



Norfolk Skills Economy Project

Engineering & Manufacturing in Norfolk

January 2011

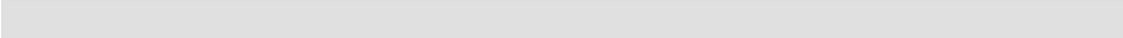
For: Shaping Norfolk's Future

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Executive Summary

This report deliberately challenges the notion that advanced manufacturing skills should be the main focus of attention when it comes to engaging with engineering and manufacturing businesses in Norfolk. On the contrary it proposes a mixed economy of “high end” and “low end” manufacturing skills to meet the needs of employers in the county and to ensure a healthy supply chain of skills – with the intention of averting the need for large scale imported skilled labour being required.

Despite the relative decline of manufacturing in the UK compared to other countries, 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.

There is much evidence of good employer engagement across all sectors of the engineering economy in Norfolk. But gaps persist and there is a danger that the needs of some manufacturing businesses are not being met. This report looks at the role FE and HE can play in helping to develop the engineering sector. 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. The FE sector has excellent resources and infrastructure from which the local business community would be pleased to benefit. 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.

Norfolk needs to ensure that it is supporting its manufacturing and engineering sector by offering effective upskilling provision – bringing together the innovation focused Hethel Engineering Centre with the core and specialist skills delivery of the FE sector. Moreover UEA should be encouraged to take a leading role in the sector – providing management and leadership support and developing its HE energy provision (see below) to add to the perceived value of the county’s sector skills base.

More could be achieved through a reinvigorated approach to GTAs (Employer led group training associations). Equally, the four colleges (CCN, CWA, GYC, & Lowestoft College) have plenty of evidence to show how they engage with employers, listen to their needs and deliver everything from NVQs and apprenticeships to bespoke solutions for the sector – yet again one can imagine a more joined up approach to upskilling and engineering training in general – and an agreement on which colleges will specialise in which manufacturing areas. Moreover employer responsiveness is at best, patchy; colleges have, not surprisingly ‘followed the funding’ and in recent years this has not always aligned with employer needs (even though it would have been in line with a government ‘demand led’ strategy).

The University of East Anglia needs to be a key player in any future strategy for engineering and manufacturing in the county. There is no ‘Cambridge’, ‘Cranfield’ or

'Hertfordshire' university to fall back on in Norfolk, yet UEA has consistently achieved very high research ratings in other subject areas and is at the centre of scientific innovations, ranging from biology, chemistry and environmental sciences to computing, mathematics and pharmacy. The university is currently planning to launch an MSc in Energy in the next year – with plans for a B.Eng in the following years (possibly from 2012). UEA also has a track record of working with engineering companies (e.g. Lotus in relation to electrical technologies).

Norfolk has a real opportunity to lead the way in developing a modern manufacturing and engineering skills strategy – not based necessarily just on advanced techniques but also following the supply chain down to the welders, fabricators and fitters who supply the sector; the CNC machines which are now used for small batch production for the energy, automotive, marine and aerospace sectors rather than the mass production needs of earlier decades. No matter how advanced a sector may be, it is likely to rely on traditional skills. This is particularly true of businesses involved in the supply chain to an emerging advanced sector.

This report suggests a skills strategy which builds on existing resources rather than necessarily creating new ones. It puts UEA at the top of a skills chain with the intention that it becomes centrally involved in skills and innovation for the sector. UEA and Hethel Engineering Centre must work closely together but equally the FE sector needs to be able to feed into HE as is already happening for example with the Lowestoft foundation degree in science and with a range of CCN higher education courses. Moreover CCN's successful application for University Technical College status will bring this seamless FE/HE reality even closer. Colleges (and EAGIT) also need to be part of the HEC skills hub to the extent that each of them has a specialist facility which could be better promoted to industry.

Pipe fitting could be an example of a future skills need which if not addressed now may lead to the importation of skilled temporary labour from other parts of the country leading to loss of income to Norfolk. Sizewell C will require hundreds of pipe fitters in the coming years (5000 people are likely to be deployed on the construction of the site over a 7 year period). Moreover, pipe fitting is a key process required across the energy sector.

On one level we could say that there isn't much to do. Skills shortage forecasts are unreliable and we know that employers would always prefer an over-supply of skilled labour to keep prices down and engender greater loyalty from their own workforce. So there isn't necessarily a case for intervention on the skills shortages front. Equally, skills gaps are generally short term so should never pose a serious problem for employers.

And yet on another level, it would be absurd to do nothing. The engineering/manufacturing sectors need all the support they can get, and they willingly participate when given the opportunity. Global competition for engineered products and services is severe; Countries from around the world are able to compete on price

– of land; labour and materials. And communications technology makes it easier every day, to make anywhere in the world feel local. Norfolk in particular, will be acutely aware of the dangers of businesses relocating. The county doesn't have an obvious engineering or manufacturing HE anchor and the training on offer appears quite disjointed with little constructive co-ordinated activity between the four main colleges. Hethel Engineering Centre acts as a local advanced engineering hub, but it's a niche market which doesn't resonate with all SMEs in the county. HEC could do much more to act as the county's beacon, ambassador, and champion for all aspects of the engineering sector. It is not as though the sector is so big in the county that one needs to differentiate between the sub-sectors: advanced; traditional; mechanical; electrical etc.. Norfolk needs a single powerful voice for the industry with stakeholders from both the private and public sector supporting and supplementing the message of support for engineering in the county. The aspirant Lotus Technology Park would certainly add critical mass to this idea and provide a key platform for the county's engineering and manufacturing potential.

UEA surely has a role to play within HEC. A university presence at HEC immediately creates a critical mass bolstering both institutions and providing a platform for greater innovation, knowledge transfer, and research for the sector. More than that, it sends a signal out to the private sector that the county takes engineering seriously – and of course it reinforces Norfolk's position in the global market place, potentially safeguarding jobs and businesses in the area.

So this report recommends working together in order to raise skills aspirations; deliver a more joined up approach to training; inspire graduates to choose the sector and stay in the county. Working together should mean – better information out to the market; more effective use of resources; and improved communications with employers (one thinks of ECITB's comment that they can't possibly know the demand for pipe fitters because they only cover businesses from the engineering construction side of the sector – others are "out of scope" and therefore out of bounds for employer engagement!)

This report identifies a range of challenges and opportunities which, if addressed could make a significant difference to the sector's prospects in the future. The following recommendations hopefully point to a way forward:

Recommendations

1. Explore the possibility of employers forming new Group Training Associations (GTAs), similar to the Warren/Milltech example, to further their workforce skills needs.
2. Identify the extent to which pipe fitting is a skills gap in the county.

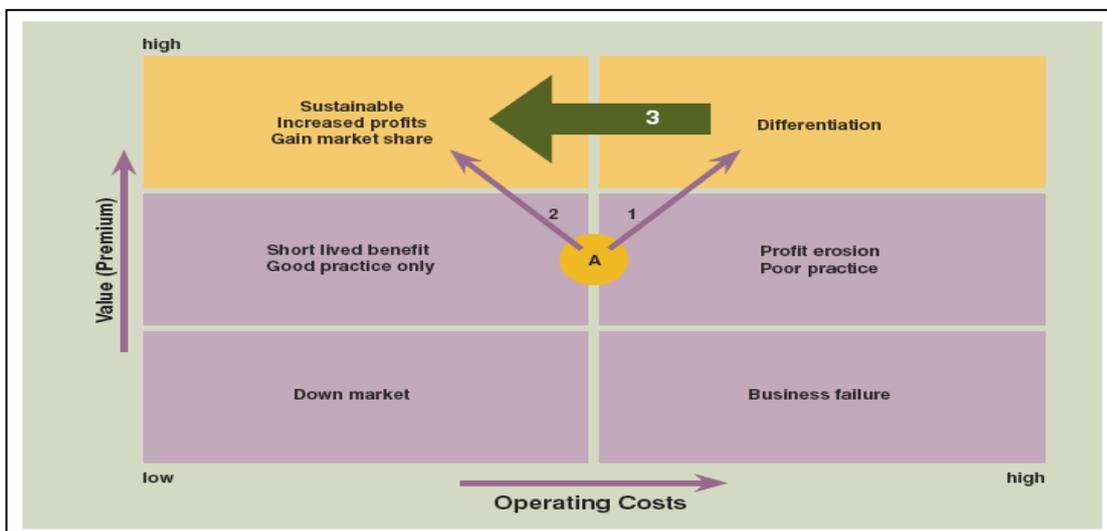
3. Based on the above, look into possibilities for pipe fitting courses in Norfolk, including apprenticeships (e.g. C&G 2800 or 2456).
4. Explore ways in which Hethel Engineering Centre (HEC) can become a genuine sector hub for engineering and manufacturing skills in the county.
5. Investigate ways in which UEA could become more involved in Hethel Engineering Centre, even entertaining the idea of a UEA HEC Chair for Engineering.
6. Work with CCN's new University Technical College to ensure that HEC is closely involved in its unfolding.
7. Develop a portfolio prospectus for engineering skills in the county – focusing on the specialist facilities available in each of the colleges; at EAGIT; and at Hethel Engineering Centre.
8. Develop a framework for engaging businesses in skills development; possibly through awareness raising peer to peer workshops (sharing best practice in upskilling); celebratory events – (rewarding business achievements in training); and ongoing dialogue on skills issues (perhaps through a GTA online forum).

1. Introduction

This report deliberately challenges the notion that advanced manufacturing skills should be the main focus of attention when it comes to engaging with engineering and manufacturing businesses in Norfolk. On the contrary it proposes a mixed economy of “high end” and “low end” manufacturing skills to meet the needs of employers in the county and to ensure a healthy supply chain of skills – with the intention of averting the need for large scale imported skilled labour being required.

