliest indication of that threat. Finally and most importantly when considering the SWOT, one must consider the 'British' effect of self- effacement with interviewees perhaps understating their personal strengths whilst all too eager to elaborate on the negative aspects of threats and weakness. For this reason if no other, the threats and weaknesses certainly numerically outnumber the strengths and opportunities but should not necessarily be treated in any form as outweighing.

STRENGTHS

The region's individual strengths are covered below but generically the strength of the SE HVM as indicated above is at the point where recent science adds value to the recent product. Products are then created by above average R&D expenditure and utilising new lower volume manufacturing processes. It is important that manufacturers form close working relationships with the universities, or technology transfer companies. Isis Innovation in Oxford & the equivalent organisation at Imperial College have good models and in particular have good program managers. The Higher Education Innovation Fund also provides good people who talk to companies that have not previously

interacted with universities to initiate meetings between the appropriate people from the universities and HM's, often working with SME's or smaller establishments.

- The regional strength is about identifying what real technology needs exist and marrying them with a route to market. It is not about incremental cost reduction in existing manufacturing process, (which is perhaps not the strong point of the universities) – but spotting opportunities and providing the solution.
- Access to highly trained world-renowned experts with an established infrastructure to support them.
- Management flexibility particularly within the smaller companies giving speed to decision making and time to market
- Products are at the 'high end'/emergent section of the technology curve warranting high prices thus to a certain extent offsetting UK costs.
- Access to a broad range of advanced processes in the micro and nano technology field with capacity available for low volume use.
- Access to venture capital for small start up technology companies together with the entrepreneurial skills to take the company through to Initial Public Offering (IPO).
- A strong RDA that is driving to achieve a Knowledge Based economy which is the essence of HVM.

WEAKNESSES

- Transport and road communication was felt to be a weakness, particularly around the large conurbations of London and Oxford.
- An ageing population of skilled people who can in turn train incoming technicians. This weakness will rapidly turn into a threat if we cannot make HVM attractive enough for young people to enter prior to the retirement of the current work force.
- The ability to recruit was a frequently mentioned aspect. The ease with which companies can recruit staff varies considerably within the HVM sector. While some companies are flooded with applicants, others find it very difficult to find appropriate staff. The general feeling amongst most company directors was that PhD students were readily available, but that "getting appropriately skilled management staff is difficult, as is getting, experienced, commercially savvy PhD students". Others felt that there were adequate numbers of appropriately skilled management staff, commenting for example, 'PhD students are not so difficult to recruit, but certainly, engineers and technicians who've got experience and who really know what they're doing; that is a problem. Getting management staff is less of a problem"

- In general there was a concern that UK was not producing enough science graduates, and that good graduates were attracted by the positive image and high salaries available in the service sector, particularly the City whereas Manufacturing suffers from a poor image, especially amongst the young.

OPPORTUNITIES

- There are enormous opportunities for cluster co-operation within the SE both within the actual technology sense and the support structures. One very positive suggestion was:
- "Companies have not appreciated the importance of in-house training and expect the government to do it, but the government is inefficient. Companies, or perhaps cluster of companies, have got to run their own colleges to bring people up to speed in terms of skills and abilities. It is not hard, it just needs organising. The idea that companies can outsource education to others who for all sorts of social reasons are producing a fairly mixed bag of results, will not work."
- There is a climate of 'entrepreneurship' in the region with a typical comment being:
- "There are more and more start-ups. There are seminars around Oxford on how to start up your own company. The DTI has become a lot more visible and friendly, and a lot less bureaucratic than it used to be. There is a lot more encouragement for people to do their own thing. The UK is becoming more entrepreneurial, like the USA. Amazingly, also in Japan, there is now no such thing as a job for life and there are start-ups in Japan – this is something that is unprecedented there".
- Investment capability was variously seen as both an opportunity i.e access was available when needed and as a threat when that investment had to pay back. Respondent comments were varied. At one end of the spectrum:

- "In all the businesses I have been part of, I've been staggered by how knowledgeable and patient investors are."

- "There's a history in the UK of investment for long run return, from fuel cells to technology businesses. The financial markets in the UK are the most sophisticated in the world. Investors understand long run rewards. There is adequate long-run risk capital. What's forgotten is that if an investor makes a long run investment, then because of the risk involved and because the investment will not be realised for a significant time, then there needs to be a commensurate level of reward. If you want someone to invest for a long period, they will need a risk premium; they need a big pay back."

