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UK COMMISSION FOR EMPLOYMENT AND SKILLS

Manufacturing: Sector Skills Assessment 2012

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Intelligence › Investment › Impact

Sector Skills Assessment: Manufacturing

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Foreword

The UK Commission for Employment and Skills is a social partnership, led by Commissioners from large and small employers, trade unions and the voluntary sector. Our ambition is to transform the UK's approach to investing in the skills of people as an intrinsic part of securing jobs and growth. Our strategic objectives are to:

- Maximise the **impact** of employment and skills policies and employer behaviour to support jobs and growth and secure an internationally competitive skills base;
- Work with businesses to develop the best market solutions which leverage greater **investment** in skills;
- Provide outstanding labour market **intelligence** which helps businesses and people make the best choices for them.

The third objective, relating to intelligence, reflects an increasing outward focus to the UK Commission's research activities, as it seeks to facilitate a better informed labour market, in which decisions about careers and skills are based on sound and accessible evidence. Related, impartial research evidence is used to underpin compelling messages that promote a call to action to increase employers' investment in the skills of their people.

Intelligence is also integral to the two other strategic objectives. In seeking to lever greater investment in skills, the intelligence function serves to identify opportunities where our investments can bring the greatest leverage and economic return. The UK Commission's third strategic objective, to maximise the impact of policy and employer behaviour to achieve an internationally competitive skills base, is supported by the development of an evidence base on best practice: "what works?" in a policy context.

Our research programme provides a robust evidence base for our insights and actions, drawing on good practice and the most innovative thinking. The research programme is underpinned by a number of core principles including the importance of: ensuring '**relevance'** to our most pressing strategic priorities; '**salience'** and effectively translating and sharing the key insights we find; **international benchmarking** and drawing insights from good practice abroad; **high quality** analysis which is leading edge, robust and action orientated; being **responsive** to immediate needs as well as taking a longer term perspective. We also work closely with key partners to ensure a **co-ordinated** approach to research.

Sector Skills Assessments (SSAs) are key sources of authoritative and focused sectoral labour market intelligence (LMI), designed to inform the development of skills policy across the UK. They combine "top-down" analysis of official data with bottom-up intelligence to provide a consistent, comparable and rich understanding of the skills priorities within different sectors of the economy, across the four UK nations.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed on the UK Commission's website at www.ukces.org.uk

But these outputs are only the beginning of the process and we are engaged in other mechanisms to share our findings, debate the issues they raise and extend their reach and impact. These mechanisms include our *Changing Behaviour in Skills Investment* seminar series and the use of a range of online media to communicate key research results.

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail info@ukces.org.uk, quoting the report title or series number.

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

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Executive Summary

Manufacturing is a major contributor to the UK economy and continues to be a key economic policy priority both in the UK and other developed economies. Manufacturing is a heterogeneous sector encompassing activities from those which require skill inputs of the highest order, to more mundane, more labour intensive activities. This variety has been reflected in the report wherever pertinent to do so. .

Current Performance of the Sector

The report analyses the current performance of Manufacturing, and its many sub-sectors, in detail. The UK continues to be one of the world's largest manufacturers. In 2010, the UK sector delivered:

- over £145 billion of added value to the economy
- over 55 per cent of the UK's exports
- over 3 million jobs; and
- 74 per cent of business Research and Development (R&D).

The Government has identified in its Growth Review the need for the economy to be rebalanced with an increasing share of output and employment to come from the manufacturing sector. In comparison to its European counterparts the UK sector is relatively small accounting for around 10 per cent of employment compared with 17 per cent in Germany.

The UK is the third largest destination for inward foreign direct investment in manufacturing in the countries of the Organisation of Economic Cooperation and Development (OECD) (behind the United States and Netherlands). Inward investment generated 94,000 jobs in 2009/10, a 20 per cent rise over the previous year.

The nature of investment is changing with 50 per cent of capital expenditure in manufacturing now in intangible assets like brands, training and design.