In this report we use the terms manufacturing and engineering interchangeably – and refer to the sector in general even though there is a recognised implicit difference between ‘advanced’ and ‘basic’ manufacturing. Much of this difference, however is in the aspiration rather than the application of any specific ‘advanced’ technique. The Institute for Manufacturing based at Cambridge University, offers a definition based on the degree of added value, so advanced manufacturers are moving away from mass production techniques where they are likely to be out competed by emerging industrial leaders such as China, Russia, Brazil and India (the so called BRIC countries). Instead, advanced manufacturers are prototyping; running small batches; and adding life time service to the customer offer – as part of a clear differentiation strategy.

The diagram below taken from the TSB report on High Value Manufacturing shows that through differentiation, UK companies are able to gain market share and profitability – providing a sustainable base for the future.



(High Value Manufacturing TSB 2008 page 17)

Sector strategies usually incorporate a skills plan, yet skills don't necessarily fit neatly into one particular sector. Moreover, the temptation is to look at those entering the workforce (from schools, colleges and universities) rather than those already in work. Of course education establishments rarely follow sectoral lines resembling anything close to the UK economy, so we are constantly trying to align the output of skills with the needs of individual sectors.

Complex sectors present a set of problems for skills matching. Not only are they broad in terms of the range of functions required within the sector (from generic business skills to sector specific skills), but complex sectors have supply chains which may be crucial for the success of the whole industry. Manufacturing is interesting because techniques and processes change over time – and training providers therefore need to constantly invest in new equipment to keep up with industry needs.

Of course the excellent work in supplying new people from school into the industry is a vital part of the overall skills equation and this report makes the assumption that this work will continue unabated. There are many good examples of raising awareness about the engineering sector and schools, colleges and the university all benefit from their close ties. However, that is not the focus of this report – rather, it explores the gaps and potential solutions to skills issues already present in the sector, the ways in which businesses and their workforces can improve their prospects by tapping into a well thought out skills infrastructure.

This report covers manufacturing and engineering in Norfolk, whereas the next report (early 2011) will focus solely on the energy sector.

First, in Section 2 the policy context is explored, showing how important manufacturing is to the UK economy. In Section 3 we explore the Norfolk economy specifically, before focusing on the skills needs in the sector (Section 4). Section 5 outlines the main FE and HE provision in the county, and Section 6 explores skills from the business perspective – reporting on our telephone research and company visits around the county. Section 7 emphasises the importance of the ‘location’ decision for manufacturers and Section 8 offers a vision for engineering skills in Norfolk in the future. In Section 9, the need for Norfolk to grow its own skills base for engineering and manufacturing is discussed. Conclusions and recommendations are set out in Section 10.

2. Policy Context – UK Economy

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.

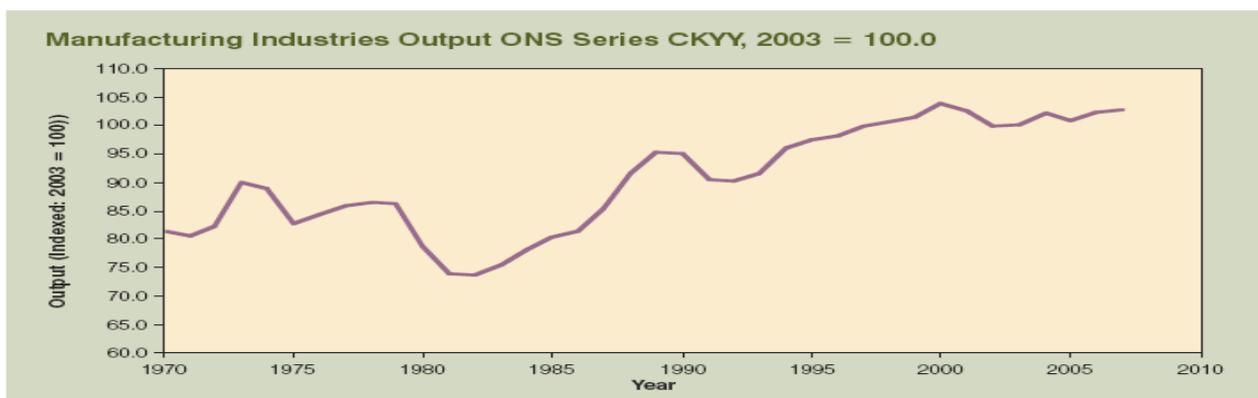
The Technology Strategy Board provides an important policy implementation dimension and survives the change in government this year. Set up in 2003 following a recommendation in The Innovation Report, the TSB provides a policy framework for technology businesses, and a range of ‘challenge’ funds, often encouraging SME and HE collaboration.

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.

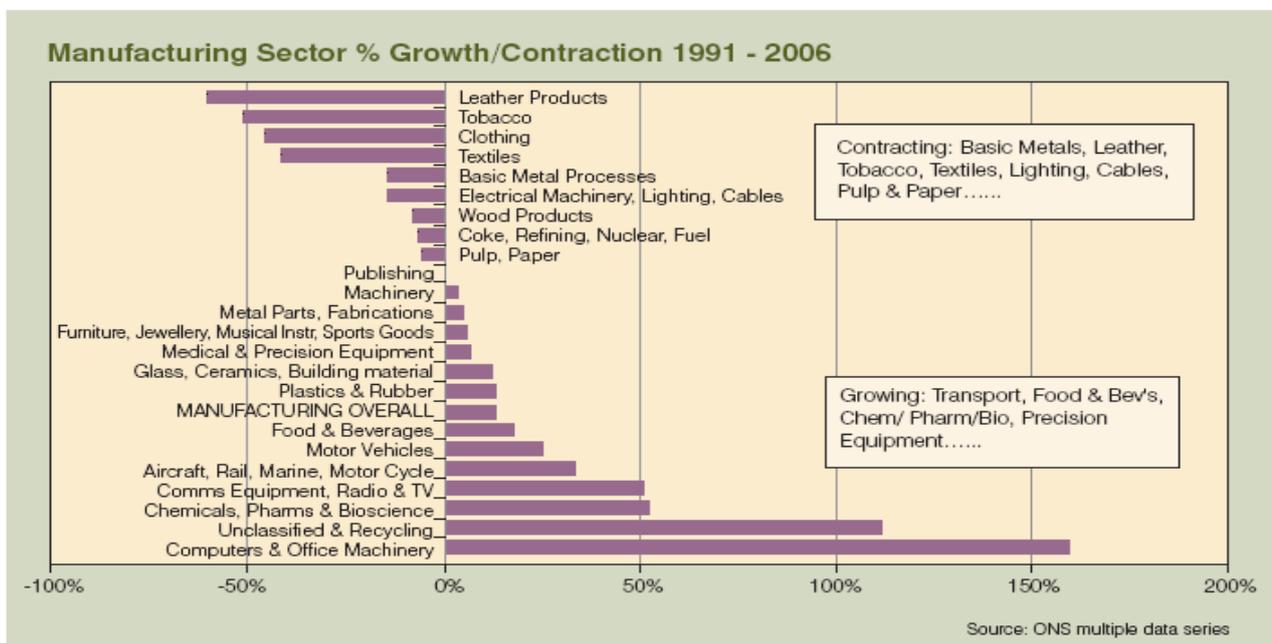
1. Manufacturing output in the UK has actually increased over the last 30 years.



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

This last diagram showing winner and losers is critical to a better understanding of manufacturing in Norfolk. It is the supply chains of the ‘winning’ sectors which need to be closely examined in order to gain a clearer picture of potential future growth. In Norfolk there are several important growth sectors within the engineering/manufacturing sectors. The Technology Strategy Board offers a list of ‘candidate technologies’ for advanced manufacturing. This has been overlaid with some tentative circles of growth for Norfolk.

The Technology Strategy Board's illustrations of 'candidate technologies' for Advanced Manufacturing. (With possible Norfolk emerging strengths circled)