At the other:

- " I think with many small UK companies, where they might have got the capital from entrepreneurs, the pressure for rapid returns is great. These people who've put their money in, as soon as they see returns coming in, want to grab it back. There is no sense of a stable long- term underpinning. This is a very big problem. If too much of the profit is taken out too early, then there's nothing left to plough back into R&D. This can lead to one-hit-wonders, rather than sustained growth."

- "The investors seldom seem to appreciate the very hard work that is needed in the high tech sector. They all seem to want a return on their investment on time-scales that are too short to create lasting value and sustained growth."

- "The investors seldom seem to appreciate the very hard work that is needed in the high tech sector. They all seem to want a return on their investment on time-scales that are too short to create lasting value and sustained growth".

THREATS

- A significant number of the respondents felt the greatest external threat to be that of the emergent economies in Asia, Eastern Europe and South America. Typical comments included the following:
- "China, without a doubt, not only cheap, but the science base is escalating at a rate we've never seen before. Their universities are well equipped, the people coming out of universities are well trained and there are huge numbers of them; they are also very commercially orientated".

- "10 years ago we dismissed work in China and India as 3rd world in standard. This has now changed completely; research coming out of these areas is world class. It sits alongside the best of research from the UK, US and Japan and this is confirmed by peer review and journals. When they get their patent situation sorted, they will pose an even greater threat".

- "There were more engineers qualified with Firsts in India in engineering in 2004 than there were in the whole of Europe. This is a big worry; these are not people who are going to be satisfied to work in call centres. There's a huge appetite for competitors in emerging economies to develop high value technologies, not just low value manufacturing."

- This threat was felt to be compounded when combined with another 'British' effect of playing the game to the letter of the rules. Whilst not advocating unilateral breach of rule sets there is an undoubted perception that the 'playing field is not level'.

- "The other threat which might arise is the un-competitive nature that manufacturing companies will have if we embrace the Kyoto protocol and European standards on the working week/working practice. This is an enormous threat –"an enemy within" type argument".

- In Nano-technology, "Legislative approval is a key. Nano-technology deals with very small particles, ten to one hundred Nanometers in diameter. The concern that Health and Safety have is that nobody knows how these particles will behave. If the UK/EU were to ban work with nanoparticles, that would be terminal."

- Since by the very nature of the business HVM's are more likely to be SME's than conglomerates, there is a fear that as the UK's industrial economy for higher volume traditional goods reduces, larger companies become predatory and attack the HVM niches. This was articulated in statements such as:

- "Larger companies are a threat to our IPR if they use our IP, either legitimately or illegitimately. If they move into our product, then we might not be able to fight the legal battle."

- "One of the main threats is from potentially large OEM companies who are interested in our technology and think that they can do it for themselves, in-house."

- "There's always the threat of target customer companies going into lock-down mode so they don't adopt anything new."

- There is a wide ranging and generic threat with regards to availability of educated, skilled people with experience in the commercial and technical aspects of HVM. One respondent expressed it as:

- "the ability to replace the loss of key individuals who have acquired skills and who are now key to operations; gaining access to people that are skilled in technology; inculcating commercial acumen in core technical staff; and a lack of availability of skilled technicians, particularly those willing to work shifts".

- "It is not only a shortage of 'front line' staff but also those who have skills in introducing new management information systems and the learning curve associated with it coupled with operational management experienced in changing expenditure on R&D/manufacturing and the changing personnel mix associated with it. In short people who can manage structural change associated with rapid growth; equipment obsolescence; and a lack of capital".

- Others felt that the educational system was not producing enough graduates who were proficient in both science and foreign languages.

- Time and the rate of change of technology and market is both a threat and an opportunity for those who can react quickly. The threat aspects were typified by remarks such as:

- "The challenge is to develop the technology fast enough so it's range of application is wide enough to make it a major technology."

- "We are constantly running a race to keep ahead of lower costs manufacturers. Our business model is to invent new products, then to generate wealth for a few years. This is a key challenge."

- "The major threat is alternative technology, and possibly in the future, competition from other companies who move into the same sort of things that we do."