Overall, manufacturing GVA has maintained a similar level over the years 1999-2008. However, in this time the size of the workforce has decreased and the productivity per employee for the sector has been increasing at a much faster rate than for the wider UK economy. In large part this has been driven by innovation and R&D – much of which is concentrated in the manufacturing sector – giving rise to new product development and new production processes.

The Sector Workforce

The size of the Manufacturing workforce has decreased significantly since 2002, by some 28.5 per cent over the eight years to 2010, with the loss of Skilled Trades and Production Operatives being particularly high.

The Manufacturing workforce consists mainly of people working in Managerial, Skilled Trades or Production Operative occupations, with significant numbers working in Professional occupations, and a smaller number of Associate Professional occupations. The composition of the workforce is broadly the same around the UK, though in Scotland, Wales and Northern Ireland the proportion of the higher level occupations is a little lower, and the proportion working in the lower level occupations a little higher.

The occupational composition of those employed in Manufacturing varies considerably by sub-sector. For example, a comparatively high share of the workforce is employed in managerial, professional, and associate professional occupations in the Manufacture of Pharmaceutical-, Chemical-, and Electronic products and Beverages, as well as Scientific R&D. In contrast, a higher share of the workforce is employed in operative and elementary occupations in Food Products, Wearing Apparel, Paper Products, Textiles and Rubber & Plastics.

Manufacturing has comparatively traditional working patterns compared to the UK workforce as a whole, with fewer part-time, self-employed, and temporary workers than in the economy as a whole. Women still represent less than a quarter of the workforce despite a number of campaigns which have sought to increase the number of women in the sector.

Manufacturing has an ageing workforce, with greater numbers of its workers in the older age-bands than across the economy as a whole, and this property has increased since 2002.

The sector has slightly lower proportions of its workers from Black, Asian or Minority Ethnic communities.

Manufacturing has a slightly lower share of of migrant workers than in the economy as a whole but this varies between sub-sectors. There is, for example, a relatively large number of migrant workers in the Food Products and Wearing Apparel sectors.

Demand for, Use of, and Value of Skills in the Sector

The pattern of skill demand reflects the heterogeneous nature of the sector with there being a range of sectors which have a strong demand for high level skills typically with a STEM element, and those which are still relatively labour intensive and dependent upon machine operatives.

The rather mixed picture with respect to the demand side is replicated on the supply side. The evidence reveals that, overall; employers in the sector are less likely to have supplied training to their employees and, compared with their European counterparts, will have supplied fewer training hours.

Even though many of the original high performance working studies were conducted in the manufacturing sector – often with a view to improving the sector's performance – the evidence suggests that there is still considerable scope for HPW to be taken up by employers. Again, all of this relates to the heterogeneous nature of the sector and the differences in the approach of the leading employers in the various sub-sectors compared with the rest.

Extent of skills mismatch in the Sector

Overall the analysis reveals that employers in Manufacturing are less likely to report that they have vacancies currently, but where they do so they are more likely to result in hard-to-fill and skill-shortage vacancies than in the economy generally. Where skill shortage vacancies exist these are more likely to relate to technical and job specific skill requirements than in the economy generally. The data also reveals that the incidence of skill gaps in the sector is relatively high.

In general, where employers face skill-shortage vacancies or skill gaps employer recognise that these are having a negative impact on their businesses – such as lost business and delays in meeting customer demands. The response of employers when faced with skill deficiencies is to engage in more training. Yet, as indicated in the previous chapter, the volume of training undertaken in the sector is slightly lower than that recorded in the economy as a whole.

Labour retention is no more of a problem than in the economy generally. In other words, employers are able to retain the skills extant in their workforce. This may account for the relatively low level of recruitment of young people in the sector compared with the economy overall. In a sector with a relatively old workforce, the relatively low incidence of recruitment of young people may be storing up problems for the future.

Fewer Manufacturing employers than those from other sectors report concerns that their workforce is 'over-skilled' or 'over-qualified' (although still nearly a half do so).