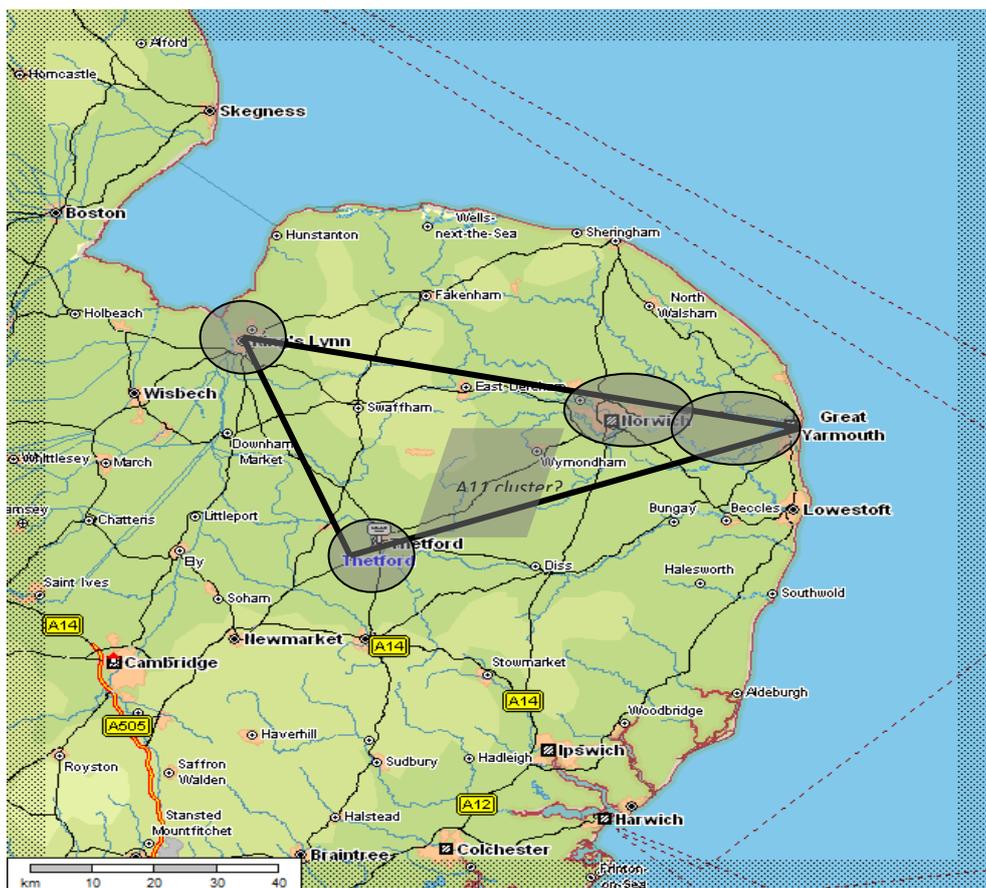
Pharmaceuticals and biotechnology	Food & beverages	Healthcare equipment	Aerospace	General industrials	Chemicals	Elec/Electronics
Natural active ingredients and micro/nano materials manufacture	Manufacture of new varieties, genetically modified ingredients etc	Novel polymer manufacture	Advanced & smart structures & materials	Energy efficient materials Alternate materials	Better ways to make small & nano particles	Cost effective, high energy density capacitors with extended operating temperature range
Process and active molecule modelling	Nutrition and shelf life modelling	Better physiological modelling based on in-vivo imaging	Synthetic environments & systems simulation	Use of finite element methods for life prediction	Higher fidelity, easier to use modelling	EMC design tools and design rules
Reduction of hazardous ingredients	Increased nutritional value New ready meals technology	Combination products Novel sensors	Advanced electric drives & distribution	Design of products to minimise environmental impact throughout lifetime	Better routes from olefins to alkanes	Smaller, more efficient high speed motors
New catalyst synthesis leading to reduced waste	Processing to retain nutritional value New sterilisation processes Automation	Manufacture of functional surfaces on implanted devices	Near net shape forming	Novel joining technologies Precision surfaces	Intensified Continuous Processing	Electronic systems embedded within injection moulded products
New diagnostic products and services	Rationalisation of support services	In-vivo monitoring through wireless sensors Minimally invasive servicing of implants	Health management & prognostics	Remanufacturing Design for servicing	Develop better understanding of down stream chemical use	Prognostics/ diagnostics for power electronics, self testing/condition monitoring
Advanced bio-informatics	The use of the internet for direct sales and marketing	Advanced health informatics	Network-enabled capability	New information formats and info minimisation through application of information theory and advanced knowledge extraction	Information traceability and maturity	Information overload & value
Implementation of new regulatory & industrial standards Reduction of experimentation	Efficient compliance with a high amount of legislation and accreditation systems	Identifying real clinical and market needs Infrastructure for increased speed to market	Design of service-oriented business models	Production management	Ability to engage with and navigate regulatory & industry standards processes	Strategic re-use of IP
Operation of increasingly fragmented supply chains in a highly regulated industry External partnerships	Identification of new sales channels to replace declining traditional fresh food channels	Integration of supply chain quality systems across raw material suppliers, contract manufacturers and OEMs	Outsourcing by primes to a global network of suppliers	Management of offshore and/or outsourced production	Substitution of non-renewable feedstocks by renewable	Supply chain networks bringing together universities, component suppliers and end users to deliver strategic research

Source: TSB 2008 High Value Manufacturing – Key Technology Area 2008-2011 –Appendix 2. (Norfolk circles and question marks added).

3. Norfolk – Engineering and Manufacturing Economy

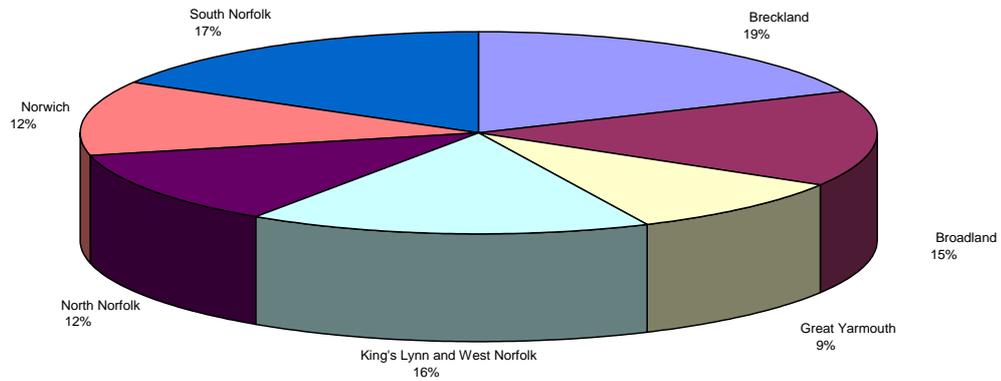
There are around 1000 manufacturing companies in Norfolk (1149 companies were identified through Companies House in 2010 – of which 916 fell into the following categories: engineering; transport; electronics; energy; food; and life sciences). The Annual Business Inquiry (ABI) 2009 brings together all production companies under one classification and records 2215 businesses for the county of Norfolk representing around 15% of the East's six counties capacity and around 2% of the UK's 'production' companies. This figure closely matches the Local Economic Assessment (November 2010) figure of 2280 business units under the "manufacturing" umbrella which is also based on the ABI.

SEMTA talk of an automotive cluster in the Greater Norwich area and there have been several economic development reports mentioning an "A11 automotive corridor" (see for example Hethel Engineering Centre - HEC Manufacturing Cluster Maps report 2010 and Breckland Spatial Strategy) and the Local Economic Assessment (2010) refers to the A11 having a "concentration of automotive and engineering expertise" (page 28). In addition to this cluster, one can refer to a key triangle of manufacturing 'hotspots' based around Greater Norwich – stretching out to Great Yarmouth; the Thetford area; and Kings Lynn. If HEC's plans for a Lotus Technology Park come to fruition (see Section 8), one can see a clear catalyst for advanced engineering emerging in the county, serving to influence and provide critical mass for the three key engineering hot spots identified.



The pie chart below, based on the Annual Business Enquiry 2009, gives a more even picture of production spread across the county.

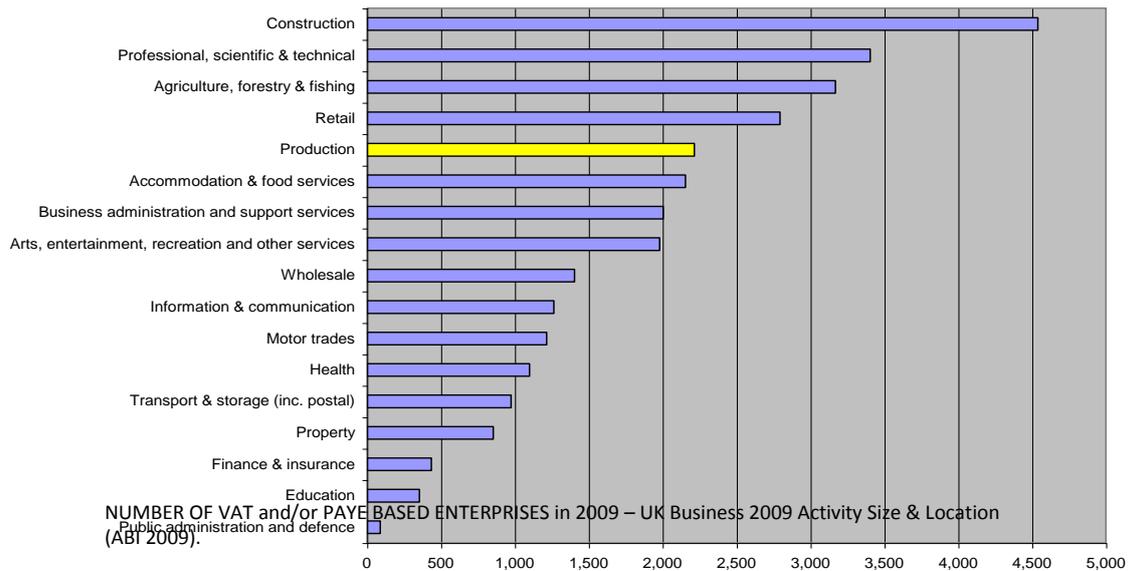
"Production" Companies in Norfolk



The Local Economic Assessment (2010) cites food processing (Kings Lynn & West Norfolk); energy (Great Yarmouth & northern coastal areas); engineering; marine industries and health and life sciences (Norwich); as the key sub-sectors making up the production base across the county.

According to the ABI (2009) "production" is the fifth largest sector in the county,

Norfolk Economy by ABI classification (numbers of businesses)



when measured by numbers of businesses in each category.

4. Skills Needs

According to SEMTA around 20% of manufacturing companies have skills gaps in the East of England and there is no reason to suggest this is different for Norfolk.

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). Keith 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) as evidenced by Bevis in the UK automotive sector. This could constrain the company, limiting its horizons and search for different ways of doing things (i.e. 'pure' innovation!) and finding new customers. It is interesting to note in this context, Milltech's decision to avoid over-reliance on the automotive sector (see Milltech case study in Section 6).

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

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?

Turning to the question of new recruits to the industry, the National Employer Survey (2009) found that non graduates were much more likely to be “poorly prepared for work” than graduates, with younger school leavers particularly deficient in key skills.

Employers, in general found that the young people they had recruited lacked specific skills or competencies, such as technical or job-specific skills; and had poor attitude, or a lack of motivation.

(NESS 09 Page 47 UKCES August 2010)

New & Old Engineering – Both need Traditional Skills

If Norfolk were to be divided into an old guard of engineering companies – albeit using modern machinery and a commitment to high quality to make their mark in the industry, and a vanguard of advanced engineering, Active Technologies would be part of the advanced vanguard – providing engineering solutions to complex problems – especially in the automotive sports and low carbon energy usage sectors. Interestingly though, the actual manufacturing techniques are similar to more traditional engineering companies (see Milltech and Warren Services below). And – to reinforce the point, Active Technologies are part of the GTA which has taken on apprentices through the new employer led training programme (see below). So once again, traditional engineering skills are seen as key to the success of the sector.

Douglas Westwood, the energy business analysts make a similar point, coming from a different perspective. In the appendix to their Industry Classifications report they create a matrix showing new energy sectors across the horizontal axis, and relevant classifications (work functions) along the vertical axis. These classifications are an excellent guide to skills needs within the energy sector.

