



## **High Value Manufacturing in Greater Cambridge**

### **Skills Gaps and Solutions**

A Report for the GCP

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On the Manufacturing Sector in Greater Cambridge

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# DRAFT High Value Manufacturing in Greater Cambridge

## Skills Gaps and Solutions

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## **Executive Summary**

This report looks at the innovative edge of a sector, rather than the sector as a whole. High value manufacturing deliberately suggests a separateness from low value production. This narrowing of focus has consequences for the kinds of skills gap likely to be reported – and the solutions likely to be offered. So this report differs in several important ways from the work undertaken for the construction sector, however it also looks at the full range of skills required by the sector.

## **Manufacturing Definition**

The Institute for Manufacturing offer the following definition of manufacturing:

The entire process that takes a product from initial concept to its eventual use by customers, including design, production, marketing, distribution, service and disposal. (IfM – Making the Most of Production)

## **What is High Value Manufacturing?**

High Value Manufacturing might be defined as creating value (revenues over costs, long term profitability, perceived 'social' value) from production and/or services which relate to an original manufacturing process.

## **Manufacturing and “UK PLC”**

The aspiration for UK manufacturers, is “to exercise comparative advantage on the basis of high levels of skills or knowledge” (New Industry New Jobs - April 2009 P10). The challenge is to retain and grow a high value manufacturing base and at the same time accept that in a global marketplace, low value production is likely to (re)locate to low cost regions rather than struggle to compete in countries where labour costs (among other cost factors) are high.

High value manufacturing therefore, needs to be nurtured.

## **Policy Context**

Despite the relative decline of manufacturing in the UK compared to other countries, the Technology Strategy Board stresses that manufacturing is still a vital part of the UK economy and manufacturing output has actually grown over the last 30 years, as has productivity. Employment in the sector however, has shrunk as the industry's efficiency has improved. Looking at individual sub-sectors a picture of mixed fortunes emerges. The East of England engineering workforce represents about 9% of the UK engineering economy.

## **Skills Arena**

One way of analysing skills needs in the sector is to think of a continuum of needs involving core skills for individuals; process skills for productivity improvements; and strategic skills for leadership and direction. Clearly, there are cross-overs between these categories but it helps to illustrate the range of skills required in high value manufacturing. In terms of strategy, management decision making skills are vital to the future health of the manufacturing industry, and of particular importance to the continued development of a high value manufacturing base in the UK. Universities

can play a key role in companies strategic development and fostering innovation especially through Technology Transfer Offices; incubator units, the development of science parks and setting up knowledge transfer partnerships. One of the most important decisions facing management relates to the location of production. There is a danger that without clear strategic thinking, companies won't take an inclusive view of the importance of production to their performance. Outsourcing production capability therefore has long term implications for the company's knowledge and asset base.

Further education (FE) has a key role to play in skills development of the workforce. FE can play an important role not simply training up new recruits for the industry but also working with companies to keep up to date with latest processes and technologies and provide support for the development of an in-house company training programme. This has the advantage of building sustainable capacity for the company at the same time ensuring that training content is wholly related to the company's needs. However, in the post-recession environment where colleges are being encouraged to charge for training services and 'engage with employers' on a more commercial footing, there is a key requirement for further education, notwithstanding its emphasis on delivering government funded work, to move into this more competitive field. As pointed out in earlier reports, the FE sector has excellent resources and infrastructure which the local business community would be pleased to benefit from. All that is missing is the commitment to keep up to date with industry development and encourage staff to develop 'just in time' subject specialisms for which there will be industry demand.

The Sector Skills Council for Science, Engineering & Manufacturing Technologies, (SEMTA) reports a range of skills gaps in East of England engineering and manufacturing companies. These can be split into technical and engineering skills and generic skills.

On technical and engineering skills, 64% of companies in the East of England reported skills gaps in the following areas:

- Welding skills - metals sector.
- CNC machine operation and tool setting - mechanical equipment.
- Computer Aided Design (CAD) and general engineering skills – electrical equipment and electronics.
- Materials Requirement Planning (MRP11) - automotive sector.
- Materials Requirement Planning (MRP11), tool setting, mechanical engineering
- Carpentry/woodwork –
- Other transport equipment.

On generic skills, SEMTA found staff lacked core personal skills; management skills; ICT skills and marketing/selling skills.

Interestingly there is no mention here of business improvement techniques, one of the most successful NVQs to be developed for the sector in the last decade. This

suggests that there is a more intricate relationship between what a company thinks it needs and what it could benefit from in terms of training programmes.

### **Greater Cambridge Manufacturing /Engineering Profile**

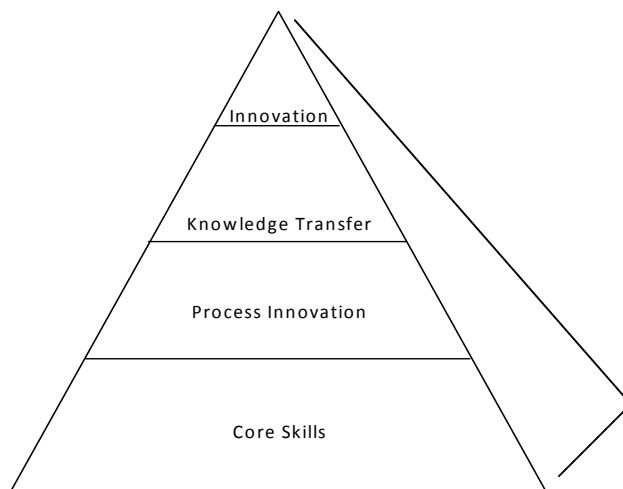
There were around 51,000 people working in the manufacturing sector in the Greater Cambridge area in 2008. The number of VAT registered "Production" businesses in the GCP area is 2,975 which is just under 20% of the total number in the East of England. There are several manufacturing 'hotspots' in Greater Cambridge, where manufacturing/engineering companies are concentrated in industrial parks. These include St. Neots; Huntingdon; Haverhill; Chatteris; Royston and Cambridge Science Park. Other significant locations include Melbourne to the south-west of Cambridge and Bury St. Edmunds to the east.

There have been several manufacturing clubs emerging in the Greater Cambridge area over the last decade, and some continue to thrive. The St. Neots Manufacturing Club for example continues to grow and attract attention from engineering and manufacturing businesses across the Greater Cambridge area.

In terms of provision, four universities and four FE colleges are considered in the report; in terms of full time programmes, there is a wide range of courses relevant to high value manufacturing and among HE establishments, there is evidence of employer engagement through bespoke and scheduled short course provision, as well as industry activity relating to innovation and knowledge transfer. At further education level, there is also evidence of employer engagement outside of government programmes like Train to Gain; most colleges offer a range of part-time technical courses for industry and some have the capability to deliver NVQs in business improvement techniques. There are several Group Training Associations in the region and one operating in the GCP area (WATA), who have a strong portfolio of technical short courses. Also in the sub-region is the Welding Institute (TWI) at Granta Park, an internationally renowned centre for welding techniques and research into new processes; and the Institution of Engineering and Technology (IET) which is based in Stevenage has an international reputation, and like the Welding Institute it has members all around the world.

The Manufacturing Advisory Service in the East of England (MAS East) is based at the PA Consulting Technology Centre in Melbourne, Cambridgeshire. PA Consulting currently has the contract for delivering the MAS service in the East of England. MAS is a dedicated source of support to engineering, manufacturing and technology businesses within the region.

## The High Value Manufacturing Skills Economy



The report suggests a manufacturing skills economy “pyramid”, where different skills considerations for a company, are separated out into: a **pure innovation** requirement at the top – here we would expect to find universities working alongside a company (perhaps itself a university spinout company), developing innovative solutions for tomorrow’s marketplace. The second segment of the pyramid refers to the kind of **knowledge transfer** activity which brings about HE and SME collaboration. Often this will be less about pure innovation and more about transferring good practice and advice, solving specific business problems and providing graduate placements to help deliver project based solutions. These skills will usually be provided at higher education level. The third segment of the pyramid is not about pure innovation or even knowledge transfer; rather, it refers to business improvement through **process ‘innovation’** – that is, implementing new processes in a particular way which result in fewer errors, less wastage and greater efficiency. These innovation processes may be new to the company but they are likely to have been tried and tested in other companies. They may even be part of an OEM’s (Original Equipment Manufacturer) service level agreement. These skills can be crucial to business profitability – many colleges now deliver the Business Improvements Techniques courses (Levels 2,3 and 4) but companies can work in partnership with a college to produce a bespoke solution. This is what has happened at Group Lotus, with impressive results for both the company and the college. The final segment of the pyramid houses probably the largest area of skills requirements. It refers to all the **individual skills gaps** in the workforce. Here we will find gaps in functional skills and management skills as well as technical skills such as welding, CNC (computer numerical control) or CAD (computer aided design).

### Company Visits –

We visited three companies to gain an understanding of different examples of High Value Manufacturing. The Herbert Group in Haverhill, specialise in bespoke solutions in the fields of weighing, labelling and in store operations. The company can be categorised as a high value manufacturer operating at the service end of the HVM continuum. As such, the Herbert Group are more involved in redesigning and installing other manufacturers equipment to the specifications of a specific client, rather than high volume manufacturing. Marshall Aerospace (MA), in Cambridge is

the largest high value manufacturer in the Greater Cambridge area. MA is an excellent example of a high value manufacturer – with its range of capabilities from original production to lifetime service including: Design Engineering; Manufacturing; Modification & Maintenance; Product Support; Test Services; AeroAcademy; Engineering Consultancy; Continuing Airworthiness Management; and International Design. Through differentiation from competitors (as seen above in its diverse range of capabilities), the company is able to gain market share and profitability – providing a sustainable base for the future. Stainless Metalcraft are based in Chatteris. Their 12 acre site provides capacity for greater development and a new Fenland Engineering Skills Centre will be housed there from Spring 2010. The centre will serve local schools and the local community; apprentices; the existing workforces of Stainless Metalcraft and companies from the surrounding area. Whilst it may not always be able to compete globally on price when it comes to high volume standardised manufacturing, Stainless Metalcraft’s ability to offer precision prototyping; and rapid response make it a valuable partner for OEMs especially at ‘pre-production’ and ‘pre-outsourcing’ stages of product development. Moreover, Stainless Metalcraft have a track record in producing high quality results.