There is little evidence of direct impact of skill mismatches on wage levels, although reported skill shortages in some engineering occupations have led to the inclusion of certain very specific roles on the official Home Office shortage list.

Drivers of change in the Sector and their skills implications

The demand for skill in Manufacturing is one derived from a number of factors which have, and will continue to, shape the sector. The principal drivers are:

- demographic change
- environmental change
- economics and globalisation
- technological change
- values and Identities
- consumer demand
- regulation and governance

The obvious impact of demographic change is upon labour supply and demand given the age structure of the sector's workforce; but it also relates to the range of products that will be in demand as a consequence of an ageing population (e.g. the demand this will generate for pharmaceutical and medical technology products).

Environmental change relates not only to how manufacturers, especially those with large carbon footprints, will need to adapt their production processes to reduce their carbon emissions, but also the opportunity to develop technologies which will support the environmental agenda.

Economics and globalisation relates to how manufacturers develop production processes which optimise supply chain relationships which are likely to stretch around the world.

Technological change in the manufacturing sector is constant in term of both processes and products. It is important that sector stays at the forefront of technological change through investments in innovation and R&D.

Values and identifies mainly refers to developing a strong brand which, in aggregate, enhances the value attached to buying a good which is designed and / or manufactured in the UK.

Meeting consumer demand essentially means having in place the processes which will allow manufacturers to anticipate and respond to changing consumer tastes. This relates to both the design and production processes.

Finally, employers need to be compliant with the wide range of regulation which governs their sector of activity.

The skill demand these will give rise to will be multifaceted, relating to having the skills to establish product market strategies capable of withstanding increased competition and changing consumer tastes. These might be considered the strategic skills required to withstand ongoing change. But there are also a range of tactical skills which are needed to support product market strategy related to innovation and design for manufacture, having the appropriate production systems in place, and employees with the skills to operate those production systems. The exact configuration of skills, as the chapter explains, is very much dependent upon the particular sub-sector in which an employer operates.

Future Trends in the Sector

The projections of future skill demand reveal the increasing demand for people employed in high level occupation (managers, professionals, and associate professions), and a decline in the number of people employed in skilled trades and operative occupations. This trend stems in large part from the skills the sector will need to obtain if it is to meet the challenges highlighted in the previous chapter.

It needs to be borne in mind that the level of replacement demand will be positive across all of the occupations on which the sector depends, including skill trades and operatives. This results in large measure from the fact that the sector has a relatively aged workforce.

From a more qualitative perspective it is expected that change will take place in the content of jobs. These relate to the strategic management skills which will be needed to steer companies through an increasingly competitive and technologically advanced future. There are a wide range of other management skills which will be required, related to, amongst other things, the management of supply chains, human resource management, and the management of innovation.

Reflecting the increasingly rich mix of skills the sector will need in the future, the number of professionals and associate professionals operating across a range of activities will increase. In other words, the sector is likely to employ more specialists in the future.

The fact remains that the sector will be looking to recruit skilled individuals against a backdrop of an overall decline in the number of people employed in the sector.

Priority Areas for action in the Sector

Looking to the future the priorities for the sector relate to:

- Ensuring that employers' product market strategies are sufficiently well developed so that they can anticipate changes in the segment of the market in which they operate. This emphasises the need to develop strategic skills in the sector
- But, it is not just the skills of the more senior managers which need addressing. There is also a need to ensure that the skills of new recruits and existing employees are also developed, especially since there is evidence that training levels might be relatively low
- Training needs to be embedded within the wider set of practices associated with high performance working including work-life balance practices which might contribute to a more diverse workforce as well as a more productive one
- It is possible that as the economy recovers and the demand for manufacturing increases, skill-shortages will emerge which will potentially constrain any growth. It is important, therefore, that investment in training of the existing workforce takes place alongside the adoption of high performance practices likely to make the sector more attractive to would-be recruits
- There are also a range of specialist skills which the sector will need to acquire over the medium-term, including those related to supply-chain management
- The sector will increasingly compete with other sectors to recruit the people with the skills it needs. The pressing issue, therefore, is to convince people of the relative merits of choosing a career in manufacturing. Many of the UK's leading manufacturers have succeeded in achieving this. It is important the practices associated with achieving this goal are adopted more widely.