8.3 Evaluation of key success factors

The key success factors for any business are innovation and entrepreneurship coupled with sound management and good people giving good access to markets. In general, not withstanding the negative impressions from the weakness and threat discussion above, all these features are present and thriving in the South East.

INNOVATION

The South East has a number of world class universities working in the forefront of enabling technologies such as nano and micro technology, photonics, pharmaceuticals, semi conductors, lasers technology etc that have attracted and retained world class scientists and students. With relatively easy access to the London finance community INVESTMENT was not seen as an inhibit to INNOVATION.

ENTREPRENEURSHIP

From both private and sponsored sources and academia and industry there have been entrepreneurs willing and able to spin out or simply start and grow HVM companies. Various DTI, RDA and private sector initiatives that have enabled the early life funding to be provided have supported them in this.

SOUND MANAGEMENT

Whilst it is not exactly 'Silicon Valley', the coastal and rural environment of the South East together with historic cities makes the region a desirable area in which to live. In this acceptable environment good managers have either come or been 'grown' and above all else have stayed. Universities giving good courses in management up to MBA levels have again supported them in this.

GOOD PEOPLE

The South East with its diverse cultural and natural environment provides an attractive location for managers, engineers and staff to live, work and raise their families. An indigenous population that has seen traditional industries slowly decline rather than collapse has proved itself willing to retrain, learn and adapt to new ways.

ACCESS TO MARKETS

Whilst road infrastructure is frequently criticised, in the bigger picture this is probably at frustration level rather than a total show stopper. The reality is that with two of the UK's largest airports and easy access to the Channel Tunnel and coastal ports, the area is uniquely positioned to move its products to market.

9. RECOMMENDATIONS

Background

In making recommendations for a subject as complex as HVM in a region as diverse as the SE it is always possible that initiatives may already be underway but not immediately clear to CIR or to the interviewee making the observation that prompted the recommendation. It is evident that a number of initiatives are under discussion in both the DTI and the RDA and it is possible that the recommendations below have already been recognised.

Within the context of this report it has been assumed that the Manufacturing industry has 'done lean to the point of emaciation' and that the future strategies for Manufacturing, both conventional and HVM, must move on from internal navel gazing efficiency improvements and recognise that in a truly global market place HVM has an economic scale that only national strategies can address. In saying this it does not relieve HVM's of striving for world class capability, that is the given to stay in the race!

If the UK is to have a long- term sustainable High Value Manufacturing industry it is vital that actions are taken now! The science and technology is at a turning point that if grasped now will put the UK in pole position. That turning point or watershed is the adoption of new technologies such as micro/nano technology in all its various guises. 'Nano' is an all-embracing and enabling technology that has applications in all HVM products. If the UK adopted a genuine cross party, cross agency, cross industry strategy to ensure that the next generation of ALL designs incorporated the benefits of nano technology, it will lead the world.

Whilst there is investment money available for short to medium term projects the real issue is the funding of the long term (7 –15 years) projects necessary to bring these technologies to market. In general, private funding in the UK just will not wait that long for returns.

The recommendations below come about as the result of the interview process carried out by CIR together with issues raised at the Harwell CIR HVM SE conference and thus in the main represent the views of HVM companies in the South East. They are in no particular order of significance and are inter-related to the extent that all need to be planned if not embarked upon, simultaneously.

9.1 HVM SE recommendations.

Facilities and Services

Start up companies and Universities should consciously create 'Joint Venture' clusters of similar start ups and research projects to share knowledge and the 'above the line' costs of say marketing, compliance, sales channel etc to avoid dissipation of efforts and money. These 'JV's' could be initiated by the RDA's or bodies similar to ISIS or i10 and need to extend their activities to that of skilled 'intermediaries' to work with HVM's to ensure that both

inward and outward licensing, together with patent registration, become easily understood, are beneficial to the UK strategy and are more easily affordable. This could become one of the front office 'cluster' services referred to above. These intermediaries should also seek to 'introduce' HVM's and research project managers to assist wider take up of opportunities. Several respondents ventured the opinion that there were 'more opportunities than HVM's to take them up'.