### **Conclusions**

Skills gaps exist among high value manufacturing companies in the Greater Cambridge area. These can be split into strategic, process and core skills. Skills gaps can be short term or ‘endemic’ in a company. In discussing HVM skills needs, it is important that we cover the full range of gaps at strategic, process and core skills levels and covering both pure innovation and process innovation. Once we are clear about this continuum of need, it is possible to offer some tentative solutions:

- The first point to make is that it is vital to look beyond 14 –19 year old provision and develop skills initiatives which address the needs of the existing workforce.
- The second point is about collaboration, especially between HE and SMEs but also between FE, the sector skills council(s) and businesses. Equally, more could be done to encourage and develop manufacturing clubs, with a particular emphasis on innovation – sharing good practice, exploring new technologies together, and collaborating on business improvement techniques. As was pointed out at a recent St Neots Manufacturing Club event, even competing businesses have been known to share resources on a ‘mutually beneficial’ basis.
- Thirdly, a clear distinction between the needs of medium and small companies needs to be made and a move away from a ‘one size fits all’ approach to training. Standardised process innovation initiatives need to be run alongside a more individual approach for smaller companies to ensure that both ends of the SME continuum are nurtured.
- A fourth point is about working with professional institutions based in the region. The Welding Institute, for example offers specialist welding

facilities and training which could give companies in the sub-region a competitive advantage because of their proximity to this internationally renowned resource. Equally, the Institution of Engineering and Technology (IET) have local networks all over the world; Cambridge IET has a long history stretching back to World War II. Moreover, the Institute for Manufacturing (IfM) has a portfolio of research centres which are focused on industry. IfM's Education and Consultancy Services (ECS) is industry focused and works directly with companies to identify problems and create solutions through consultancy services, short courses and industry events. Another example of this outward facing approach is the IfM's Centre for Technology Management (CTM) which works with start up companies through its "emerging industries programme".

- Finally the importance of collaboration, partnership and working with the wider community cannot be emphasised enough. Richard Herbert (Herbert Group in Haverhill) speaks of 'knowing the right people' in university in order to find a solution to a particular problem and John Tadman from Stainless Metalcraft (Chatteris) explains how the new Fenland Engineering Skills Centre will not only train apprentices and the existing workforce of its own and other companies from the surrounding area but will also serve local schools and the local community. At Marshall Aerospace, Dave Hudson emphasises the wider training role that MA provides in Cambridge: the company has a commitment not just to its workforce, but to the community in which it is based. MA's investment in training exceeds £3m per annum and it provides ongoing significant contact and support to schools and local colleges.

## 1. Introduction

This paper differs significantly from the Construction report for the Greater Cambridge area, in that it is looking at the innovative edge of a sector, rather than the sector as a whole. High value manufacturing deliberately suggests a separateness from low value production. This narrowing of focus has consequences for the kinds of skills gap likely to be reported – and the solutions likely to be offered. Whilst the Construction report focused mostly on areas where Further Education could address skills gaps in the sector, this report tends to move towards Higher Education – the role of technology and knowledge transfer; and the process of encouraging innovation. However, no matter how cutting edge a company is, it is likely to present skills gaps at any given time, and these need not necessarily be cutting edge skills; they may simply be generic management, business or marketing skills, core technical skills required to manufacture a product in the first place, or it may be about implementing business improvement techniques across the company.

So whilst this report differs in several important ways from the work undertaken for the construction sector, it also looks at the full range of skills required by the sector.

The main body of the report is divided into 10 sections. First, the policy context is briefly examined, showing the development of manufacturing in the UK over the past 30 years. Employment in the East of England is compared to the UK as a whole and a “Skills Arena” framework is introduced, which suggests that, for high value manufacturing, skills gaps can be split into three analytical groups – strategic, process and core. Section 3 delves further into the strategic arena – looking specifically at management issues and the wider global environment; In section 4, the work being done at HE level is briefly explored to show how innovation is nurtured and skills gaps met through initiatives such as the knowledge transfer partnership scheme. Then in section 5, the role of further education is examined, in particular how process innovation can be rolled out through an FE framework (e.g. the Lotus example). In the next section (6), the evidence on skills gaps in the sector is explored; and this leads into a discussion (section 7) about the Greater Cambridge Manufacturing profile. Section 8 looks at the supply side of the equation and attempts to illustrate the range of provision in the Greater Cambridge area. In section 9, a High Value Manufacturing Skills Economy emerges; this is one where innovation and knowledge transfer lie at the top of the pyramid, with process skills and core individual skills at the base. Finally, three very different HVM companies are briefly explored – looking at their approach to skills development. Section 11 concludes that there are skills gaps at every level in the pyramid, and that more publicly funded bespoke interventions with SMEs (especially at the smaller end of the SME range), would greatly improve the growth prospects of the sector. Moreover it is suggested that investment in nurturing innovation will lead to a culture of skills improvement and upskilling of the workforce in general.

## **Manufacturing Definition**

The Institute for Manufacturing offer the following definition of manufacturing:

The entire process that takes a product from initial concept to its eventual use by customers, including design, production, marketing, distribution, service and disposal. (IfM – Making the Most of Production)

## **What is High Value Manufacturing?**

High Value Manufacturing might be defined as creating value (revenues over costs, long term profitability, perceived 'social' value) from production and/or services which relate to an original manufacturing process. The Technology Strategy Board conjures up four "pillars" of high value manufacturing: products; processes; service systems; and value systems. Finbarr Livesey from IfM suggests that "there is no simple definition of high value manufacturing", but specific definitions may suffice for individual stakeholders. High value may be measured in terms of financial, strategic and social value depending on who the stakeholders are. (Defining High Value Manufacturing F. Livesey 2006)

## **Manufacturing and "UK PLC"**

The aspiration for UK manufacturers, is "to exercise comparative advantage on the basis of high levels of skills or knowledge" (New Industry New Jobs P10). The challenge is to retain and grow a high value manufacturing base and at the same time accept that in a global marketplace, low value production is likely to (re)locate to low cost regions rather than struggle to compete in countries where labour costs (among other cost factors) are high.

High value manufacturing therefore, needs to be nurtured.

## 2. Policy Context

The Lambert Review of 2003 encouraged greater collaboration between businesses and universities in order to raise levels of successful innovation in the UK.

Paraphrasing Lambert, Livesey et al concluded that “British business purchases rather than innovates..” (IfM A Pilot Study on the Emergence of University level innovation policy in the UK Livesey et al. 2008 page 29), a reference to the lack of organic growth in British business and the preference for growth through acquisition.

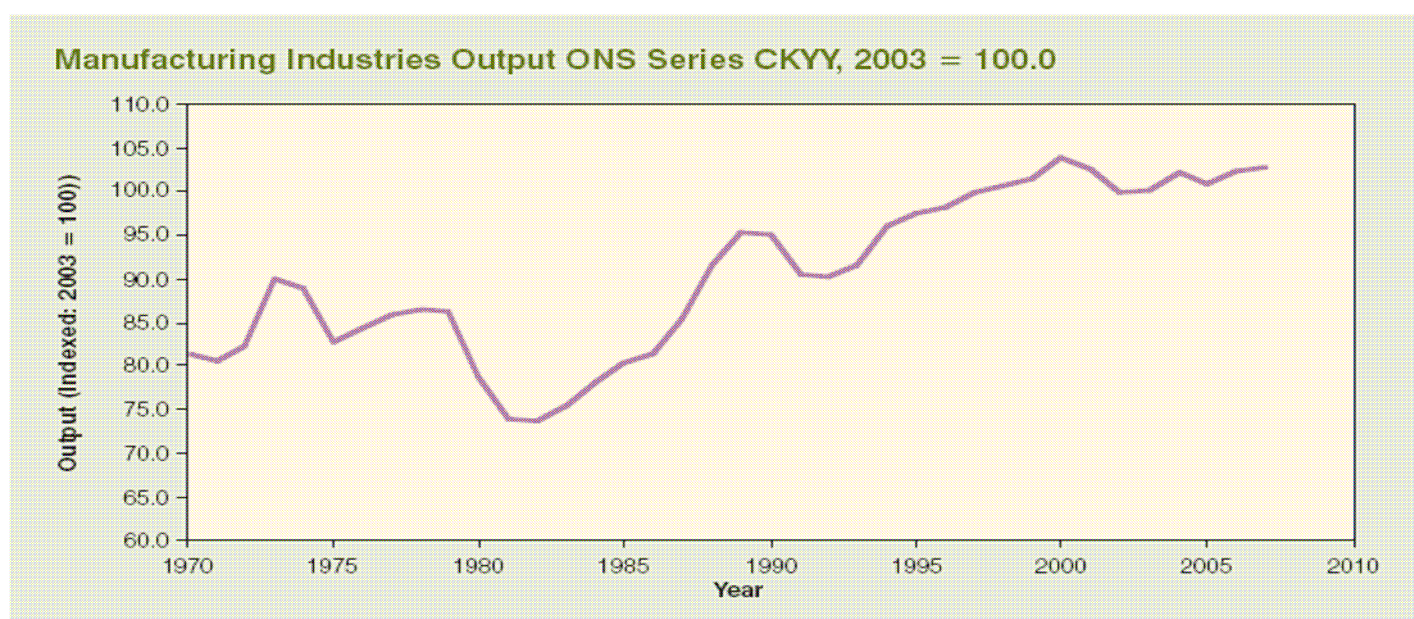
The Technology Strategy Board provides an important policy implementation dimension. Set up in 2003 following a recommendation in The Innovation Report, the TSB provides a policy framework for technology businesses, and a range of ‘challenge’ funds, often encouraging SME and HE collaboration. Later in this report we will look at how universities in the sub-region are collaborating with SMEs.

A further policy context, particularly relevant to manufacturing is the New Industry New Jobs report (2009), which sets out Britain’s “fundamental strengths” in new technologies and emerging industries. The report emphasises the need for ‘world class’ knowledge and skills to retain or gain a comparative advantage.