1 Introduction

1.1 Purpose of report

The aim of this report is to provide authoritative labour market intelligence (LMI) for the Manufacturing sector to inform the strategic decision making of national governments in the development of employment and skills policy. It is one of 15 UK Sector Skills Assessment (SSA) reports produced by Sector Skills Councils[1] and the UK Commission for Employment and Skills.

SSAs combine top-down data from official sources with bottom-up sectoral intelligence to provide a consistent, comparable and rich understanding of the skills priorities within sectors across the four UK nations. The reports have been produced to a common specification (developed by the UK Commission in consultation with the four UK governments) and follow a consistent structure.

Reports have been produced for the following sectors of the economy:

- Agriculture, forestry and fishing
- Energy production and utilities
- Manufacturing
- Construction building services, engineering and planning
- Wholesale and retail trade
- Transportation and storage
- Hospitality, tourism and sport
- Information and communication technologies
- Creative media and entertainment
- Financial, insurance & other professional services
- Real estate and facilities management
- Government
- Education
- Health
- Care

[1] Please note: the Education SSA report was produced by the *Learning and Skills Improvement Service* (LSIS), which is not a licensed *Sector Skills Council*

The reports contain intelligence on sectors and sub-sectors of particular interest to the four UK governments. As each nation has different 'key sectors', that are defined in different ways, it has not been possible to define the SSA sectors in a way that matches precisely the key sectors identified by each nation government.

Therefore, as far as possible, data have been reported in such a way that it can be aggregated to produce an overall picture for key sectors of interest. In some cases this will involve gathering information from more than one SSA report.

The reports are designed to provide sectoral intelligence at a relatively broad level for strategic decision making purposes. Whilst they do contain some sub-sectoral and occupational intelligence, further intelligence at a more granular level may be available from individual Sector Skills Councils.

In addition to the main UK reports, executive summaries have been produced for Scotland, Wales and Northern Ireland. The UK reports contain information on key regional variations between the four UK nations and within England where appropriate (for example if sectoral employment is focused in a particular geographic area). However, the reports are not designed to provide a comprehensive assessment of sectoral skills issues beyond the national level.

1.2 Defining the sector

The sectoral scope of Manufacturing in the United Kingdom is specified in terms of 24 (two-digit) categories of the Standard Industrial Classification (SIC), and, for this Assessment, Scientific Research and Development is also included within scope.

SIC07 codes	Description
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related good
16	Manufacture of wood and wood products
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products
26	Manufacture of computer, electronic and optical products

SIC07 codes	Description
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment nec
29	Manufacture of motor vehicles
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacture
33	Repair and installation of machinery and equipment
72	Scientific research and development

Descriptions of the contents of each category are provided in Annex A.

1.3 Sector Skills Councils

The Sector Skills Councils whose remit, between them, covers UK Manufacturing are:

- Cogent
- Creative & Cultural Skills
- Improve
- Proskills
- Semta
- SkillsActive
- Creative Skillset.

The sectoral scope of each of these is summarised in the following statements:

Cogent

Cogent is the UK's industry skills body for chemicals, pharmaceuticals, life-sciences, nuclear, oil and gas, petroleum and polymer industries, and also has a key role in meeting the skills needs of emerging technologies.[2]

Creative & Cultural Skills

Creative & Cultural Skills is the Sector Skills Council for the creative and cultural industries. Its remit includes Craft, Cultural Heritage, Design, Literature, Music, Performing Arts and Visual Arts across the UK.[3]

[2] Note that SIC 24.46 *Processing of Nuclear Fuels*, although fundamentally associated with energy production, is accounted for within the Manufacturing SIC grouping, but addressed in the corresponding SSA for Energy