The energy sectors include:

Offshore Wind
Onshore Wind
Bio Fuels
Biomass
Geothermal
Hydro

Hydrogen / Fuel Cell
Nuclear
Oil & Gas
Solar PV

Microgeneration
Wave & Tidal

Carbon Capture & Storage
Gas Storage

The skills needed in these sectors are suggested by some of the following classifications:

Fabrication &
Construction
Fluids & Lubricants
Forging & Casting
Foundations & Piles
Gears & Gearboxes
Grouting
Hoses & Fittings

Inspection & Testing
Pipes, Pipelines &
Risers
Process Control
Propulsion Systems
Pumps & Accessories
Reservoir Engineering
Ropes

Rotor Blades
Seals & Gaskets
Towers
Valves & Accessories
Welding

It is interesting to note how many of the skill classifications are actually traditional engineering skills, reinforcing the point that no matter how advanced a sector may be, it is likely to rely on traditional skills. This is particularly true of businesses involved in the supply chain to an emerging advanced sector.

5. Provision

Further Education in particular, 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 the latest processes and technologies and provide support for the development of an in-house company training programme (see Lotus below Section 6). 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.

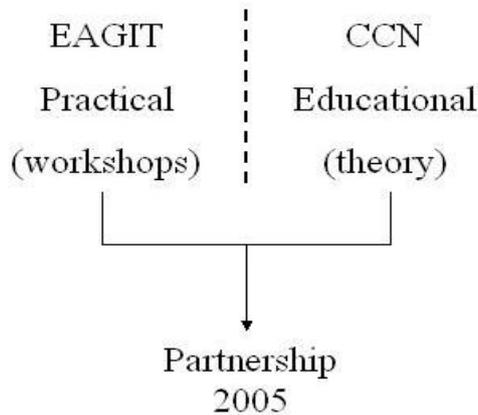
Below is a snapshot of engineering provision in the FE and HE sector in Norfolk (also including Lowestoft College in Suffolk). It is worth noting that there are many good private training providers operating in Norfolk and delivering key skills for the sector but they have not been listed here.

City College Norwich

The School of Technology incorporates the Engineering & Manufacturing Technologies. The college is one of the largest in the UK with 6,000 14 –19 students and an annual budget approaching £50m. Each of its academies is led by a 'board' of employers – (for example Lotus sit on the Manufacturing board). City College is unusual in the sense that it is an awarding body in its own right. The first college in the country to gain Awarding Organisation Status in April 2008, it allows the college to accredit high quality training provided by employers with nationally recognised qualifications.

City College entered into a formal arrangement with EAGIT in 2005. they agreed to stop competing for a diminishing market and instead to work together – each organisation working to its strengths – EAGIT providing the practical learning and CCN providing the classroom based theory. This relationship has developed over the last five years and it makes sense for it to continue in Greater Norwich.

CCN successfully applied for University Technical College status this year, and UTC provision will begin in 2011.



EAGIT

EAGIT has custom built workshop facilities, on the Norwich Airport Estate. EAGIT provides a wide range of training services to over 250 companies. With multi-level skills training which includes mechanical and electrical engineering, welding and fabrication, pneumatics and hydraulics, CNC, machining, fitting, milling and turning. EAGIT is well equipped to provide apprenticeships, short courses and bespoke training courses for the local industry. It is an important player in the Norfolk skills economy and is CCN's delivery partner for engineering apprenticeships.

Hethel Engineering Centre

Hethel Engineering Centre is the SNF Advanced Manufacturing & Engineering Sector Coordinator and has a dedicated Business Development Manager providing support to businesses in Norfolk. HEC is a vital part of the engineering skills equation in Norfolk. It is a successful innovation centre with a range of SMEs co-located at the site. HEC is a training centre, a conference venue, and an innovation hub. Its staff are specialists and have wide industry experience. HEC offers consultancy services, specific engineering services, network development, mentoring, and skills brokerage for the sector across the whole of the East of England as part of the Beyond 2010 programme. HEC runs a range of events including EAME2010 with nearly 600 attendees from the sector and it supports the three manufacturing excellence clubs in Norfolk; Its bi-monthly Real Advice Workshops, and quarterly Sector Focused Group meetings ensure that it has an 'open door' to engineering/manufacturing businesses across the county.

Great Yarmouth College

GYC has good mechanical, electrical and welding facilities. The college serves the local industry and has built up a reputation among engineering companies for skills. GYC now runs a three year foundation degree in mechanical engineering – they currently have around 30 students on the course, spread over the three years. This University Campus Suffolk (UCS) degree is jointly validated by the Universities of East Anglia and Essex. The course provides a recognised qualification for application for membership of the Institute of Engineering Technology (IET), or the Institute of Incorporated Engineers (IIE)

Lowestoft College

Lowestoft College provides a range of engineering courses and has some very good facilities across the engineering disciplines. However it is also an internationally successful commercial provider of maritime specialist skills, providing training in the areas of Emergency Response and Crisis management for the offshore industry. Training takes place in a purpose built simulation suite with interactive links to other facilities such as the Marine Bridge simulator. Facilities in the suite include a full range of authentic communications systems, alarms, process annunciators, data loggers, SCADA emulation, hi-fidelity sound effects, video monitoring and recording and classrooms. Lowestoft's commercial income amounts to some £1.5m per year, most of it coming from international clients.

College of West Anglia

CoWA delivers a range of full time engineering courses and its employer engagement team works with many engineering and manufacturing employers across the county. In addition to government funded learning, the college brings in an average £0.5m commercial income, and has a range of company based full cost programmes with employers such as Bernard Mathews; Purina; Palm Paper and Nestle. CoWA has a specialist facility for food processing which offers engineers the opportunity to test out equipment, fault checks, diagnose problems – all within a factory environment, but without the pressure of a rolling production line working to tight deadlines. This training facility is used by some of the largest food manufacturers in the county – at full cost, commercial rates – and customised to meet their needs.

CoWA offer a range of HE options including a Foundation Degree (FdSc) in Motorsport Engineering. The course appears to be aimed at people already working in or else “actively involved in” motorsport in some capacity.

UEA

UEA is an internationally recognised university. Although it has no core engineering provision, it has consistently achieved very high research ratings in other subject areas and is at the centre of scientific innovations, ranging from biology, chemistry and environmental sciences to computing, mathematics and pharmacy. The university is currently planning to launch an MSc in Energy in the next year – with plans for a B.Eng in the following years (possibly from 2012). UEA's EVOLVE programme and its Research, Enterprise & Engagement Office are good examples of outward facing teams who are actively developing links with SMEs and larger businesses around the county.

6. Business Interviews & Employer Case Studies

There is much evidence of good employer engagement across all sectors of the engineering economy in Norfolk. But gaps persist and there is a danger that the needs of some manufacturing businesses are not being met.

We carried out telephone interviews with 30 companies in Norfolk and visited several others. Of those interviewed, 60% had taken on an apprenticeship at some time in the past – although only 30% of companies currently had an apprentice in place. When asked if they would consider taking on a new apprentice just under half (47%) said yes. One third of respondents said they would be happy, at some stage in the future, to receive more information on apprenticeships – these are listed at appendix 2.

Has your company ever had apprentices?	60%	Said Yes
Are you aware that you can nominate any member of staff for an apprenticeship? (but its not necessarily free but always subsidised)	90%	Said No
Would you consider taking on a new apprentice?	47%	Said Yes
Would you like more information about apprenticeships?	33%	Said Yes

Current Situation: What kind of training goes on in your organisation:

	(a) Supplier (OEM)	(b) In house/ own trainer	(c) college	(d) university	(d) Group Training Association e.g. Eagit.	(e) Other Private	Accredited ? Yes/ No	if yes, which provider? a, b, c, d, e.
management		6	3	1		4		
specialist	8	7				9		
craft/technician	3	7	1		1	2		
Health & Safety		11	1			7		
other						1		

OEM = Original Equipment Manufacturer

Analysis of the interviews carried out in relation to existing training suggests that in house provision is the most popular form of upskilling across all training categories. According to the 30 companies interviewed, there is little activity which involves colleges and only one example of a company engaging with a university, (Lowestoft – University Campus Suffolk). Most companies have some involvement with private trainers and there were 11 examples of the original equipment manufacturer (OEM) being involved in training up specialists or technicians in the company.

On the question of the importance of local college provision, training young people was seen as the most important role for FE, followed by delivering apprenticeships. Working directly with companies was perceived as the least important role. Running

courses for employees (e.g. evening classes) fared only slightly better in terms of perceived importance.

	Very important = 5 Not very important =1
Your local college offers the following training solutions:	
How important is it for your local college to:	Aggregate scores
Train young people for industry jobs of the future	101
Deliver apprenticeships for businesses so they can train someone to do exactly the job they need now	96
Deliver on site training for groups of employees.	73
run courses that individual employees can sign up to.	78

When asked what more the local college could do for any of the above categories the following comments were made:

What's right about the current situation
"... really happy with Lowestoft...."

"...Great Yarmouth College are pretty good" – [in response to the question "what more should your college be doing to support your sector?"]

"Lowestoft - my experience is very good with this college. The contact and support is superior"

"Lowestoft College keep in contact with us, we've had guys there for health and safety and software training – excel and word. Its about marketing, telling us what's going on and what's available. Lowestoft do this really well."

What's wrong with the current situation
"Engineering in general does not get the same support as things like construction. More young people with a better understanding of what engineering can do for them would help"

"Let young people at college learn on site more, treat them like adults; if they want to put some money in so that people could be here to train we'd have them. On site is a better way to learn."

"They don't teach you imperial, it's all metric. They don't teach both, they should. The apprenticeship course is very basic. ... if the work all got checked it would be great. I quit my course when they tried to get me to do an IT course and key skills, I just want to do practical stuff".

"...the sort of courses my lot would want, they'd have to go away for. We have CNC machines so we send them to the manufacturer for training".

Suggested Improvements

"More practical, less theory based"

"Photoshop would be good; I think the college do everything we need. Some really technical specialist training is too high-tech for them to keep up with" [so better done by private specialist or OEM trainers?].