This model is a slight extension to the business plan and structure for the Council for the Central Laboratory of the Research Councils (CCLRC). The CCLRC has three facilities, the Rutherford Appleton Laboratory in Oxfordshire, the Daresbury Laboratory in Cheshire and the Chilbolton Observatory in Hampshire. With two of these based in the SE it represents an ideal opportunity for the SE to extend the model and strive for world leadership by introducing satellite facilities in which high cost capital plant and expensive services are available to many smaller start up enterprises that might otherwise not be able to sustain the investment needed to remain at the leading edge.

Since the establishment of such centres is the subject of ultra high cost investment, such facilities should be the subject of strategic partnerships between RDA's and not be the cause of envy, friction or internal competition. Energy and finance should be used against international competition, not dissipated through regional competition.

Strategy

There must be a national strategy for enabling technologies such as nano technology that brings together all the body of knowledge and seeks to disseminate this information across industry sectors. In the mean time, the SE RDA needs to proceed with the Regional Nano and Microtechnology Network plan and become the pilot for UK best practice. This could and should be along the lines of 'Facilities and Services' described above

These enabling technologies need to produce 'road maps' of where they are going and what other industries need to become involved. A technical elite knowing all is inadequate, there is a need for buy in from all aspects of HVM and to achieve this it is essential that knowledge is adequately disseminated. It is not sufficient to have these road maps published in learned journals, all agencies facing industry such as Business Link, MAS etc need to be proactively discussing and nurturing them topic with HVM management.

The current Knowledge Transfer Partnerships go some way towards this goal but they need to be extended, developed and more actively publicised.

Awareness

A national and regional awareness campaign is required for the stimulation of science and maths as entry to HVM that in turn highlights the attractive opportunities for the future of employment in HVM. As Professor Gregory said at the conclusion of the Harwell conference:

"It is a pity more people on the street cannot see this (the conference) and we must try to get these messages of what has been said today out to the person on the proverbial Clapham Omnibus, and indeed that is what the Manufacturing Forum is also working on". As an interviewee put it, "We need to reach out to the young people of today and show them the attractiveness of working in modern HVM as opposed to their 'smoke stack' view of life". Whilst this aspect is being addressed through the national Manufacturing Forum, the SE cannot wait. Local initiatives must be addressed now to redress a negative image and gain the interest of today's school pupils that will ensure they want to enter an HVM career that will excite and stimulate them throughout their life.

Education, training and apprenticeships

There has been much press coverage of late regarding the parlous state of pupils taking maths and science, with particular concern being expressed over Physics. Under banner headlines of 'Physics could die in state schools due to lack of teachers', a report by Dr Pamela Robinson of Buckingham University found that 'over the past 15 years, the number of pupils taking physics at A-level had fallen by 38%, chiefly because most of those teaching it did not know enough to instruct, let alone enthuse, their pupils.' The Department of Education said it is working towards reversing this trend including offering trainee physics teachers' bursaries and 'golden hellos'. This will clearly take time to work through and must be part of an integrated plan including the awareness campaigns to make young people want to come into science and hence HVM. Clearly, any SE activity possible within the school system to promote this should be pushed forward with all vigour.

In association with this drive towards physics and maths, there is a need to establish technical colleges to train Technicians who leave school pre A-level and wish to enter directly into industry and not university. This clearly falls under the remit of the Regional Skills Academies but they are not moving fats enough. The DTI states that 3 of these are at the business planning stage but this seems like paralysis by analysis. The need is clear, the objectives are clear and the consequences of failure are clear. In China, India etc these would be set up immediately, why does the UK have to take so long to implement the blindingly obvious?

Industry too must play its part by large scale take up of the modern apprenticeship scheme to employ these trainee technicians. Many companies believe this is a cost burden and are reluctant to do so therefore there is perhaps a case for the stimulation of apprenticeships and training schemes through some form of Tax levy redeemable by those companies who invest in training. This approach was used in the 1960's and had a clear and immediate effect on the number of young people in training. Sadly that initiative was stopped and the technicians trained under them are now fast approaching retirement. Actions must be taken now before that level of training potential is put beyond availability. We have a demographic issue in terms of age of staff in current employment that should be cause for major concern. Whilst the ability to levy tax is beyond the RDA, it must use its' powers of persuausion to promote such an idea.

It is recognised that the equipment required for training is a costly investment so 'cluster' training schools should be set up to link with the apprenticeship and academic technical training schemes. These should be allied to or part of the facilities and services model discussed above.