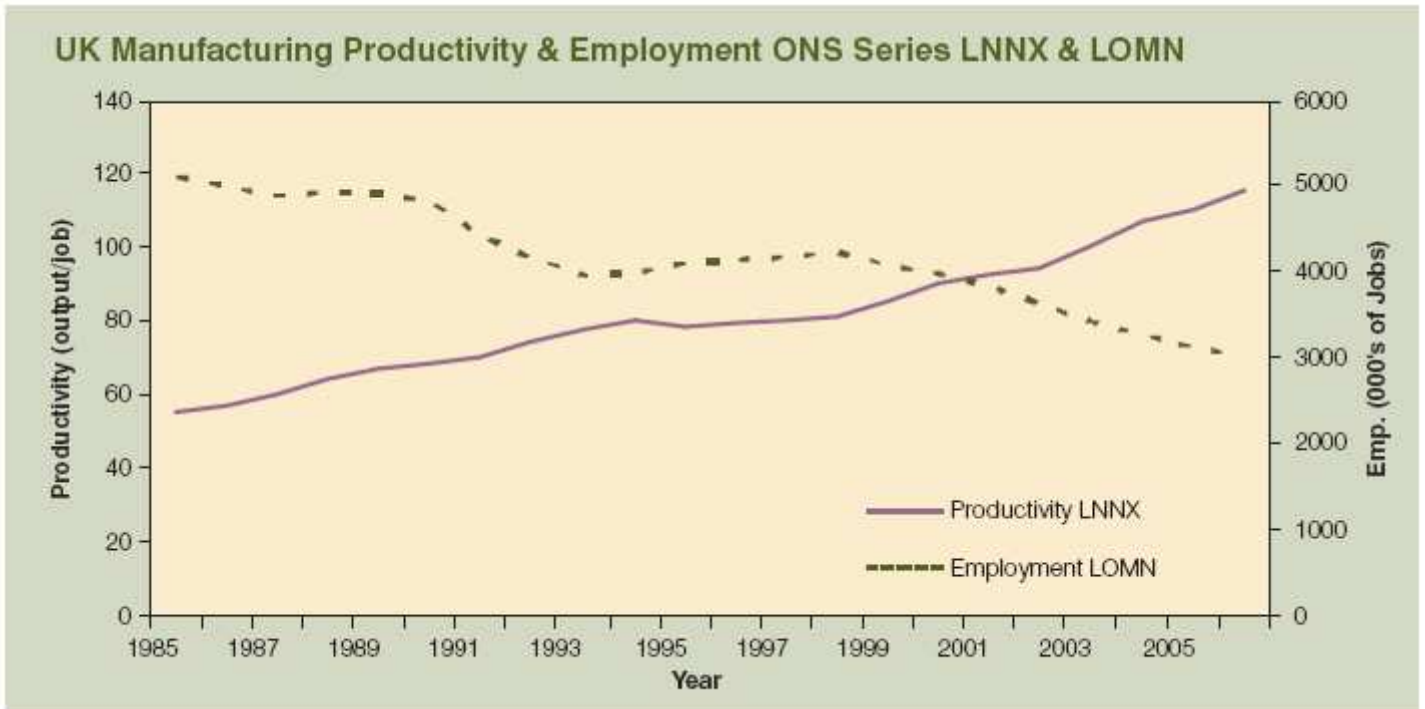
### Manufacturing in the UK

Despite the relative decline of manufacturing in the UK compared to other countries, the Technology Strategy Board stresses that manufacturing is still a vital part of the UK economy and as the three graphs below show, manufacturing output has actually grown over the last 30 years, as has productivity. Employment in the sector however, has shrunk as the industry’s efficiency has improved. Looking at individual sub-sectors (Graph 3) one can see a mixed picture of fortunes for the industry.

1. Manufacturing output in the UK has actually increased over the last 30 years.



2. But improvements to productivity has meant an overall decline in employment – giving the impression of a shrinking industry.



3. Within the manufacturing industry, there are 'winners' and 'losers'.



Source for all three graphs: TSB High Value Manufacturing 2008-2011 P.9

The Greater Cambridge Area fares well based on the information presented here. Traditional manufacturing in fields such as leather; tobacco; and clothing have

significantly declined in the last two decades, whereas Greater Cambridge strengths such as ICT; pharmaceuticals and Bioscience have all grown substantially over the same period.

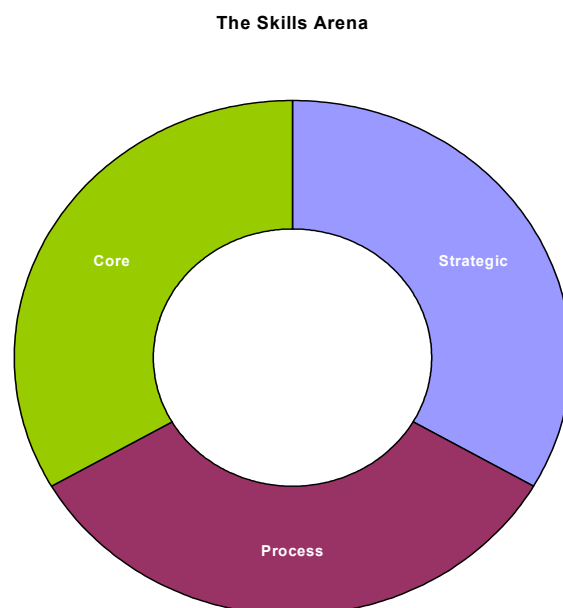
The table below shows the number and percentage of people employed by the engineering industry, in East of England compared with Great Britain. Overall the East of England has a 9% share of this broad UK sector.

Sector	Sub sector	East of England	Great Britain	% of GB economy
Metals	Basic Metals	2,800	71,700	4%
	Metal Products	24,000	305,200	8%
	Wholesale Metals & Scrap	2,800	35,500	8%
Mechanical Equipment	Mechanical Equipment	30,800	263,700	12%
Electrical Equipment & Electronics	Electrical Equipment	10,100	111,900	9%
	Electronics	24,800	187,400	13%
Automotive	Automotive	13,500	160,900	8%
Other Transport Equipment	Marine	1,400	31,800	4%
	Aerospace	5,900	92,300	6%
	Other Transport Equipment (ex marine & aerospace)	400	15,000	3%
All Engineering		116,500	1,275,400	9%
All Sectors		2,380,678	26,309,606	9%

Source: Annual Business Inquiry 2006, ONS (cited in Semta East of England Report Page 11)

### The Skills Arena

The diagram below divides the skills agenda facing manufacturing companies into three distinct blocks. First there is the need for strategic management skills which will give the company leadership and direction on important issues such as the location of production and the case for capital investment. Secondly there are process skills, these relate to business performance and can make the difference between profit and loss. Finally, there are the core skills required for the workforce from management to the 'shop floor'. These are skills which individuals need to perform better in their jobs. They will have an impact on individual performance which will also affect the company. The diagram represents the 'skills arena' which this report explores for the Greater Cambridge area.



### **3. Management Issues and Key Drivers for Manufacturing**

Management decision making skills are vital to the future health of the manufacturing industry, and of particular importance to the continued development of a high value manufacturing base in the UK. Universities play a key role in fostering innovation especially through Technology Transfer Offices; incubator units, the development of science parks and setting up knowledge transfer partnerships. What more can be done to embed world class management practices in our manufacturing companies?

#### **EEF's "Manifesto for Manufacturing"**

In its recent report Manufacturing our Future, EEF aptly suggests a "manifesto for manufacturing". Manufacturers, they contend "must focus on the future, evolving to become more innovative, agile and diverse". (Manufacturing Our Future EEF 2009 p.2). This includes developing long term strategies for achieving a sustainable competitive advantage; raising their game in terms of ambition, innovation and investment in new technologies; investing in the workforce to retain and grow the knowledge base and continuously improve productivity; and to be champions for the sector, lobbying government for support where needed, and being bold in setting out a global vision for UK manufacturing.

The Technology Strategy Board (TSB) highlights the direction of travel for HVM management: Firms need to:

- Develop innovative business solutions which give a continuing competitive edge
- Optimise performance over the lifecycle of the product or service
- Manage the increasing complexity of companies, supply networks & projects
- Adapt to environmental issues
- Develop intellectual property

(TSB High Value Manufacturing 2008-2011 page 11)

#### **SEMTA's (The Sector Skills Council for Science, Engineering & Manufacturing Technologies ) Skills Drivers**

SEMTA considers the following "drivers for skills change"

1. Increasingly competitive global economic climate
2. Rapid advances in science and technology
3. Environmental challenges and sustainability requirements
4. Socio-demographic aspects
5. Values and public acceptance of new technology
6. The regulatory environment, standards, and IPR

#### **IfM's Location Decision Research**

The Institute for Manufacturing (IfM) is closely involved in researching management practices of manufacturing firms and working directly with management teams through its Education and Consultancy Services (see below). One of the most important decisions facing management relates to the location of production. In the IfM report "Making the Most of Production", Gregory et al. contend that UK firms don't necessarily make location decisions for the right reasons, and may in the

longer term damage the performance of the company by too narrow a view of production capability – often failing to make the link “between production and other functions within the company such as innovation or the provision of services” (p.1). Outsourcing production capability therefore has long term implications for the company’s knowledge and asset base.

Gregory et al. distil the production/location debate into five key considerations or ‘tests’:

- Is production essential to innovation?
- Is production a source of competitive advantage?
- Is production key to meeting personalised demand?
- Is production key to providing total solutions offerings?
- Is production a key function for value capture?

The report emphasizes the importance of location decisions; There is a danger that companies don’t “take an inclusive view of the importance of production to their performance.” (ibid - Executive summary)

## 4. HE Collaboration

In considering the role of higher education in encouraging innovation – and specifically in relation to high value manufacturing, there are a range of tools, resources and infrastructures which can greatly help businesses acquire new skills and apply them in a profitable way. These include “technology transfer offices”; “Knowledge Transfer partnerships” the development and management of science parks; and the creation of incubator units. The University of Cambridge has been particularly active and successful in each of these fields: The University’s Institute for Manufacturing (IfM) has a portfolio of research centres which are focused on industry. IfM’s Education and Consultancy Services (ECS) is industry focused and works directly with companies to identify problems and create solutions through consultancy services, short courses and industry events. Another example of this outward facing approach is the IfM’s Centre for Technology Management (CTM) which works with start up companies through its “emerging industries programme”.

Other universities in the sub-region have also played a key role in encouraging innovation: Anglia Ruskin University has led a region wide knowledge transfer partnership scheme which has proved to be a good way to establish grass roots collaboration between universities and SMEs. Cambridge, Cranfield and the University of Hertfordshire have all participated in the KTP scheme, providing specialist advice, graduate placements and project development to SMEs in the sub-region.

Cranfield University has been involved in many regional innovation projects and continues to influence the sector in terms of the quality of its engineering and manufacturing research and wide range of industry relevant courses. The University of Hertfordshire has an excellent track record in engaging with SMEs in the region and it has a wide range of short engineering courses designed for industry professionals.

Universities then, offer high value manufacturers the possibility of developing new skills through research, consultancy and training services. There are also opportunities for collaboration leading to new job openings for graduates (e.g. KTP schemes).

## 5. Role of FE

Further education has a key role to play in skills development of the workforce. The National Skills Academy has published several case studies showing how Business Improvement Techniques training at Levels 2 and 3 has helped companies to develop and grow. One such study shows how Group Lotus in Norfolk embarked on a publicly funded Business Improvement NVQ programme working with City College Norwich and the National Skills Academy. So successful has the training programme been that Lotus are now involved in helping other companies undertake the same upskilling journey. Key to the achievements at Lotus has been the relationships built between their Continuous Improvement and Manufacturing Business Coordination Manager; the Skills Academy East of England regional manager; and staff at City College Norwich, to prepare the ground for an in-house NVQ programme – delivered by Lotus assessors who themselves have been trained by the College.