"They should do more to promote what they offer, and more special offers for companies. Maybe we'd train more if there were more offers. Our machining is all set up so no need there, software is so specialised. Generic software courses would be handy like Photoshop or 'office' could be good".

"The only thing I would need could be a welding course, I've thought about different routes to go down. I think it could be ideal to have them on the job like hairdressers do. But I found that my own apprenticeship was very different to actually working."

"...maybe make the apprenticeship courses a bit more practical..."

"..more specific to my industry ... tailored apprenticeships and other courses would be good"

"Cold calling, ringing us up, letting us know, better direct marketing would be good. Then we'd know what was on offer - right now I have to go looking."

"An overview of engineering, maybe like an apprenticeship but much quicker, just a couple of months."

There is very little knowledge of the role of Group Training Associations. An awareness raising exercise which explored how employers could come together to create appropriate GTAs and perhaps pool resources for training – could be an important next step in encouraging more training and development in the sector.

Involvement of Higher Education

Unlike the Greater Cambridge manufacturing profile, companies we interviewed in Norfolk don't tend to become involved with higher education institutes – and of course the lack of specialist academic capacity in engineering/manufacturing at UEA makes the connection between HE and businesses from the sector that much more difficult to imagine.

In terms of engagement with higher education most companies interviewed had no experience of this – but there were exceptions:

Working with Higher Education

Future Transport Systems are involved in a project with UEA at the moment – they also work with Cambridge university and Cranfield university technology park. Future Transport would consider taking on an intern: “Really we're interested in people who already have a good deal of experience in the automotive electricity generation sector. So we would be interested in taking on university graduates yes and we already work with a number of universities on various projects.”

Apogee Analysis has contact with UEA even though they don't have any engineering teaching, but they have met with their consultants and would consider taking on an intern.

CMAC have relationships with various universities around the country.

Applied Acoustics are looking at internships from Cambridge University.

Milltech

A recent example – a success story in fact, highlights the dangers of assuming that what FE and HE deliver is what business need. Milltech is a precision engineering company based to the north east of Norwich. It won the EDP/Barclays Commercial business of the year award in 2008 and more than 70% of its work is for the energy sector. It is one of many small companies which form the foundation stones of commerce in the county – and its attention to quality is exemplified by its accolades and the growth it has achieved over the last decade. Milltech, along with several other engineering businesses in Norfolk simply needed to be listened to. Their concern was that apprenticeships were not fit for purpose; that the local college had little interest in getting involved especially because the businesses were not seen as part of the ‘advanced’ sector. The fact that the advanced sector depends on businesses like this for its own development may have been lost in the rush to create academies, centres of excellence, or other (e.g. university technical college) aspirations.

Milltech's concerns were legitimate and perhaps point to a more universal problem. Apprentices seemed not to be getting the best off-site training and so employers felt reluctant to engage in the apprenticeship programme. “not like it used to be” has become a mantra for business leaders who have first hand experience of what a good apprenticeship looks like – having mostly done one for themselves in the 1960s, 70s or 80s. There is clearly the danger of a downward spiral whereby companies cannot see the point in taking on an apprentice because of the poor quality or relevance of the programme so they opt out and there are less places to go around in the future. The number of companies from our limited survey, who used to have an apprentice but no longer do, is telling.

Fortunately for Milltech and other companies involved, a solution has been achieved (see Warren Services below). A new apprenticeship programme has been introduced, parts of which have been written by the employers themselves. So the

content is entirely relevant to their needs. The solution has involved ‘knocking heads’ together ranging from City College Norwich (for accreditation); EAGIT (off site training); Hethel Engineering Centre (for advanced aspects of the course including instruction on using a 5 axis machine); and HAAS (using their specialists to train apprentices on their CNC machines).

In many ways, this exemplifies the way forward – listening to what employers say and working together to bring a solutions which meets their needs. It is as simple as that.

Warren Services

Warren Services is based in the heart of Norfolk. The company, founded as a small engineering services company 21 years ago, now has more than 60 staff spread across two sites (30,000 sq. ft and 8,000 sq ft.) on the outskirts of Thetford. The company has very low staff turnover – more than a quarter of the labour force have been there for more than 10 years.

Richard Bridgman has been at the helm since the beginning, although has more recently stepped aside to become Chairman of the business. His philosophy is based on quality and hard work – and he confidently asserts that apprentices with the right attitude will always find a career at the company. Richard has been somewhat of a ‘skills champion’ for the sector, pushing for curriculum changes in the delivery of apprenticeships and working behind the scenes to drive up quality in the programme. This has resulted in a genuine employer led Group Training Association being formed; this group has taken apart the old apprenticeship – and with the help of SEMTA, the (now defunct) LSC – Norfolk; and both EAGIT and City College Norwich, have put together a programme which reflects the needs of engineering companies in the area and conforms to all the necessary standards for the appropriate awarding bodies. It certainly shows that, rather than playing the ‘blame game’ where employers point the finger at Further Education’s lack of industry contact and FE complains that employers are not prepared to spare the time to contribute, instead - a constructive dialogue between the right organisations can make a lasting difference. The new apprenticeship includes a diverse delivery partnership: HEC will be involved in delivering some elements of the programme using advanced CNC machining techniques and local CNC manufacturer Haas – one of the best producers of CNC machines in the world, will deliver a series of awareness sessions and demonstrations for the new apprentices. Additionally the Haas e-learning module for CNC’s will be available on licence to the students. Local manufacturing sector manager, John Bradley has been instrumental in bringing together all these key players to deliver the apprenticeship programme. A cohort of 10 students started in September 2010 and if employers commit to taking on future apprentices, further courses will be run in future years.

Richard Bridgman is adamant about what’s needed. A new approach to apprenticeships which focuses on quality, the right attitude, and industry relevant technical skills.

Warren Services is a good example of Norfolk manufacturers not just surviving in a highly competitive global market place, but actually thriving. Moreover, the term “advanced” doesn’t appear in Richard Bridgman’s vocabulary, because what ever end of the engineering sector one occupies the reliance on traditional skills is paramount. Increasingly, competing globally is about differentiation and adding value. A high value manufacturer differentiates through, for example, lifetime service or by moving up the component assembly chain – effectively from selling “widgets” to selling “assembled products.” Or of course, by investing in automation so that the labour cost is removed from the competitive equation (labour is often the most significant cost advantage for foreign industrial competitors.

Warren Services also compete through sheer diversity. Their factory offers one of the most diverse range of sub-contracting engineering services in the country – from precision CNC milling & turning (EDM - wire) stainless steel fabrication, welding, electromechanical assembly to testing dynamic head water jet and laser cutting / profiling. Key to their success is having the right attitude and the right skills – and the starting point is apprenticeships which focus on traditional engineering skills, are applied in a modern setting, and delivered to exacting requirements.

Cooper Roller Bearings

Cooper Roller Bearings employ around 260 staff – the majority of these are based at the Kings Lynn site. They have built their own training centre which will be dedicated to producing high quality engineers through five year apprenticeships. Coopers have an ageing workforce and many employees will leave in the next decade, so training up replacements is essential. They currently have 19 apprentices; the first year is spent with College of West Anglia and the remaining years will involve specialist training at the training centre within the Cooper site.

Through contact with Hethel Engineering Centre, Coopers have become involved in EWEG (the Eastern Wind Energy Group initiative) which Stuart Morris, Director of New Business Development, suggests has been the “single most effective marketing spend we’ve ever made.” The initial investment of £11,000 has resulted in significant ,marketing exposure for the company and several contract breakthroughs. Through HEC, Coopers became involved in the I10 initiative and now have a KTP (knowledge transfer partnership) with Hertfordshire University.

It is interesting to note that Cooper is still searching for a graduate mechanical engineer with five years experience and have not succeeded in recruiting someone suitable even though they have advertised globally for this post.

Stuart Morris is keen to emphasise that the Coopers model requires significant engineering expertise even on the shop floor. Because their products are highly engineered, everyone in the workforce needs to be attuned to the precision process. This sets them apart from large volume producers – and with this quality comes a substantial training requirement. Coopers forecast growth of 12% in the next year, significantly higher than other businesses in the sector. Their split bearing technology, however, is unsurpassed in the industry – and therefore there is high

demand. Moreover, the local offshore wind farm industry has recently come to realise the asset they have on their doorstep; Cooper split bearings can be used to replace existing worn out bearings at a fraction of the cost of traditional replacement (which involved manoeuvring platforms out to sea, and dismantling existing rig in order to fit the new bearing). They have recently produced a new bearing that will extend the life of roller mills and this was launched in Germany earlier this year.

Stuart Morris feels that engineering has been eclipsed by the new technologies. “Engineering is not seen as tomorrow’s industry” he suggests. And yet the world is still driven by steel – split bearing technology can significantly reduce production cost – and it is that factor which gives Coopers its competitive edge.

Their website gives an example of the kind of saving that can be achieved through their bearing technology. A heavy duty clinker breaker application in the cement industry which used solid bearings was undergoing bearing replacement every six months, each change over took 32 man hours with 16 hours downtime. Production loss was quoted at \$7,500 per hour, resulting in a production loss cost to the customer of \$120,000 every time the bearings had to be changed. The total cost per year for this customer was \$240,960.

Once the bearings were replaced with Coopers 03 BCP 180mm GR bearings, installation time plummeted to 4 hours with the resultant savings of \$105,000.

Cooper Roller Bearings invest on average £2.5M per year in new machinery and work closer with the OEMs (original equipment manufacturer) to train up staff on the new CNC processes.

As the website states, “the name Cooper is synonymous with inventiveness, innovation and problem solving. Coopers are credited with holding as many as 137 patents.” That Kings Lynn is the home of this company needs to be celebrated – but it is also vital that the American owner (Kaydon) see a sustainable logic for keeping the site in Norfolk.

Group Lotus

Lotus is a Norfolk success story by any standard. It is a niche engineering business and a specialist car maker producing 2,500 cars per year (around 100th of Nissan’s annual production capacity). Whilst Lotus thrives on distinctiveness, it succeeds by recruiting local committed people and turning them into multi-skilled car builders. A training culture is embedded in the organisation and clearly it makes the difference.