All of the above are aimed at the absolute need to increase the technician engineering pool but this needs to be taken further. As Professor Colin Whitehouse succinctly pronounced at the conference, 'it is an inter-disciplinary world we are coming to' therefore we need to breed more inter-discipline people; scientist who understand marketing, engineers who can speak foreign languages etc. The education of all people involved in HVM must go beyond those core scientific skills and knowledge and provide continuous educational opportunities to extend beyond primary disciplines.

Access to funding

The government needs to rationalise the current panoply of bodies addressing Science and Manufacturing, These include the DTI, RDA's, University Councils, Research Councils, Professional Institutions, Trade Associations etc. They have duplication of boards and staff collecting data that could represent a cost saving in terms of administration that could be reduced and the money used for actual grants to industry. The system needs to be streamlined, focused and strategically re-directed with the money saved re-invested in Science and HVM. The nation needs to adopt the role 'venture capitalist' for emergent technology companies.

The 'Encouraging Intelligent Public Procurement' initiative needs to step up a gear with the strategic impact of the decision being taken into account on an equal or greater footing than the economic circumstances. This is particularly so in Medicine and Defence spending that have historically been great catalysts of technical innovation. This is exactly the strategy propounded in the American Manufacturing strategy.

To encourage private funding participation there need to be established some form of tax benefits for those people willing to invest in long term investment projects and simplification of the capital allowance schemes. There should be a positive bottom line incentive for all companies to invest in technology, capital and long term projects. Again it is recognised that such initiatives are beyond the authority of the RDA but the lobbying power of the largest RDA within the UK must be placed behind such initiatives.

Infrastructure

There is an absolute and immediate need for affordable housing and a resolution of the transport gridlock that is not simply taxing vehicles off the roads. The roads need to be improved as part of a national long tern transport policy. Looking at the German solution, long distance road lorries are taken to their destination on flat bed trains and only travel on roads for the last part of their journey. Expensive to implement? Yes, but the removal of HGV's from overburdened trunk roads will go a long way to alleviating what is a real and increasing frustration.

European Legislation

The RDA must influence the Government to think through very carefully the adoption of the Integrated Pollution Prevention and Control (IPPC) Directive and associated schemes to make sure that adoption does not disadvantage UK industry. Opinions on the subject do vary but simply put, regulatory burden unilaterally assumed by UK industry must not be allowed to render HVM non-competitive.

The above recommendations, both specific and general, have been expressed during the interview and conference process and summarise a broad swathe of opinion. They should be evaluated by SEEDA and if possible embodied in the SE Regional Economic Development plan which should then become the catalyst for stimulating the growth of HVM.

9. 2. The need for IPR and process 'recipe' retention

The current UK manufacturing strategies are based on the following political premises:

- Energy costs featuring oil at circa $60 per barrel
- The Suez and Panama canals remain open
- America (and others) maintain an open market free trade stance.

If any or all of the following 'Armageddon' events were to happen e.g

- In the event that, say, oil went to $150 per barrel
- Either or both of the canals were blocked for a prolonged period of time
- Barriers to free trade were erected by any of the major nations
- The present minor conflicts that exist around the world in very sensitive areas were to escalate with major blocs supporting opposing sides then the mass importation of goods of any description from extended global supply lines would be either stopped or subject to re-evaluation in the light of soaring logistic costs. A very sobering thought!

It is routine for all companies to have a Disaster Recovery Plan for localised events, fire, flood bombs etc. Eventualities on the scale above require National Manufacturing Disaster Recovery Plan of epic proportions. In order for this to be effective it is vital that we maintain the 'recipe' for all production processes, even if only at pilot scale, and arguably (although in the event of free trade barriers perhaps not so) ownership of the IPR to continue manufacturing. We must NOT allow HVM to go the way of the Garment industry where, during the recent hiatus regarding import quotas, the Chairman of the Garment Manufacturers Trade Federation said on radio words to the effect that the UK no longer had the skills and knowledge, let alone the capacity, to fill the vacuum in the supply chain.

Whilst the above is the blackest of situations, at the national procurement level it is essential that investment in technology and new products is made in recognition of the possibility that the UK may have to produce the items on shore under certain circumstances. The person who recovers form a catastrophe the fastest is the one who

planned for it! Without wishing to look too much in to the past or to dramatise the future, it is worth reflecting that one of the most successful 'lean manufacturing lines' ever introduced was borne out of a war time emergency manufacturing programme making Spitfires in WW2!