[3] The manufacturing element within the sectoral remit of ***Creative & Cultural Skills*** is the manufacture of jewellery and other related articles (32.12), the manufacture of imitation jewellery and other related articles (32.13) and the manufacture of musical instruments (SIC 32.20). These are 4-digit SICs found within code 32 - Other Manufacture. Creative & Cultural Skills also represents the craft sector (contemporary and heritage). Parts of the heritage craft sector will touch upon activity associated with manufacturing, but due to the limitations of the SIC system craft activity is not the primary focus of this report as it cannot be identified through 2-digit SICs. For more information about the craft sector please visit www.creative-blueprint.co.uk.

Improve

Improve provides the strategic overview for the food & drink manufacturing sector to help increase performance and productivity. It researches which skills are needed and sets national occupational standards, regulating and ensuring that qualifications are fit for purpose and directly reflect the skills and knowledge required by the sector.

Proskills

Proskills UK is an employer-led organisation that represents the interests of the industries that make up the process and manufacturing sector, covering Building Products & Refractories, Coatings, Ceramics, Extractive & Mineral Processing,4 Furniture, Furnishings & Interiors, Glass and Related Industries, Paper, Printing and Wood.

Semta

Semta is the Sector Skills Council for Science, Engineering and Manufacturing Technologies. Semta aims to address the sector's skills needs, providing expert support to improve performance and growth. It addresses the skill needs of aerospace, automotive, electrical, electronics, maintenance, marine, mathematics, mechanical, metals and engineered metal products, as well as research and experimental development on natural sciences and engineering.

SkillsActive

SkillsActive is the Sector Skills Council for the Active Leisure, Learning and Well-being Sector, working with five sub-sectors: Sport, Fitness, Playwork, The Outdoors, and Caravans.[5]

Creative Skillset

Creative Skillset is the Creative Industries' Sector Skills Council which comprises TV, film, radio, interactive media, animation, computer games, facilities, photo imaging, publishing, advertising and fashion and textiles.[6]

Each SSC carries out a wide range of research into skills and labour markets of relevance to its sectors: for more information about this, see the relevant website sections, as follows:

Creative & Cultural Skills

http://www.creative-blueprint.co.uk

4 Extractive & Mineral Processing is addressed in the corresponding SSA for Energy
5 The manufacturing element within the sectoral remit of SkillsActive is the Manufacture of Caravans (SIC 29.20/3)
6 The manufacturing element within the sectoral remit of Creative Skillset is the Manufacture of Textiles (SIC 13), and the Manufacture of Wearing Apparel (SIC 14), as well as (SIC 15) Manufacture of Leather and Related Goods, and (SIC 20.60) Production of Man-made Fibres

Cogent:

http://www.cogent-ssc.com/research/

Improve

http://improveltd.co.uk/england/food-industry-research-and-insight

Proskills

http://www.proskills.co.uk/research

Semta:

http://www.semta.org.uk/about_us/media_centre/labour_market_information.aspx

SkillsActive

http://www.skillsactive.com/what_we_do/research

Creative SkillSet

http://www.creativeskillset.org/research/

The coverage of the 25 SIC 2-digit sub-sectors among the seven Sector Skills Councils is summarised in Annex B.

The scope of this Assessment inevitably covers a wide range of types of manufacturing, whose markets, and labour markets, are by no means uniform. As well as presenting a considerable amount of quantitative evidence relating to Manufacturing as a whole, the report summarises, where data are available, the main variations between the positions in the different types of manufacturing.

It is important to note that the different elements of Manufacturing, as well as having separate market positions and being covered by different SSCs, are of differing intensity in, and so priority for, the nations of the United Kingdom. In particular, recent policy statements of the administrations for Wales, Scotland and England have confirmed special commitment to the following areas within Manufacturing:

England: Department of Business, Innovation and Skills (**BIS) Growth Sectors**:

Advanced Manufacturing

Healthcare and Life Sciences (the life sciences element within manufacturing)

Space

Scottish Government Key Sectors

Life Sciences

Food and drink (food and beverage manufacturing element)

Welsh Government Key Sectors

Advanced Materials / Manufacturing

Life Sciences

Agri-food (food and beverage manufacturing element)

1.4 Summary of methodology

This report combines top-down data with bottom-up intelligence to provide a rich assessment of sectoral skills priorities that is consistent and comparable with assessments produced for other sectors of the economy.