Further Education then, can play an important role not simply training up new recruits for the industry but also working with companies to keep up to date with latest processes and technologies and provide support for the development of an in-house company training programme. This has the advantage of building sustainable capacity for the company at the same time ensuring that training content is wholly related to the company's needs.

However, in the post-recession environment where colleges are being encouraged to charge for training services and 'engage with employers' on a more commercial footing, there is a fundamental question about how FE with its emphasis on delivering government funded work has the capability to move into this more competitive field. As pointed out in earlier reports, the FE sector has excellent resources and infrastructure which the local business community would be pleased to benefit from. All that is missing is the commitment to keep up to date with industry development and encourage staff to develop 'just in time' subject specialisms for which there will be industry demand.

Keith Bevis has undertaken research into engineering SME training needs in the East of England. Looking at the automotive supply chain, he asks to what extent training programmes help or inhibit innovation. Bevis goes as far as to suggest that many training programmes may actually constrain competitive behaviour, and simply instil the original equipment manufacturer's (OEM) control environment, to the detriment of innovation. Bevis suggests that: "for training to support the drive for competitiveness it must nurture innovation within those SMEs." (Bevis 2007 page 5)

"Training must also be designed in the context of where the SME aspires to be, to allow the SME to mature and develop. There is a great risk when externally promoted and funded training potentially constrains the potential for innovation and the Lisbon goals. European manufacturers have also seen that national programmes are currently part of the problem". (Bevis 2007 page 25)

From his SME research in the East of England (engineering /advanced manufacturing companies) Bevis suggests that there are four training themes which emerge: specialist [bespoke] technical training specific to each SME's needs; for medium sized

companies, supervisory training to support roll out of process innovation (e.g. lean manufacturing processes expected by the supply chain customer); broader apprenticeships to take account of the need “to engage in innovation”; and marketing especially at the small enterprise level.

### **Apprenticeships**

Apprenticeships are clearly an effective way of fostering home grown talent and delivering publicly funded training to young employees through an approved government framework. Engineering firms have traditionally been havens for young apprenticeships, although in more recent decade there has been a deterioration in apprenticeship opportunities, partly as a result of funding (only the training is funded not the labour cost), and partly because of a changing labour market. Bevis has suggested a need for broader apprenticeships to take account of the need “to engage in innovation”; This seems particularly appropriate as a means of bridging the divide between the FE focus on NVQs and HE’s approach to innovation and knowledge.

## 6. Workforce Skills Gaps

Decisions about training are influenced by the availability of government funding. This can impact on who gets trained (e.g. 14 – 19 preferences) and what type of training is undertaken (the level; content and depth of the courses). Bevis identifies two other influencing factors: the promotion drive from the training providers themselves; and management drivers (Bevis 2007 page 9). The latter may not just be about what's best for the company; it could be driven by what a supply chain customer is insisting on (e.g. process innovation) and as we have seen above, this could constrain the company, limiting its horizons and search for different ways of doing things (i.e. 'pure' innovation!) and finding new customers.

SEMTA reports a range of skills gaps in East of England engineering and manufacturing companies. These can be split into technical and engineering skills and generic skills.

On technical and engineering skills, 64% of companies in the East of England reported skills gaps in the following areas:

- Welding skills - metals sector.
- CNC machine operation and tool setting - mechanical equipment.
- Computer Aided Design (CAD) and general engineering skills – electrical equipment and electronics.
- Materials Requirement Planning (MRP11) - automotive sector.
- Materials Requirement Planning (MRP11), tool setting, mechanical engineering
- Carpentry/woodwork –
- Other transport equipment.

On generic skills, SEMTA found staff lacked core personal skills; management skills; ICT skills and marketing/selling skills.

Interestingly there is no mention here of business improvement techniques, one of the most successful NVQs to be developed for the sector in the last decade. This suggests that there is a more intricate relationship between what a company thinks it needs and what it could benefit from in terms of training programmes. Moreover, taking on board Bevis' comments earlier, the question needs to be asked what is the nature of the benefit derived from training: is it essentially about "lean" production? Does it encourage genuine innovation as opposed to simply 'process' innovation? And thinking of the government agenda – to what extent does it raise the qualifications base of people in the workforce?

Returning to the Lotus example, one might surmise that it can do all three. Frequently, however these three questions lead to mutually exclusive answers.

## 7. Greater Cambridge Manufacturing /Engineering Profile



The map above shows four areas of manufacturing/engineering concentration. These are represented by the St. Neots Manufacturing Group; The Huntingdon Manufacturing Association (launch date April 2010) including the St. Ives cluster; the Haverhill Enterprise Group; Chatteris Business Park; and Cambridge Science Park. Other significant locations include Melbourne and Royston to the south-west of Cambridge and Bury St. Edmunds to the east.

### Manufacturing Clubs

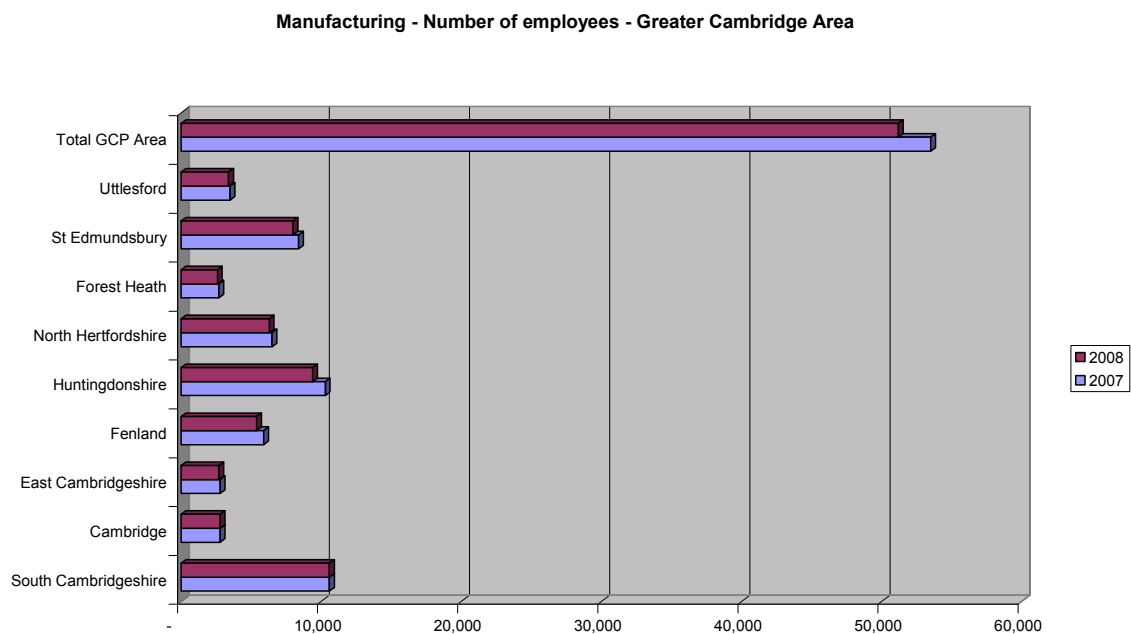
There have been several manufacturing clubs emerging in the Greater Cambridge area over the last decade, and some continue to thrive. The St. Neots Manufacturing Club for example was founded in 2003 and has ongoing support from the St Neots Town Centre Initiative and a local champion in the form of John Davies from Sealed Air – a large local manufacturer. The Club continues to thrive and attract attention from engineering and manufacturing businesses across the Greater Cambridge area.

West Suffolk Manufacturing Excellence Club was set up in 2006. Based on the combined membership of the previous Sudbury and Bury St Edmunds clubs, it included a catchment area extending to Newmarket, Haverhill, Halstead, Hadleigh, Eye, Stowmarket and Woolpit. Initial enthusiasm for the initiative has waned as public funding declined. Without an ‘embedded’ local champion and a means of financial sustainability, such initiatives run the risk of alienating companies who invest time in the idea only to find it falling apart before it has achieved its objectives.

In Huntingdon a new Manufacturing Association is set to launch in April this year. Underpinned by the district council, the new group has several key objectives one of which will be to become a key driver for skills growth in the district in the coming years. It will be chaired by Stewart Gibbons, a local manufacturer, and industry champion.

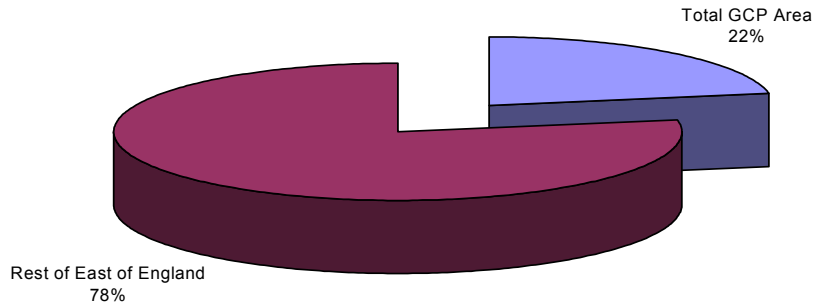
**Numbers of Employees & Businesses engaged in Production in GCP area.**

The Annual Business Inquiry shows that there were around 51,000 people working in the manufacturing sector in the Greater Cambridge area in 2008, slightly less than in 2007 (53,500). According to the ABI manufacturing in the GCP area represents 22% of the total manufacturing sector in the East of England.