10. CONCLUSIONS

With such a high proportion of the UK HVM's located in the region, the South East is clearly in prime position to lead the UK in the key sector and in some cases 'clusters' of:

- Nanotechnology and materials
- Bioscience and pharmaceuticals
- Motorsport and automotive
- Aerospace and defence
- Instruments, medical, electronic and optical including photonics
- Information and Communications Technology

One of the key reasons for the South East in achieving this has been the close co-operation between the Universities and Industry with several successful companies being the result of 'spin outs' from the excellent universities situated throughout the South East.

Whilst the DTI and the RDA have made good progress in achieving and sponsoring the links between science and industry, it needs to be lifted up a gear and good thoughts put into positive actions speedily. Whereas the emergent economies of China, India etc were playing 'catch up', it is sad but true to say that is no longer the case. They and many other countries have surpassed the UK in volume manufacturing and are accelerating their passage along the food chain into the Research and Development necessary for High Value Manufacturing; their investments happen rapidly, planning permissions are immediate and not retarded by 'democracy' and their investment in education is set for the long term.

The five SEEDA key strategy elements comprising:

- Support for the Manufacturing Advisory Service
- Innovation Advisory Service
- Regional Skills and Productivity Alliance
- Affordable start up assistance
- Inward and Export trade assistance

These go a long way to help the HVM initiative but, as with 'Oliver Twist', there must be more. It is understood by all involved that the UK government and the RDA do not have bottomless pots of money but it is essential that the Regional Economic Strategy puts HVM and the infrastructure to support it at the heart of all investment projects. This will clearly entail hard choices with many other equally deserving causes demanding what they perceive as their 'fair share' of money available. This is entirely understandable but, as part of the publicity process needed to

raise the public perception of HVM, the populous as a whole must understand that fair shares of a falling revenue stream will be far worse than the situation they have today. Time is of the essence and unless the good plans laid in the recent years are implemented now with the education, transport and capital investment necessary to outstrip the international competition, then High Value Manufacturing will follow High Volume Manufacturing with the South East and the UK slipping from a world leader to a poor consumer of others goods and services.

We have the ideas and in most cases the people to start them off, it is the extension of research into a sustainable development model with all the potential pitfalls in terms of Intellectual Property when transitioning from High Value indigenous supply lines to offshore High Volume supply that is needed. The RDA must encourage and stimulate the entrepreneurs emerging in today's younger generation of scientists and not drive them disillusioned to seek foreign employment because of high costs of living and raising families in the South East.

Now is an opportunity for government, the DTI and the RDA's to give strong leadership in determining the place for Britain in the 21st century. It probably does not require very much 'new money' just the re-distribution of the existing funding that disappears into the beurocratic morass that exists today. The agencies have moved to simplify and reduce but more needs to be done with the burden not only falling on the DTI and the RDA's. The venerable 'Institutions' and Trade Associations also need to reduce their numbers, increase their focus and become catalysts for change as HVM pushes forward. To do so will mean that a large number of people may have to re-evaluate their personal and political positions and put the national and regional requirement to the fore. If the focus and dedication is put to the cause of HVM then the current growth rate in the South East will improve from its' current 3% level to that approaching where the 'emergent' nations will fall to, i.e. around 5 % long term sustainable growth.

There is no alternative, the 'Tiger and the Elephant' of China and India are en route to this goal, America is awaking from its' industrial slumber, Russia has aspirations to resume its' world leading position and South America has untapped natural resources and hungry populations.

The only way ahead is a dynamic and inspired partnership between government (national and local), academia, industry and the investment sector. Bringing these together within a national and Regional Economic Strategy focused on success in High Value Manufacturing is the lasting legacy that this generation of leaders must leave tomorrows UK citizens.

Acknowledgements

This summary is part of a report commissioned by SEEDA in HVM in its region, and also forms the foundations of work that has been and is being continued by CIR on the Global HVM Report 2006 alluded to above.

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Announcements

CIR will soon announce the HVM Series plan for 2006 and hopes to expand the number of events both in the South East and neighbouring regions in 2006.

CIR will set up a membership of HVM for all those who have voted with their feet and attended an HVM event since 2002.

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