John Vigar is responsible for Continuous Improvement and Training at Lotus. He has introduced a range of quality systems and best practices which led to the need of also upskilling the workforce at the car-making factory. Working with City College Norwich and the National Skills Academy for Manufacturing (NSAM) John and his training team has delivered an NVQ in Business Improvement Techniques (BIT) across the company. So successful has the training programme been that Lotus have begun helping other companies undertake the same upskilling journey.

Key to the achievements at Lotus has been the relationships between Lotus, the Skills Academy and staff at City College Norwich. Together they prepared the ground for an in-house NVQ programme – delivered by Lotus trainers and assessors who had been trained by the College.

Lotus is an international brand and is not dependent on Norfolk for its future. Innovation has always been at the heart of the company. It would not be too difficult to imagine the company being at the heart of a Norfolk Sports Car Academy. It could provide international conferences and workshops – perhaps working closely with Hethel Engineering Centre to provide training and 'Lean' consultancy for international customers as well as county based businesses. Such a venture could become a profit centre in its own right, especially if it could attract delegates and businesses from around the world. The manufacturing system at Lotus is unique and the company would also have the opportunity to highlight and celebrate its own brand of work based training. As well as exciting delegates through learning at first hand about its systems and processes it may also be possible for specialists training i.e. those associated with new types of vehicles such as electric cars and hybrids.

Lotus has been at the forefront of designing and making desirable sports cars for almost 60 years.

7. Location Location Location

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.

The report does not advocate that all production should remain in the UK, but it does suggest that companies should look at how production impacts on innovation; differentiation; customisation; and added value services.

"The linkages between production, design and development mean that having them in different locations may weaken the innovation process within the company." (IfM ibid page 3)

Norfolk needs to ensure that it is supporting its manufacturing and engineering sector by offering effective upskilling provision – bringing together the innovation focused HEC with the core and specialist skills delivery of the FE sector. Moreover UEA should be encouraged to take a leading role in the sector – providing management and leadership support and developing its HE energy provision to add to the perceived value of the county's sector skills base.

8. A Vision of Engineering in Norfolk –

How FE & HE can better Engage with the Sector

There is much evidence of good employer engagement across all sectors of the engineering economy in Norfolk.

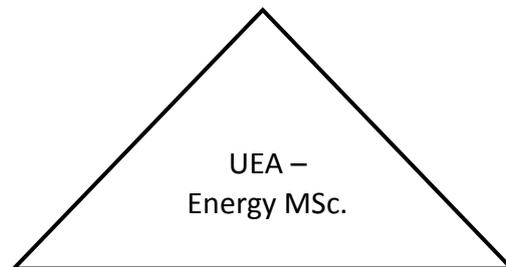
If one were to sketch out a vision for the future of engineering and manufacturing and how colleges and other skills institutions engage with the sector, what would be the starting point? Where would one be trying to create a critical mass of facilities, and when would it be appropriate to disperse resources across the county for greatest impact? Under the honourable banner of working together, how would it be possible to improve engineering training across all providers, sharing resources, facilities and even staff to achieve the best outcome for Norfolk?

The Group Training Association concept has received renewed attention in recent times (see for example ALP's Investigating the Group Training Association (GTA) model and the potential to develop and expand. February 2009). Having become almost an anachronism from the 1960's, GTAs now have the backing of government (see for example John Hayes recent speech to the Institute of Directors – hailing a new era for GTAs). Norfolk's EAGIT certainly has the history and a track record in delivering industry training over many years. But one can't help think that more could be achieved through a reinvigorated approach to GTAs, even challenging EAGIT's long held status as an employer led organisation. Equally, the four colleges (CCN, CWA, GYC, & Lowestoft College) have plenty of evidence to show how they engage with employers, listen to their needs and deliver everything from NVQs and apprenticeships to bespoke solutions for the sector – yet again one can imagine a more joined up approach to upskilling and engineering training in general – and an agreement on which colleges will specialise in which manufacturing areas. Moreover employer responsiveness is at best, patchy; colleges have, not surprisingly 'followed the funding' and in recent years this has not always aligned with employer needs (even though it would have been in line with a government 'demand led' strategy).

Hethel Engineering Centre needs to be at the heart of a rejuvenated approach to engineering training in the county. Already HEC has an admirable track record in making things happen. For example in the last month, Active Technologies Ltd. - an innovation led SME based at HEC - has organised and hosted an international workshop on "Innovation, Automation and Control" in partnership with SMC, BPX and Mitsubishi Electric, with critical input from HEC in the organisation and hosting of the event. Moreover the successful annual "Exhibition of Advanced Manufacturing and Engineering" (EAME) has become a showcase for the sector in the county – and plans to create a Lotus Technology Park will lead to a critical mass of advanced engineering activity at Hethel, further demonstrating the importance of bringing HEC into the heart of a future engineering vision for the county.

The University of East Anglia needs to be a key player in any future strategy for engineering and manufacturing in the county. There is no 'Cambridge', 'Cranfield' or 'Hertfordshire' university to fall back on in Norfolk, yet UEA has consistently

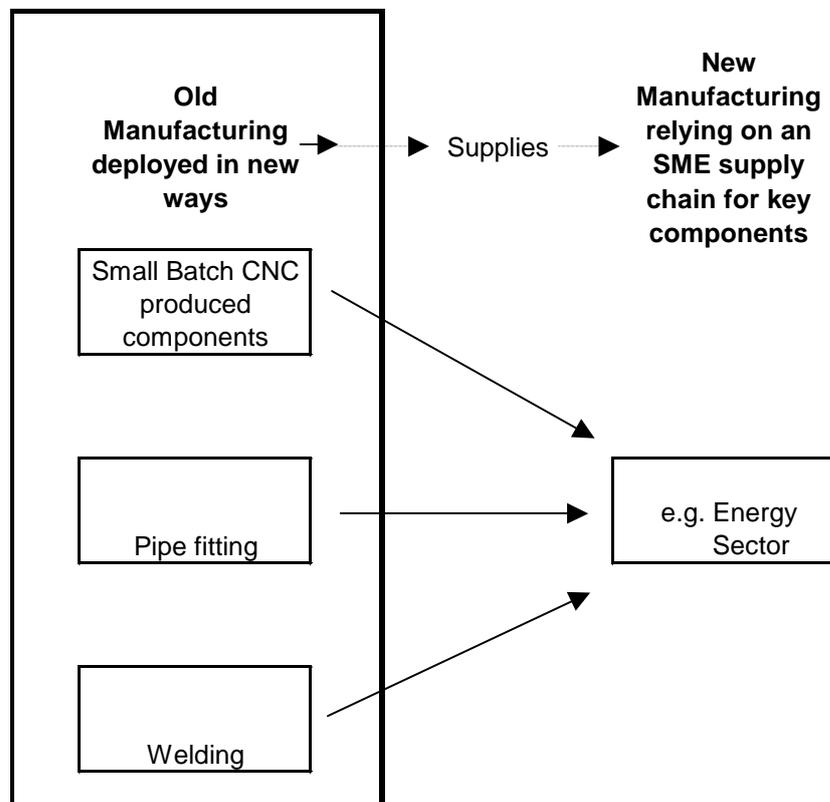
achieved very high research ratings in other subject areas and is at the centre of scientific innovations, ranging from biology, chemistry and environmental sciences to computing, mathematics and pharmacy. The university is currently planning to launch an MSc in Energy in the next year – with plans for a B.Eng in the following years (possibly from 2012). UEA also has a track record of working with engineering companies (e.g. Lotus in relation to electrical technologies).



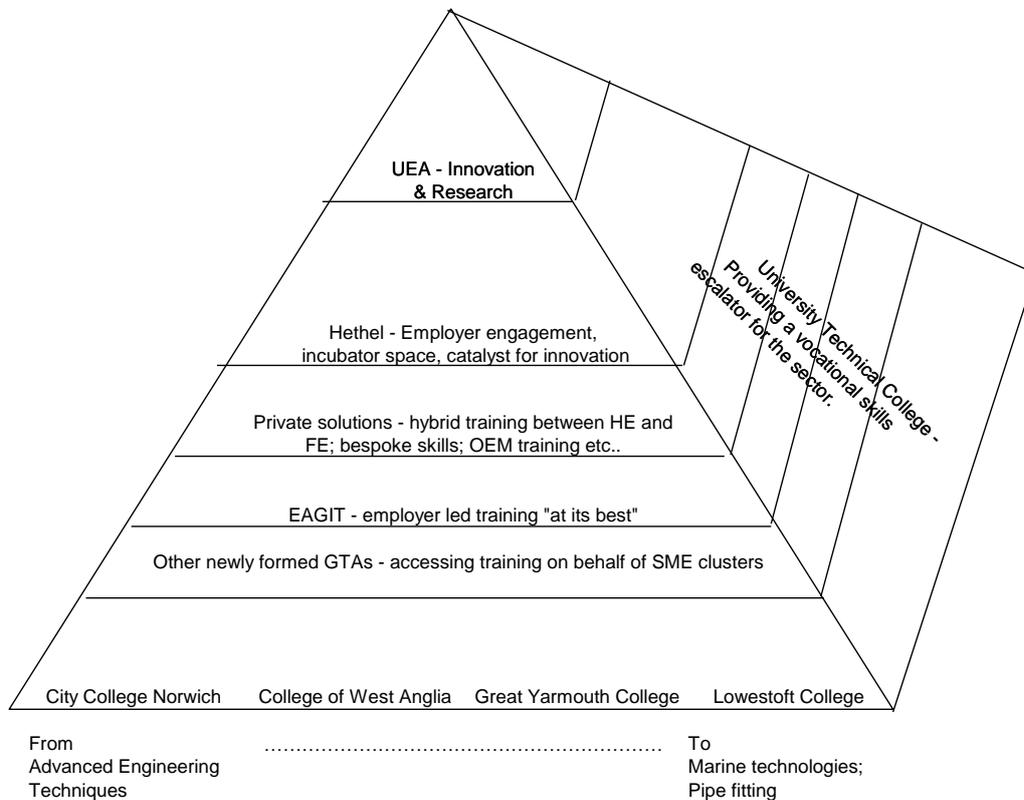
Here then is a starting point – a place at the top of the pyramid – where UEA leads the way in applied research focusing on the energy sector.