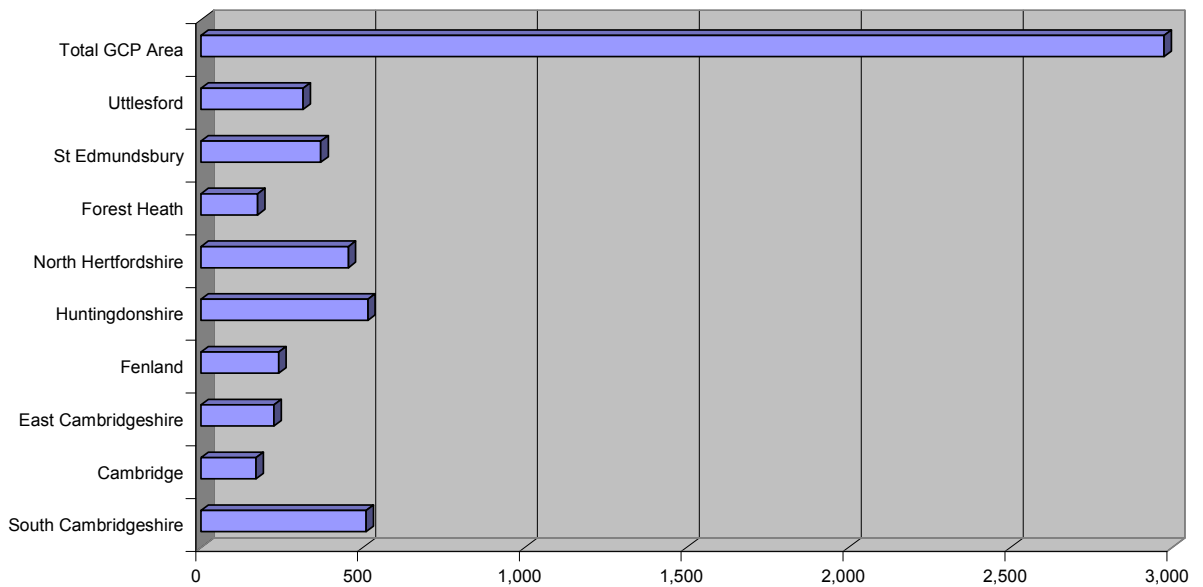
Annual Business Enquiry 2008

**GCP Manufacturing employment compared to East of England**



Annual Business Enquiry 2008

**No. of VAT based "Production" enterprises in Greater Cambridge Area**



Annual Business Enquiry 2008

The number of VAT registered "Production" businesses in the GCP area is 2,975 which is just under 20% of the total number in the East of England (ONS UK Business: Activity, Size and Location 2009).

## 8. Training Provision & Support Available

Semta's Skills Balance Sheet for the East of England provides some information on engineering and manufacturing, showing for example, which colleges deliver HNDs and HNCs; it also gives a breakdown of all engineering qualifications; and provides a snapshot of college quality as measured by the Adult Learning Inspectorate (ALI). Here we look at what universities, colleges, group training associations (GTAs) and other providers are able to offer industry, both in terms of core provision e.g. degree courses or diplomas; and short course delivery direct to people already working in the industry. Appendix 1 gives a full breakdown of courses related to engineering and manufacturing.

### Universities

#### University of Cambridge

The Department of Engineering incorporates the Institute of Manufacturing – a single site for undergraduate study, post graduate research and industry collaboration. “The IfM provides a unique environment for the creation of new ideas and approaches to modern industrial practice - from understanding markets and technologies, through product and process design to operations, distribution and related services” ([www.ifm.eng.cam.ac.uk](http://www.ifm.eng.cam.ac.uk)).

Through the IFM in particular Cambridge has close involvement with local businesses and provides graduate placements through the KTP scheme (see below). Several undergraduate and post graduate degrees are offered through the Department of Engineering.

#### Anglia Ruskin University

ARU manage the KTP contract on behalf of EEDA and work closely with all ten universities in the region to deliver collaborative projects with SMEs. ARU also runs several engineering and manufacturing courses:

ARU's Chelmsford campus offer a range of relevant undergraduate and postgraduate courses:

#### Cranfield University

Cranfield's School of Engineering offers a “wide range of masters, doctoral and professional development courses in addition to extensive technology development and consultancy for industry” ([www.cranfield.ac.uk/soe/index.jsp](http://www.cranfield.ac.uk/soe/index.jsp))

Cranfield offers many different Engineering Masters Degrees at Cranfield

#### University of Hertfordshire

In addition to its undergraduate and post graduate courses UH offers a range of scheduled and bespoke short courses designed to suit the training needs of the individual, specific companies or groups of companies.

## Colleges

### **Cambridge Regional College**

Cambridge Regional College offers students very modern facilities on a large single site close to Cambridge Science Park. A wide range of staff specialisms enables students to undertake a range of engineering specific options.

Not surprisingly the college tends to focus its resources on its core market – the 16 – 19 age group, and full time and part time courses. Matching up manufacturing & engineering company needs is more difficult to achieve – and sufficient short course industry provision is still some way off. However, CRC has an impressive track record on employer engagement, mostly related to Train to Gain and apprenticeship work.

### **West Suffolk College**

West Suffolk College is a rural further education college. Its main campus is at Bury St Edmunds but it has many other local learning centres across Suffolk. Interestingly over 80% of its students are older than 19 and the college has an enviable reputation for working with employers. Short industry based courses are well established and full-cost provision is substantial – working with over 1200 employers in the region.

### **Huntingdonshire Regional College**

Huntingdonshire Regional College is based in Huntingdon and St Neots but also provides learning opportunities in the workplace and in many other locations throughout the area. The college is engaged in several employer engagement initiatives. These include:

OR4B (Opportunities for Regional Business) was set up in the summer of 2009 and has been well attended by employers in the area (50 plus businesses attended the last few events).

The college also has an HE programmes Business Development Manager who is active in employer engagement.

HRC has close working relations with several sector specific private training providers who understand their market and have a good knowledge of employers skills needs.

As part of the Regional University Partnership with Anglia Ruskin University also offer several HE courses.

### **College of West Anglia**

Spread across four campuses in King's Lynn, Isle, Wisbech and Cambridge (Milton), the college offers a wide range of further education courses and a range of HE provision through a partnership with Anglia Ruskin University. Work based learning is a key feature of the college offer, and Train to Gain funding has enabled the college to engage with new employers throughout the sub-region.

### **Group Training Associations**

GTAs have played an important role in engineering and manufacturing since the 1960s. EAGIT; Eastern Seafish Training Association; Prospects Training; and West Anglia Training Association (WATA) are all based in the East of England. WATA has been in existence for 30 years and is the only GTA based in the Greater Cambridge area (Huntingdon). It provides a range of technical and non-technical courses for industry members, and delivers apprenticeships for around 50 member companies.

There is some evidence to suggest that quality and responsiveness is greater among GTAs compared to college provision (Burge et al DFES 2002).

### **Other Provision – influencing the skills agenda**

The Engineering Council lists 36 professional Engineering Institutions, licensed by the Council to assess the competence and commitment of candidates for registration; monitor the continuing professional development of registrants; and monitor the conduct of registrants.

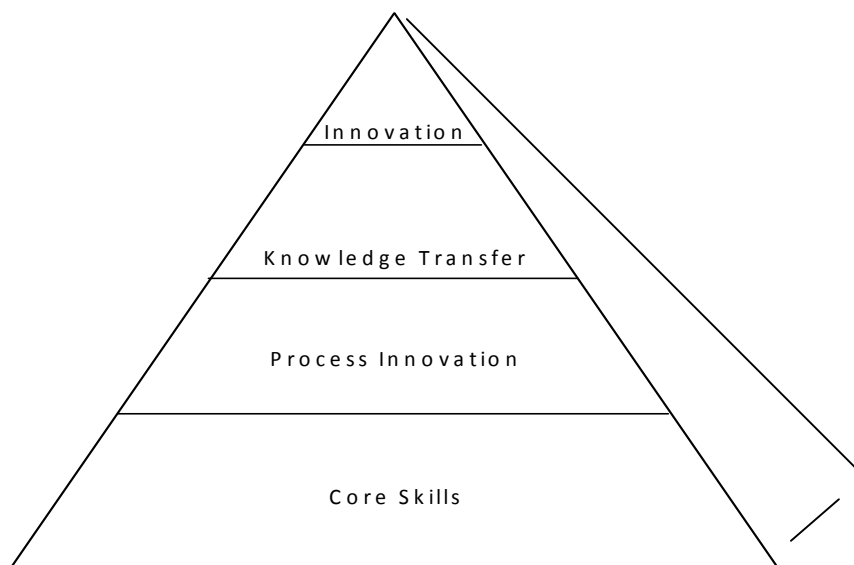
Two important institutions pertinent to high value manufacturing, are based in or close to the Greater Cambridge Area:

- The Welding Institute – based at Abingdon, Cambridge.
- The Institution of Engineering and Technology - in Stevenage

### **Practical Support - Manufacturing Advisory Service**

The Manufacturing Advisory Service in the East of England (MAS East) is based at the PA Consulting Technology Centre in Melbourn, Cambridgeshire. PA Consulting currently has the contract for delivering the MAS service in the East of England. MAS is a “dedicated source of support to engineering, manufacturing and technology businesses within the region” ([www.mas-east.org.uk](http://www.mas-east.org.uk)) . As one of the core offers from “Solutions for Business,” it has a team of Specialists who provide direct support to companies often working closely with Business Link to bring about a complete solution.

## 9. The High Value Manufacturing Skills Economy



The pyramid above is an extension of the skills arena diagram produced earlier. It attempts to separate out the different skills considerations for a company, dividing them into: a pure innovation requirement at the top – here we would expect to find universities working alongside a company (perhaps itself a university spinout company), developing innovative solutions for tomorrow's marketplace. The second segment of the pyramid refers to the kind of knowledge transfer activity which brings about HE and SME collaboration. Often this will be less about pure innovation and more about transferring good practice and advice, solving specific business problems and providing graduate placements to help deliver project based solutions. These skills will usually be provided at higher education level. The third segment of the pyramid is not about pure innovation or even knowledge transfer; rather, it refers to business improvement through process 'innovation' – that is implementing new processes in a particular way which result in fewer errors, less wastage and greater efficiency. These innovation processes may be new to the company but they are likely to have been tried and tested in other companies. They may even be part of an OEM's service level agreement. These skills can be crucial to business profitability – many colleges now deliver the Business Improvements Techniques (Levels 2,3 and 4) but companies can work in partnership with a college to produce a bespoke solution. This is what has happened at Group Lotus (see above – page XXX), with impressive results for both the company and the college. The final segment houses probably the largest area of skills requirements. It refers to all the individual skills gaps in the workforce. Here we will find gaps in functional skills and management skills as well as technical skills such as welding, CNC or CAD.

Appendix 2 provides a list of current industry courses published on Trainagain for four providers in the region: The Welding Institute; University of Cambridge; Cranfield University; and Cambridge Regional College. This shows the breadth of short courses available to industry in the sub-region.

## **10. Company Visits – three different examples of High Value Manufacturing**

### **Herbert Group - Haverhill**

The Herbert Group specialise in bespoke solutions in the fields of weighing, labelling and in store operations. The company can be categorised as a high value manufacturer operating at the service end of the HVM continuum. As such, the Herbert Group are more involved in redesigning and installing other manufacturers equipment to the specifications of a specific client, rather than high volume manufacturing.

Richard Herbert – executive chairman of the Herbert Group spoke about “knowledge transfer” higher education links in relation to graduate placement schemes. University of Hertfordshire; Cranfield and Cambridge have all provided graduate placements through the Teaching Company Schemes and Knowledge Transfer Partnerships (KTP) , and these have been invaluable for specific problem solving projects. One recent KTP placement has led to fixed term two year employment for ‘Liang’ (a six sigma “black belt”), who has helped the company identify critical business improvement processes, and will now be responsible for widening participation in the quality improvement process, starting with section managers and later, moving on to all relevant employees. The Herbert Group hope to start a new KTP to look at the company’s marketing strategy.

Richard Herbert also confirmed that the company has approached University of Cambridge (IfM) for advice and support on technical challenges, and that they have been extremely useful in finding the right solution to the issue in hand. This kind of Informal networking has proved invaluable for specialist advice and support on specific projects.

In terms of core skills, the Herbert Group work with several local colleges. West Suffolk is the main provider of core skills and some NVQ training for company staff. However the majority of company training takes place outside of the public sector environment – delivered by private providers, often specialist trainers in a particular field.

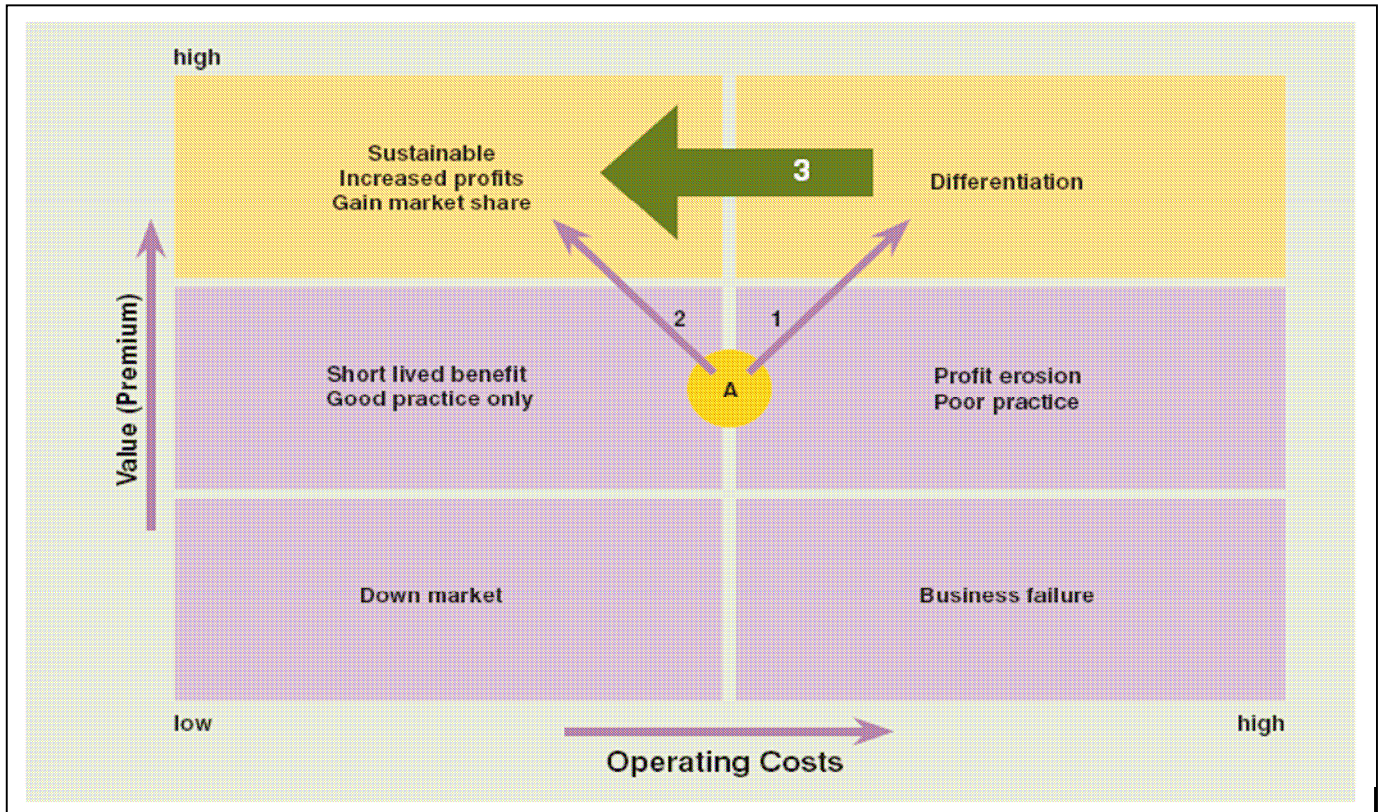
Richard Herbert chairs the Haverhill Enterprise Group which includes several key manufacturing companies from the locality.

### **Marshall Aerospace**

Marshall Aerospace (MA) is probably the largest high value manufacturer in the Greater Cambridge area. MA is an excellent example of a high value manufacturer – with its range of capabilities from original production to lifetime service including: Design Engineering; Manufacturing; Modification & Maintenance; Product Support; Test Services; AeroAcademy; Engineering Consultancy; Continuing Airworthiness Management; and International Design.

The diagram taken from the TSB report on High Value Manufacturing reflects the Marshall Aerospace position; through differentiation from competitors (as seen

above in its diverse range of capabilities), the company is able to gain market share and profitability – providing a sustainable base for the future.



High Value Manufacturing TSB 2008 page 17)

MA's vision is to:

To build on our history to grow a set of sustainable, geographically diverse engineering and aviation related businesses, strategically aligned, delivering best in class support, service and solutions to Civil, Military and OEM Customers across world markets and to be the partner of first choice.  
(Vision Statement – [www.marshallaerospace.com/coreValues.php](http://www.marshallaerospace.com/coreValues.php))

With over 1700 staff across a range of business streams, Marshall Aerospace takes development of its staff very seriously; On average MA recruit 15 – 20 advanced apprenticeships (often lasting 4 years) and 10 – 15 adult trainees per annum; there are currently 68 apprentices 'in the system' at various stages of completion of their qualification. There are two routes which develop the apprentice for employment as a technician in the Hangars or as a design engineer in the Aircraft Design Office with the latter given the opportunity to achieve a degree through day release.

The company also operates a placement scheme for 10-12 undergraduates on sandwich courses each year and the majority return to join them upon completion of their degree where they join a structured development programme towards professional registration.

In addition to recruiting graduates fresh from university MA have recently begun to deliver a Foundation Degree in conjunction with Kingston University based around modules of the EASA Part 66 Licensed Engineer course through the Marshall AeroAcademy. The company also provides a broad range of training for internal staff and other aerospace organisations in the area including Core knowledge and skills, aircraft type training, regulatory courses and specialist training for the design staff. The Marshall AeroAcademy adds further to the perception of Marshall Aerospace as an exemplary 'high value' manufacturer, committed to success through its people and backing this up with continuous development and improvement across the company.

MA is committed to performance management through a transformation team improvement programme:

"The need to develop a framework of company wide behavioural, leadership and generic skills and competencies has been embraced by the [Transformation] team working towards identifying core skills and competencies and how they align with roles within the business." (MA News Spring 2009)

This commitment in the Spring of 2009 is then followed through in the next edition of MA News showing how different elements of the 'transition plan' are progressing. It reinforces the point that MA is committed to high value in every aspect of its business.

Finally it is worth emphasising the wider training role that MA provides in Cambridge: the company has a commitment not just to its workforce, but to the community in which it is based. MA's investment in training exceeds £3m per annum and it provides ongoing significant contact and support to schools and local colleges.

### **Stainless Metalcraft**

Stainless Metalcraft are based in Chatteris. Their 12 acre site provides capacity for greater development and a new Fenland Engineering Skills Centre will be housed there from Spring 2010. The centre will serve local schools and the local community; apprentices; the existing workforces of Stainless Metalcraft and companies from the surrounding area.

Stainless Metalcraft are specialists in pressure valve manufacture and offer a range of on site capabilities including: Materials Preparation; Fabrication & Welding (50 tonnes in shop craneage); Machining – Conventional & CNC (4.25m Dia turning & 9m Lg boring); Inspection Services – Radiography, UT, DPI, Laser Measurement; Project Management; Production Engineering; Weld / Metallurgical Engineering; Pressure and Vacuum Vessel experience; Light Fabrication.

The company can be classed as a high value manufacturer. Whilst it may not always be able to compete globally on price when it comes to high volume standardised manufacturing, its ability to offer precision prototyping; and rapid response make it a valuable partner for OEMs especially at 'pre-production' and 'pre-outsourcing' stages

of product development. Moreover, Stainless Metalcraft have a track record in producing high quality results.

This 'bespoke' capability gives the company a higher perceived value compared to other manufacturers. The added value can be described as: experience and quality; geographical proximity; batch and prototyping capabilities.

With a workforce of around 180, including welders, CNC operatives and CAD/CAM specialists, the company has a continuous need for upskilling, which will be partly fulfilled through the new onsite engineering skills centre.

It is interesting to note that a lack of appropriate specialist welding skills in the workforce has sometimes led to the company outsourcing work which could be handled in house were the skills available .

## 11. Conclusions

Skills gaps exist among high value manufacturing companies in the Greater Cambridge area. These can be split into strategic, process and core skills. We saw in the Construction Skills Gaps and Solutions report that gaps are usually short term, caused by a member of staff leaving and often remedied when a new recruit is fully embedded into the organisation. But skills gaps can be 'endemic' in a company; they are not picked up because they are harder to unearth. Some skills gaps will be a source of anxiety or shame for an employee so they are unlikely to voluntarily expose their weakness. In engineering and manufacturing companies there are two types of skills gaps covering innovation. The first can be called 'pure' innovation and is about producing new things; the second is called process innovation and is about producing the same things better. Both are vital to the success of the high value manufacturing economy. Innovation needs to be encouraged and nurtured. However it is extremely difficult to identify a gap simply by analysing employers responses (e.g. through the Annual Business Inquiry), because innovation gaps are not necessarily recognised within the company. Skills gaps reported are more likely to relate to poor matching between a job needing to be done and the skills required to do it.