Energy is clearly a vital sector for skills – and Norfolk has a real opportunity to lead the way in developing a modern manufacturing and engineering skills strategy – not based necessarily just on advanced techniques but also following the supply chain down to the welders, fabricators and fitters who supply the sector; the CNC machines which are now used for small batch production for the energy, automotive, marine and aerospace sectors rather than the mass production needs of earlier decades.

Exploring the Supply Chain for Advanced Manufacturing Sectors



So what will this new skills base look like? If UEA is at the top of the pyramid, how does the picture look further down? Hethel Engineering Centre needs to be at the centre of the engineering skills equation for the county. But equally, there needs to be robust input from the FE sector.



The pyramid above suggests a skills strategy which builds on existing resources rather than necessarily creating new ones. It puts UEA at the top of a skills chain with the intention that it becomes centrally involved in skills and innovation for the sector. UEA and HEC must work closely together but equally the FE sector needs to be able to feed into HE as is already happening for example with the Lowestoft foundation degree in science and with a range of CCN higher education courses. Moreover CCN's application for University Technical College status will bring this seamless FE/HE reality even closer. Colleges also need to be part of the HEC skills hub to the extent that each of them has a specialist facility which could be better promoted to industry.

9. “Growing our own” Skills in Norfolk

Keeping engineering and manufacturing in Norfolk is important. But there is an equally persuasive argument to address potential skills shortages of the future. We have referred to skills shortages elsewhere as a ‘scatter gun approach’ (see Norfolk Baseline report September 2010). But spotting a gap in the future skills market and acting ‘ahead of the game’ may be a sensible precision intervention.

Pipe fitting could be an example of a future skills need which if not addressed now may lead to the importation of skilled temporary labour from other parts of the country leading to loss of income to Norfolk. Richards in Great Yarmouth is a precision engineering company which supplies the energy sector (among others). Richards would like to see an apprenticeship programme for pipe fitters but there is apparently insufficient demand for such a course to be put on. EAGIT are accredited to run the relevant pipe fitting course (e.g. C&G 2800 or 2456 both of which include pipe fitting key elements), and ECITB have an agreement to send companies to EAGIT for pipe fitting courses. But of course the programme can only run if it is economical to do so – and the minimum number would normally be in the region of 7 or 8. So in the absence of evident demand, EAGIT can’t act, and pipe fitting apprentices are sent to other counties by ECITB. Not only is this inefficient and an obvious disincentive but it also disadvantages Norfolk for the future. Sizewell C will require hundreds of pipe fitters in the coming years (5000 people are likely to be deployed on the construction of the site over a 7 year period. Moreover, pipe fitting is a key process required across the energy sector. ECITB describes it as follows:

“Pipefitting is the laying out and marking out, cutting, forming and joining of metal pipe, which when assembled form industrial process piping and heating/cooling systems.

Typical industrial process pipe is under high pressure, which requires metals such as carbon steel, stainless steel and many different alloy metals fused together through precisely cutting, threading, bending and welding”.

In the absence of pipe fitters in Norfolk the energy sector imports skills from other parts of the country (e.g. Midlands; Humberside; and Aberdeen). Yet this could be an expanding area of skilled employment for Norfolk and Suffolk in the near future. The immediate problem of demand is complicated by the fact that ECITB is only mandated to engage with employers from its sector scope, which is focused on engineering construction rather than on manufacturing components companies who supply pipe fitting to the sector. So through no fault of their own, they don’t necessarily get to see the whole demand picture. The problem is then further compounded by stakeholders and funding bodies talking up ‘advanced’ engineering and talking down basic manufacturing such as pipe fitting. Following the “bright stars” (energy solutions; advanced manufacturing; lean etc..) shouldn’t mean ignoring the “clouds” of SMEs supporting and supplying these new modern sectors.

Pipe fitting then, is likely to be a key skill requirement in and around the county for the foreseeable future and this needs to be recognised and supported by economic development strategies. Looking at how EAGIT or Lowestoft College may be able to run an apprenticeship course for pipe fitters even in the short term on an “uneconomic” basis may be a sensible start.

Apprenticeships – Cost Effective Way Forward

Strategic People’s report (commissioned by Kings Lynn and West Norfolk) looked at the skills needs in production and maintenance engineering in West Norfolk (August 2008) and concluded that apprenticeships were the most cost effective way forward. Although the research was focused on large manufacturing companies – the findings – about the benefits of apprenticeships can still be applicable to smaller companies.

The CFE Employers Project report(February 2008), focusing on Great Yarmouth, looked at skills vacancy solutions across several sectors (including manufacturing). Both of these reports suggest an organic solution to skills shortages – developing the capacity of people in the community to fill vacancies (apprenticeship or otherwise) in local companies.

So what kind of apprenticeships will be useful for the future?

ECITB suggest that the Advanced / Modern Apprenticeship in Engineering Construction “is recognised as the best proposition for new entrants to the industry to achieve craft skills and/or technician status both on and offshore. Many of today’s supervisors, managers, designers, etc previously achieved their own craft / technician competence through this system. The occupations and pathways covered by this framework are listed below:

Craft: Welders (Joining metal components using intensive heat processes) Pipefitters (Connecting pipework efficiently and safely) Mechanical Fitters (Assembling, installing and maintaining complex machinery) Platers (Cutting and shaping heavy sheets of metal to exact specifications) Erectors (Erecting the steelwork which holds up buildings and structures) Riggers (Lifting and positioning heavy loads using cables, ropes and chains) Electrical Installers (Installing and commissioning electrical plant and equipment)

Technician:

Mechanical Maintenance Technicians (Looking after valves, pumps and transmission systems and prime movers such as diesel engines and gas turbines)

Electrical Maintenance Technicians (Looking after high voltage power and distribution systems as well as motors, control systems and electrical systems)

Instrumentation and Control Maintenance Technicians (Calibrating and maintaining measurement systems for flow, level and temperature. Also responsible for electronic and pneumatic process control systems and fire and gas detection systems and flu gas analysers)

Non-Destructive Testing Technicians (Testing materials such as welded pipework or storage vessels to detect any flaws using testing methods including radiographic and ultrasonic)

Design and Drafting Head Office Technicians (Office based design and drafting of plans for various construction projects and processes)

Project Control Technicians (Controlling critical project aspects including planning, finances, and resources)

(ECITB: Advanced / Modern Apprenticeship in ENGINEERING CONSTRUCTION For use in England and Wales Page 9)

Appendix 1 lists the core elements of the City & Guilds 2800 and 2456, both of which may be applicable for Norfolk – and which EAGIT has been accredited by ECITB to deliver.

10. Conclusions and Recommendations

On one level we could say that there isn't much to do. Skills shortage forecasts are unreliable and we know that employers would always prefer an over-supply of skilled labour to keep prices down and engender greater loyalty from their own workforce. So there isn't necessarily a case for intervention on the skills shortages front. Equally, skills gaps are generally short term so should never pose a serious problem for employers.

And yet on another level, it would be absurd to do nothing. The engineering/manufacturing sectors need all the support they can get, and they willingly participate when given the opportunity (e.g. EWEG; GTA apprenticeship programme; EAME; etc.). Global competition for engineered products and services is severe; Countries from around the world are able to compete on price – of land; labour and materials. And communications technology makes it easier every day, to make anywhere in the world feel local. Norfolk in particular, will be acutely aware of the dangers of businesses relocating. The county doesn't have an obvious engineering or manufacturing HE anchor and the training on offer appears quite disjointed with little constructive co-ordinated activity between the four main colleges. Hethel Engineering Centre acts as a local advanced engineering hub, but it's a niche market which doesn't resonate with all SMEs in the county. HEC could do much more to act as the county's beacon, ambassador, and champion for all aspects of the engineering sector. It is not as though the sector is so big in the county that one needs to differentiate between the sub-sectors: advanced; traditional; mechanical; electrical etc.. Norfolk needs a single powerful voice for the industry with stakeholders from both the private and public sector supporting and supplementing the message of support for engineering in the county. The aspirant Lotus Technology Park would certainly add critical mass to this idea and provide a key platform for the county's engineering and manufacturing potential.

HEC shouldn't be asked to act on its own, beating a path for engineering around the county. It needs cooperation from UEA – whose brand in related fields such as environmental science is genuinely global. UEA surely has a role to play within HEC. A university presence at HEC immediately creates a critical mass bolstering both institutions and providing a platform for greater innovation, knowledge transfer, and research for the sector. More than that, it sends a signal out to the private sector that the county takes engineering seriously – and of course it reinforces Norfolk's position in the global market place, potentially safeguarding jobs and businesses in the area.

With HEC in UEA and UEA in HEC, there would be a firm foundation for building a Further Education alliance which can deliver vocational expertise. The key will be to promote the individual specialist facilities of each college. CoWA is in a good position to promote itself as a food manufacturing training hub and has the equipment to help businesses in the sector build skilled teams. Lowestoft's marine technology attracts customers from all over the world and should be promoted within the area much more than it is currently. Great Yarmouth College has specialist facilities for pipe fitters, and CCN has invested significant resources in its

automotive technology suite. These four college facilities and expertise need to be jointly promoted across the county but not on their own – rather, as part of a package of offers from the Hethel stable and involving private sector specialists wherever there are gaps. HEC already has an informal brokerage role through its Beyond 2010 work and this is set to continue over the next year. Adding in the FE sector to the mix, is surely not against any principles of employer choice (the ‘mantra’ of Beyond 2010).