So when we talk about high value manufacturing it is important that we cover the full range of gaps at strategic, process and core skills levels and covering both pure innovation and process innovation. Once we are clear about this continuum of need, it is possible to offer some tentative solutions:

- The first point to make is that it is vital to look beyond 14 –19 year old provision and develop skills initiatives which address the needs of the existing workforce.
- The second point is about collaboration, especially between HE and SMEs but also between FE, the sector skills council(s) and businesses as we have seen with the Group Lotus example. All four universities operating in the sub-region are involved in collaborative initiatives with local businesses. Anglia Ruskin University has an excellent track record in developing knowledge transfer partnerships which often involve placements from Cambridge, Cranfield and Herts University. The Institute for Manufacturing at Cambridge University has built up an impressive body of collaborative work with local SMEs and both Cranfield and Herts are involved in innovation projects with industry. More could be done, especially if funds were available to undertake more bespoke 'mentoring' work with individual SMEs. Equally, more could be done to encourage and develop manufacturing clubs, with a particular emphasis on innovation – sharing good practice, exploring new technologies together, and collaborating on business improvement techniques. As was pointed out at a recent St Neots Manufacturing Club event, even competing businesses have been known to share resources on a 'mutually beneficial' basis.

- In discussing innovation and collaboration, there is much that FE colleges can become involved in. The Group Lotus example showed how a partnership between the sector skills council, the local college and the company can lead to dramatic results. This sort of collaboration can be replicated and improved on in Greater Cambridge. All it needs is commitment from the main players and passion from a local champion, someone prepared to cut through the barriers of inertia and make it happen.
- Thirdly, a clear distinction between the needs of medium and small companies needs to be made and a move away from a 'one size fits all' approach to training. Business improvement techniques may be much more suitable for a company of 100+ than for a workforce of say, 20 or less. Yet these small companies are often the most innovative ones who need support to continue to develop. Research from both the IfM and University of Hertfordshire points to the need for bespoke support for smaller companies – identifying problems and working through individual solutions outside of a business improvement framework or any other generic model. So standardised process innovation initiatives need to be run alongside a more individual approach for smaller companies to ensure that both ends of the SME continuum are nurtured.
- A fourth point is about working with professional institutions based in the region. The Welding Institute, for example offers specialist welding facilities and training which could give companies in the sub-region a competitive advantage because of their proximity to this internationally renowned resource. Equally, the Institution of Engineering and Technology (IET) have local networks all over the world; Cambridge IET has a long history stretching back to World War II. Moreover, the Institute for Manufacturing (IfM) has a portfolio of research centres which are focused on industry. IfM's Education and Consultancy Services (ECS) is industry focused and works directly with companies to identify problems and create solutions through consultancy services, short courses and industry events. Another example of this outward facing approach is the IfM's Centre for Technology Management (CTM) which works with start up companies through its "emerging industries programme".
- Finally the importance of collaboration, partnership and working with the wider community cannot be emphasised enough. Richard Herbert (Herbert Group in Haverhill) speaks of 'knowing the right people' in university in order to find a solution to a particular problem and John Tadman from Stainless Metalcraft (Chatteris) explains how the new Fenland Engineering Skills Centre will not only train apprentices and the existing workforce of its own and other companies from the surrounding area but will also serve local schools and the local community. At Marshall Aerospace, Dave Hudson emphasises the wider training role that MA provides in Cambridge: the company has a commitment not just to its

workforce, but to the community in which it is based. MA's investment in training exceeds £3m per annum and it provides ongoing significant contact and support to schools and local colleges.

## **Appendix 1 – Training Provision – HE & FE**

### **University of Cambridge**

- Undergraduate degrees: Manufacturing Engineering Tripos (MET)
- Post graduate: MPhil in Industrial Systems, Manufacture and Management (ISMM)

### **Anglia Ruskin University**

ARU's Chelmsford campus offer a range of relevant undergraduate and postgraduate courses:

Undergraduate:

- Engineering FdSc
- Mechanical Engineering BEng
- Engineering Intermediate award(s): CertHE, DipHE

Post graduate:

Engineering Management MSc

Related intermediate award(s): PG Dip, PG Cert

### **Cranfield University**

#### **Engineering Masters Degrees at Cranfield**

Advanced Lightweight Structures and Impact MSc

Advanced Mechanical Engineering MSc

Aerospace Dynamics MSc

Aerodynamics MSc

Flight Dynamics MSc

Aerospace Vehicle Design MSc

Aircraft Design MSc

Avionics Systems Design MSc

Structural Design MSc

Aircraft Engineering MSc (part-time)

Astronautics and Space Engineering MSc

Autonomous Vehicle Dynamics and Control MSc

Computational Fluid Dynamics MSc/PgDip/PgCert

Computational and Software Techniques in Engineering MSc

Computer Aided Engineering MSc

Digital Signal and Image Processing MSc

Grid Computing & e-Engineering MSc

Software Engineering for Technical Computing MSc

Design of Rotating Machines MSc

Ergonomics and Safety at Work MSc/PgDip/PgCert

Process Systems Engineering MSc

Energy Systems and Thermal Processes MSc

Process Systems Technology MSc

Thermal Power MSc

Aerospace Propulsion MSc

Gas Turbine Technology MSc

Power, Propulsion and the Environment MSc  
Rotating Machinery Engineering and Management MSc

## **University of Hertfordshire**

### **Undergraduate**

#### **Automotive Engineering**

Automotive Engineering with Motorsport (BEng)  
Automotive Engineering with Motorsport (MEng)  
Automotive Engineering (MEng)  
Automotive Engineering (BEng)  
Automotive Technology with Management (BSc)  
Engineering Product Design (BSc(Hons))  
Motorsport Technology (BSc)

#### **Electronic and electrical engineering**

Audio, Video and Digital Broadcast Engineering (BEng)  
Computer and Network Technology (BSc)  
Digital Communications and Electronics (BEng)  
Digital Communications and Electronics (MEng)  
Digital Forensic Technology (BSc Honours)  
Digital Rights Technology (BSc Honours)  
Digital Systems and Computer Engineering (MEng)  
Digital Systems and Computer Engineering (BEng)  
Electrical and Electronic Engineering (BEng)  
Engineering Product Design (BSc(Hons))  
Games and Graphics Hardware Technology (BSc)  
Internet Technology and e-Commerce (BSc)  
Media Technology and Digital Broadcast (BSc)  
Multimedia Technology (BSc)

#### **Aerospace Engineering**

Aerospace Engineering (BEng)  
Aerospace Engineering (MEng)  
Aerospace Systems Engineering with Pilot Studies (BEng)  
Aerospace Systems Engineering with Pilot Studies (MEng)  
Aerospace Systems Engineering (BEng)  
Aerospace Systems Engineering (MEng)  
Aerospace Technology with Management (BSc)  
Aerospace Technology with Pilot Studies (BSc)  
Extended Degrees in Engineering - Initial Year

#### **Post Graduate**

Automotive Engineering (MSc, PgD, PgC)  
Manufacturing Management (MSc, PgD, PgC)  
Operations and Supply Chain Management (MSc)  
Professional Engineering Doctorate programme (EngD)  
Professional Engineering Work-Based Learning (MSc)

Advanced Digital Systems (MSc)  
Biometrics and Cybersecurity (MSc)  
Broadband Telecommunication Networks (Msc)  
Data Communications and Networks (MSc)  
Data Communications and Networks (MSc)  
Embedded Intelligent Systems (MSc)  
Internet Engineering (MSc)  
Professional Engineering Doctorate programme (EngD)  
Professional Engineering Work-Based Learning (MSc)  
Radio and Mobile Communication Systems (MSc)  
Aerospace Engineering (MSc, PgD, PgC)  
Manufacturing Management (MSc, PgD, PgC)  
Professional Engineering Doctorate programme (EngD)  
Professional Engineering Work-Based Learning (MSc)

## **Colleges**

### **Cambridge Regional College**

#### **Engineering Courses**

City & Guilds 3901 Motor Vehicle Servicing & Maintenance  
NVQ Level 1 EAL Performing Engineering Operations  
IMI Level 1 Award Motor Vehicle Maintenance & Repair (Light Vehicle Route)  
NVQ Level 2 EAL Performing Engineering Operations  
BTEC First Diploma Electronics  
NVQ Level 2 Performing Engineering Operations  
IMI Certificate Motor Vehicle Maintenance & Repair (Light Vehicle Route)  
Certificate Vehicle Technology & Customer Service  
EAL Advanced Diploma Engineering & Technology (Level 3)  
IMI Diploma Vehicle Service & Repair (Light Vehicle Route) (Level 3)  
BTEC National Diploma Motor Vehicle Technology (level 3)  
BTEC National Qualifications Engineering (level 3)

### **West Suffolk College**

#### **Full-time courses**

Engineering (Maintenance) First Diploma (Course code: 107740VF013)  
Engineering Technology National Diploma (Course code: 107741VF012)

#### **Part-time engineering courses**

Automotive Vehicle Maintenance and Repair NVQ2  
Automotive Vehicle Maintenance and Repair NVQ3  
Computer Aided Drawing C&G 4353 Intermediate and Advanced  
Electronics National Certificate

### **Huntingdonshire Regional College**

#### **Full Time Courses**

Engineering - The New Diploma Levels 1 2 & 3

Engineering - BTEC First Diploma level 2  
Performing Engineering Operations - NVQ level 2  
Engineering (Mechanical) - BTEC National Certificate & PEO. level 3  
Engineering (Electrical/Electronics) - BTEC National Certificate & PEO. Level 3

#### **Part-time courses**

Computer Aided Drawing Using Solidworks City & Guilds 2303  
EMTA Intermediate Certificate in Engineering Technology  
Engineering Maintenance NVQ Level 3 (Mechanical, Electrical & Electronic)  
Foundation Degree in Engineering  
Mechanical Manufacturing Engineering NVQ Level 3  
National Certificate in Engineering  
Performing Engineering Operations (NVQ)

As part of the Regional University Partnership with Anglia Ruskin University also offer several HE courses:

HNC in Engineering (Mechanical and Electronic)  
HND in Mechanical Engineering  
HND in Electronic Engineering

#### **College of West Anglia**

##### **Full-time courses**

Advanced Diploma in Engineering  
BTEC First Diploma in Engineering  
BTEC First Diploma in Motorsport  
BTEC National Award/Diploma In Engineering  
BTEC National Award/Diploma in Motorsport  
Entry to Motor Vehicle  
Foundation Diploma in Engineering  
Higher Diploma in Engineering  
Introduction To Plumbing & Electrical Skills  
Level 2 Certificate in Vehicle Body and Paint Operations  
Motor Vehicle - Service and Repair Level 1  
Motor Vehicle - Service and Repair Level 2  
Practical Engineering Skills Level 1  
Practical Engineering Skills Level 2

##### **Higher Education**

BTEC Higher National Certificate Electrical / Electronic Engineering  
Foundation Degree (FdSc) in Motorsport Engineering  
Higher National Certificate in Engineering  
Higher National Diploma in Civil Engineering

## Appendix 2 – Courses published on Trainagain in 2010

### The Welding Institute- Industry Courses

EventName	EventDate
Welding Inspector - Level 2	13/12/2010
NDT Practitioner Level 3	22/11/2010
Adhesive Bonding Technical Workshop (Practical)	16/11/2010
Time of Flight Diffraction (ToFD)	01/11/2010
Radiation Protection Supervisor (RPS)	20/10/2010
Basic Radiation Safety (BRS)	18/10/2010
IIW/EWF Diploma - Fabrication and Application (Advanced)	11/10/2010
IIW/EWF Diploma - Fabrication and Application (Intermediate)	04/10/2010
Manual & Encoded Phased Array Inspection of Welds	04/10/2010
BGAS-CSWIP Painting Inspection - Grade 2	04/10/2010
Welding Inspection - Practical & Theory	30/09/2010
Visual Welding Inspector - Level 1	28/09/2010
IIW/EWF Diploma - Fabrication and Application (Foundation)	27/09/2010
Electronics Packaging Technology	21/09/2010
NDT Practitioner Level 3	20/09/2010
Damage Assessment for Rbi and Ffs Based on Api Rp 571	15/09/2010
Adhesive Bonding Technical Workshop (Theory)	14/09/2010
IIW/EWF Diploma - Practical Welding Technology	13/09/2010
IIW/EWF Diploma - Practical Welding Technology	13/09/2010
CSWIP Cathodic Protection Level 3	13/09/2010
CSWIP Cathodic Protection Level 3	13/09/2010
Electronics Packaging Technology	07/09/2010
Welding Inspector - Level 2	06/09/2010
Materials Weldability - C-mn & Low Alloy Steels	23/08/2010
IIW/EWF Diploma - Design and Construction (Foundation)	23/08/2010
IIW/EWF Diploma - Fabrication and Application (Foundation)	09/08/2010
IIW/EWF Diploma - Practical Welding Technology	09/08/2010
IIW/EWF Diploma - Practical Welding Technology	09/08/2010
NDT Practitioner Level 3	02/08/2010
IIW/EWF Diploma - Materials and Their Behaviour (Foundation)	26/07/2010
BGAS-CSWIP Site Coatings Inspector	05/07/2010
IIW/EWF Diploma - Welding Processes and Equipment (Foundation)	21/06/2010
Radiation Protection Supervisor (RPS)	09/06/2010
Ultrasonic Testing (UT) - Welds - Training & Exam Package	07/06/2010
Basic Radiation Safety (BRS)	07/06/2010
Welding Inspection - Practical & Theory	03/06/2010
Visual Welding Inspector - Level 1	01/06/2010
Appreciation of Ndt Techniques	24/05/2010
IIW/EWF Diploma - Practical Welding Technology	17/05/2010
Manual & Encoded Phased Array Inspection of Welds	10/05/2010
Penetrant Testing (PT)	10/05/2010
Welding Inspector - Level 2	10/05/2010
IIW/EWF Diploma - Design and Construction (Advanced)	10/05/2010
Adhesive Bonding Technical Workshop (Practical)	27/04/2010
IIW/EWF Diploma - Design and Construction (Advanced)	26/04/2010
Materials Weldability - C-mn & Low Alloy Steels	26/04/2010
Radiographic Interpretation (RI) - Light & Dense Metal Welds (Part B)	19/04/2010
Damage Assessment for Rbi and Ffs Based on Api Rp 571	19/04/2010
NDT Practitioner Level 3	19/04/2010
IIW/EWF Diploma - Design and Construction (Advanced)	19/04/2010
Wire Bonding	13/04/2010
Radiographic Interpretation (RI) - Principles (Part A)	12/04/2010
Time of Flight Diffraction (ToFD)	12/04/2010
BGAS-CSWIP Painting Inspection - Grade 2	12/04/2010
Wire Bonding	30/03/2010
CSWIP Plant Inspector Level 2 - Week 1	08/03/2010
Magnetic Particle Testing (MT)	01/03/2010
IIW/EWF Diploma - Materials and Their Behaviour (Foundation)	22/02/2010

## Institute for Manufacturing – Cambridge University - Industry Courses

EventName	EventDate
Technology Intelligence Monitoring Science and Technology Developments	14/10/2010
Innovation in Global Manufacturing - New Models for Sustainable Value Capture	23/09/2010
Friction Wear and Lubrication	15/09/2010
Delivery Performance	27/05/2010
Unique Value and Innovation	26/05/2010
Delivery Performance	25/05/2010
PRISM - Practical Information for Sustainable Manufacturing	19/05/2010
Delivery Performance	13/05/2010
Delivery Performance	13/05/2010
Company Visits	05/05/2010
Delivery Performance	28/04/2010
Supply Chain Management	18/03/2010
Technology and Innovation Management	16/03/2010
Supply Chain Management	16/03/2010
Technology Intelligence Monitoring Science and Technology Developments	11/03/2010
Emerging Industries	04/03/2010
Supply Chain Management	04/03/2010
Lean Planning and Control	03/03/2010
Supply Chain Management	25/02/2010
The Natural Step: a Unifying Framework for Sustainable Development	16/02/2010
Cut Waste Boost Revenue: Practical Examples From Industry	11/02/2010
Configuring International Supply Chains: an Integrated Operations Perspective Findings From Research and F	04/02/2010
Manufacturing Strategy for Start-ups	28/01/2010
International Design Scoreboard: Where the UK Ranks and Why it Matters	21/01/2010

## Cranfield University – Industry Courses

EventName	EventDate
Pumps and Pumping Systems for the Process Industry	22/11/2010
Axial Compressor Design & Performance	08/11/2010
An Introduction to Automotive Systems Engineering	19/10/2010
Combined Heat & Power	11/10/2010
Combined Heat & Power	11/10/2010
Airworthiness Fundamentals	13/09/2010
Aircraft Fatigue Damage Tolerance	05/07/2010
Introduction to Aircraft Stress Analysis	07/06/2010
Introduction to Aircraft Aerodynamics	07/06/2010
High Performance Computing for Cfd	28/05/2010
Validation and Verification for Credible Cfd	27/05/2010
Composite Material Structures	10/05/2010
Cost Engineering Awareness Development	29/03/2010
Cost Engineering Awareness Development	29/03/2010
Laser Micromachining and Surface Structuring	22/03/2010
Airframe Systems Design	15/03/2010
Advanced Control Systems	15/03/2010
Advanced Control Systems	15/03/2010
Advanced Signal Analysis	15/03/2010
Process Measurement Systems	01/03/2010
Air Transport Engineering – Maintenance Operations	01/03/2010
Specification & Performance of Mechanical & Electrical Rotating Equipment	01/03/2010
Clinical Evaluation of Medical Technology	23/02/2010
Clinical Evaluation of Medical Technology	23/02/2010

## Cambridge Regional College – Industry Courses

EventName	EventDate
Safety in the use of Abrasive Wheels	07/06/2010
Basic Vehicle Electrical Systems (Practical Skills Training)	22/04/2010
Engineering Workshop Practice	21/04/2010
Automotive Air Conditioning Refrigerant Handling	27/03/2010
City & Guilds 3268 Introductory Welding Skills Level 1 (Practical Skills Training)	25/02/2010
City & Guilds 3268 Introductory Welding Skills Level 1 (Practical Skills Training)	24/02/2010
Basic Electronics	24/02/2010
Automotive Air Conditioning Refrigerant Handling	24/02/2010
City & Guilds 3268 Certificate in Welding Skills Level 2 (Practical Skills Training)	22/02/2010
Safety in the use of Abrasive Wheels	15/02/2010
Automotive Air Conditioning Refrigerant Handling	30/01/2010
Basic Vehicle Electrical Systems (Practical Skills Training)	14/01/2010
Engineering Workshop Practice	13/01/2010
17th Edition Wiring Regulations C&G 2382-10	04/01/2010
Automotive Air Conditioning Refrigerant Handling	25/11/2009
Safety in the use of Abrasive Wheels	26/10/2009
Automotive Air Conditioning Refrigerant Handling	24/10/2009
City & Guilds 3268 Introductory Welding Skills Level 1 (Practical Skills Training)	17/09/2009
Basic Vehicle Electrical Systems (Practical Skills Training)	17/09/2009
City & Guilds 3268 Introductory Welding Skills Level 1 (Practical Skills Training)	16/09/2009
Engineering Workshop Practice	16/09/2009
Basic Electronics	16/09/2009
City & Guilds 3268 Certificate in Welding Skills Level 2 (Practical Skills Training)	14/09/2009
Automotive Air Conditioning Refrigerant Handling	26/06/2009
Safety in the use of Abrasive Wheels	25/05/2009
Automotive Air Conditioning Refrigerant Handling	24/04/2009
Basic Vehicle Electrical Systems (Practical Skills Training)	23/04/2009
Automotive Air Conditioning Refrigerant Handling	27/03/2009
Automotive Air Conditioning Refrigerant Handling	27/02/2009
City & Guilds 3267 Introductory Welding Skills Level 1 (Practical Skills Training)	26/02/2009
City & Guilds 3267 Introductory Welding Skills Level 1 (Practical Skills Training)	25/02/2009
City & Guilds 3267 Certificate in Welding Skills Level 2 (Practical Skills Training)	23/02/2009
Safety in the use of Abrasive Wheels	23/02/2009
Automotive Air Conditioning Refrigerant Handling	30/01/2009
Basic Vehicle Electrical Systems (Practical Skills Training)	15/01/2009
Automotive Air Conditioning Refrigerant Handling	28/11/2008
Automotive Air Conditioning Refrigerant Handling	24/10/2008
Safety in the use of Abrasive Wheels	20/10/2008
Automotive Air Conditioning Refrigerant Handling	26/09/2008
City & Guilds 3267 Introductory Welding Skills Level 1 (Practical Skills Training)	18/09/2008
Basic Vehicle Electrical Systems (Practical Skills Training)	18/09/2008
City & Guilds 3267 Introductory Welding Skills Level 1 (Practical Skills Training)	17/09/2008
City & Guilds 3267 Certificate in Welding Skills Level 2 (Practical Skills Training)	15/09/2008
Safety in the use of Abrasive Wheels	30/06/2008
Basic Vehicle Electrical Systems (Practical Skills Training)	17/04/2008
Basic Vehicle Electrical Systems (Practical Skills Training)	17/04/2008
IMI Diploma in Automotive Air Conditioning & Climate Control	20/02/2008
Safety in the use of Abrasive Wheels	18/02/2008
Basic Vehicle Electrical Systems (Practical Skills Training)	17/01/2008
Basic Vehicle Electrical Systems (Practical Skills Training)	17/01/2008

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