We often talk of a ‘hub & spoke’ solution but it rarely works efficiently outside of a single organisation (with many sites for example). In what way could Hethel Engineering Centre break the mould and act as a ‘hub’ or catalyst for the sector? It is unlikely the HEC would want to become involved in actual FE brokerage – dealing with training enquiries from diverse enquirers and actually taking bookings for courses. But there may be a role for HEC in disseminating the FE offer across the county (or possibly the two coastal East Anglian counties).

HEC needs to be more than a niche innovation hub for advanced engineering. Both SMEs and colleges we have spoken to are unsure of its role and most have expressed an interest in knowing more – and seeing HEC play a more active role in supporting all of the sector.

So this report recommends working together in order to raise skills aspirations; deliver a more joined up approach to training; inspire graduates to choose the sector and stay in the county (UEA already records considerable success in retaining graduates in Norfolk). Working together should mean – better information out to the market; more effective use of resources; and improved communications with employers (one thinks of ECITB’s comment that they can’t possibly know the demand for pipe fitters because they only cover businesses from the engineering construction side of the sector – others are “out of scope” and therefore out of bounds for employer engagement!)

Multiskilling

The need for a multi-skilled workforce is more pressing than ever. Many companies rely on fewer engineers than before but their skills base needs to be across a range of specialisms: electrical, mechanical etc.. – so this needs to be reflected in upskilling courses. Lotus require all of their staff to multiskill - becoming specialists in lots of different assembly and production areas. Most of this training needs to take place at work and the trainers are Lotus staff. It would not be sensible for CCN, for example to train up their own staff to do the job, but they can still learn from the process and offer multiskilling courses to smaller companies who would not be able to afford their own training team. Lotus is clearly a best practice example for the county and it makes sense for FE to learn from them and pass the methods and processes on to other companies.

Multi-skilling College Staff

Multi-skilling isn’t restricted to engineering companies workforce. It is also important for college staff to learn from industry on a continuous basis – in order to become specialists in lots of different areas. Most companies will be only to pleased

to hear from their local college with a request for a day's upskilling in order to benefit the industry.

This report has looked at skills issues in relation to Norfolk's engineering and manufacturing economy. It has identified a range of challenges and opportunities which, if addressed could make a significant difference to the sector's prospects in the future. The following recommendations hopefully point to a way forward:

Recommendations

1. Explore the possibility of employers forming new Group Training Associations (GTAs), similar to the Warren/Milltech example, to further their workforce skills needs.
2. Identify the extent to which pipe fitting is a skills gap in the county.
3. Based on the above, look into possibilities for pipe fitting courses in Norfolk, including apprenticeships (e.g. C&G 2800 or 2456).
4. Explore ways in which Hethel Engineering Centre (HEC) can become a genuine sector hub for engineering and manufacturing skills in the county.
5. Investigate ways in which UEA could become more involved in Hethel Engineering Centre, even entertaining the idea of a UEA HEC Chair for Engineering.
6. Work with CCN's new University Technical College to ensure that HEC is closely involved in its unfolding.
7. Develop a portfolio prospectus for engineering skills in the county – focusing on the specialist facilities available in each of the colleges; at EAGIT; and at Hethel Engineering Centre.
8. Develop a framework for engaging businesses in skills development; possibly through awareness raising peer to peer workshops (sharing best practice in upskilling); celebratory events – (rewarding business achievements in training); and ongoing dialogue on skills issues (perhaps through a GTA online forum).

Appendix 1

The Certificate in Engineering provided by City & Guilds (C&G 2800) at Level 3 includes the following units:

- 001 Work effectively and safely in an engineering environment
- 002 Engineering principles and practice
- 003 Principles of welding
- 004 Principles of fabrication
- 005 Principles of fabrication and welding
- 006 Principles of installation, commissioning and maintenance engineering
- 007 Principles of materials processing
- 008 Principles of materials forming
- 009 Principles of mechanical manufacturing engineering
- 010 Principles of electrical engineering
- 011 Principles of electronics engineering
- 012 Principles of integrated engineering
- 013 Principles of shipbuilding
- 014 *Kept free for new NVQ routes*
- 015 Manual metal arc (MMA) welding
- 016 Metal inert gas (MIG) welding
- 017 Tungsten inert gas (TIG) welding
- 018 Mechanised welding
- 019 Thick plate work
- 020 Sheet metal work
- 021 Structural steelwork
- 022 Pipe and tube fabrication
- 023 Composite fabrication
- 024 Pattern development
- 025 Extrusion
- 026 Forging
- 027 Vacuum forming and moulding
- 028 Mould and core production and casting
- 029 Specialised casting processes
- 030 Pattern and model making
- 031 Manufacturing machinery and ancillary systems
- 032 Utility systems
- 033 Factory/plant services
- 034 Hydraulic systems and components
- 035 Pneumatic systems and components
- 036 Steam generation plant and ancillary systems
- 037 Power generation units and ancillary systems
- 038 Refrigeration plants and systems
- 039 Turning
- 040 Milling
- 041 Grinding
- 042 CNC Machining
- 043 Electro discharge machining (EDM)
- 044 Detailed fitting
- 045 Electrical equipment and systems
- 046 Computer integrated engineering (CIE)
- 047 Computer aided design (CAD)
- 048 Finishing surface coatings
- 049 Organising and managing engineering operations
- 050 Advanced mathematics and science
- 051 Industrial communications
- 052 Mechatronics systems
- 053 Robotics
- 054 Automation systems
- 055 Control systems
- 056 Control electronics
- 057 Analogue and digital electronics
- 058 Using wood for engineering applications

Leading to a certificate in one of the following:

Level 3 Certificate in engineering-Welding
Level 3 Certificate in engineering-Fabrication
Level 3 Certificate in engineering-Fabrication and welding
Level 3 Certificate in engineering-Installation, commissioning and maintenance engineering
Level 3 Certificate in engineering-Materials processing
Level 3 Certificate in engineering-Materials forming
Level 3 Certificate in engineering-Mechanical manufacturing engineering
Level 3 Certificate in engineering-Electrical engineering
Level 3 Certificate in engineering-Electronics engineering
Level 3 Certificate in engineering-Integrated engineering
Level 3 Certificate in engineering-Shipbuilding

The City & Guilds 2456 Level 3 contains the following elements:

Unit 1 Develop self and comply with legal and safety requirements
Unit 2 Interpreting information and marking out fabrication materials (steel erecting)
Unit 3 Hand cutting and shaping processes
Unit 4 Assembly and erection of structural steelwork
Unit 5 Interpreting information and marking out fabrication materials (platework)
Unit 6 Preparation, joining and erection of fabrication material
Unit 7 Forming of thick plate and sections
Unit 8 Interpreting information and marking out pipe work
Unit 9 Preparation joining and erection of pipe work assemblies
Unit 10 Fabrication and installation of pipe work systems
Unit 11 Preparing for and inspecting fitting operations
Unit 12 Fitting by filing and sawing
Unit 13 Fitting by drilling, reaming and threading
Unit 14 Fitting by machining and assembling components
Unit 15 Preparing and quality controlling the welding operation
Unit 16 Welding with manual metal-arc process
Unit 17 Welding with tungsten inert gas/tungsten arc gas shielded process

Appendix 2

These Companies may like more information on apprenticeships

Northgate Engineering	John layton	01493 740997	Northgate Engineering East Anglia Ltd, 1c Hemsby Road, Martham, Great Yarmouth, Norfolk, NR29 4QQ	northgate@unit1c.wanadoo.co.uk
Applied Accoustics Engineers	Sue	01493 440355	Applied Acoustic Engineering Ltd Marine House Marine Park Gapton Hall Road Great Yarmouth NR31 0NB United Kingdom	sue@appliedaccoustics.com
c & m hydraulics	John Pendergast	01493 655515	C & M Hydraulics Ltd. Da Vinci House, Harfreys Rd, Great Yarmouth, Norfolk NR31 0LS.	john.pendergast@smsgrp.com
Applus RTD	Steven	01493 604663	Applus RTD UK - Greath Yarmouth Office Unit 2, Brinell Way Harfreys Industrial Estate Great Yarmouth NR31 0LU Norfolk,	steven.haylett@applusrtd.com
Aquamech	Doug	01493 332507	Aquamech Services LTD, Wipstock House, Southdenes Road, Great Yarmouth, Norfolk, NR30 3LD	aquamech00@aol.com
Yarmouth Rewind	Sharon	01493 854554	Unit 11 Swanston's Road, Great Yarmouth, Norfolk NR30 3NQ	info@yarmouthrewind.co.uk
Aquazone	Gary Matthews	01493 416430.	Norfolk NR31 ONN	gary.matthews@aquazone.uk.com
Sprunt Engineering	Taha	01493 650 883	Sprunt Engineering Services Ltd, Unit 11, Suffolk Road, Great Yarmouth, Norfolk, NR31 0LN.	info@ses-engineering.co.uk
multiforce contracts	Mark	01493 600543	Unit 2-3, Shuttleworth Close, Harfreys Industrial Estate, Great Yarmouth, Norfolk NR31 0NQ.	mark@multiforcecontracts.com
C-mac Microcircuits Ltd	Chris Andrews	01493 856045	C-mac Microcircuits Ltd Fenner Works, Fenner Road, Great Yarmouth, Norfolk, NR30 3PX	chrisandrews@cmac.com
AK Engineering	Tony	01493 600365	AK Precision Ltd. Morton Peto Road Harfreys Industrial Estate Great Yarmouth Norfolk NR31 0LT. Telephone:	toni@akprecision.co.uk
Matric Wiring	Daniel Meakin, Director	01362 698811	NR20 3TR	sales@matrixwiring.co.uk
Apogee	Dr Andy New	01603 612 928	Unit 4 Marine Park, Gapton Hall Rd., Great Yarmouth, NR31 0NB	andrew.new@apogee-analysis.com
Comtek Ltd	Mick Grossman	01842 753 907	Thetford, Norfolk IP24 1HG T	enquiries@comtek-ltd.com
BRT Bearings	Dave Thorpe	01493 656834	B.R.T Bearings Ltd. Hewett Rd, Harfreys Industrial Estate, Great Yarmouth, Norfolk NR31 0NN.	