Three main types of information have been drawn on in the preparation of this report:

- Economy-wide quantitative data from core labour market information sources (such as the Labour Force Survey and the UK Commission's Employer Skills Survey)
- Sectoral, sub-sectoral and occupational specific quantitative data generated by SSCs / sector bodies and others (including Government departments and agencies, academics and professional associations)
- Qualitative information collected by SSCs / sector bodies and other organisations.

To ensure consistency and comparability across all 15 SSA reports, data from core labour market information sources was centrally collected, processed and formatted. It was then distributed by the UK Commission to Sector Skills Councils / sector bodies for inclusion within the reports. This data was quality assured by contractors, the UK Commission and by Sector Skills Councils.

To meet consistency requirements, sub-sector analysis of data from core sources has primarily been undertaken at a 2-digit Standard Industrial Classification (SIC) code level (or by combining 2-digit SIC codes where appropriate).

Data from core sources has been supplemented within the report with data from sector specific sources. The SSCs involved with Manufacturing skills themselves have developed extensive contacts with a wide range of employers within their sub-sectors (and market 'segments') operating 'below' the SIC 2-digit categories mentioned above (e.g. Aerospace- and Marine- Engineering Manufacturing within SIC 30: Manufacture of Other Transport Equipment), and are therefore able to gain more thorough understanding of key aspects of skills demand within these sub-sectors and segments.

This additional evidence base enables Sector Skills Councils to test the findings of UK-wide employer surveys (e.g. UK ESS 11) against the realities of Human Resource Management (HRM) within real companies. In addition to this in-depth understanding, SSCs carry out, from time to time, their own surveys of employers in one or more of the industries within their footprint – surveys that cover many of the same indicators as those within the UK ESS 11. These enable them to gain further quantitative insights into the skill needs of these employers, in some cases filling gaps, and in others achieving more representative sub-sector sample sizes to improve the validity of the evidence base.

The report also draws on qualitative research that has been undertaken to explore sectoral skills issues in more detail. Qualitative research with small samples of employers (and others), most commonly through interviews and focus groups, seeks to provide rich and detailed understanding and insight, rather than measurement. Samples tend to be designed to be broadly representative of the wider population, to gather a range of views. In terms of skills research with employers, size and sector tend to be key drivers of demand and therefore these are usually the main characteristics that are taken into account when designing samples.

The report synthesises and contextualises information from the sources identified above and, by undertaking a rigorous analysis of it, turns the information into intelligence.

Further information

Further methodological information is provided within the Technical appendix. This includes descriptions of the main quantitative and qualitative sources used within the report.

In addition to the UKCES supplied quantitative data, this report has drawn on evidence from a number of different sources. These are shown in the tTable below, together with information on the confidence that can be placed in them.

Data provided	Data Source(s)	Confidence level
Values for 5 indicators of main contribution to the UK economy (Table 2.1)	• IDBR • ONS LFS • ONS ABS • ONS Trade Statistics	All Sources quality assured by ONS – confidence as high as for any other quantitative data in the report.
Business Enterprise R&D data (Figures 2.2, 2.3, 2.4 and 2.5)	ONS R&D Inquiry	High - Data quality assured by ONS
Quarterly Export figures for Manufactured Products (Figure 2.6)	ONS Trade Statistics	High - Data quality assured by ONS

Data provided	Data Source(s)	Confidence level
Manufacturing productivity for some European economies (Figure 2.7)	Eurostat Detailed Enterprise Statistics	High - Data quality assured by Eurostat
Manufacturing Labour productivity for some OECD member countries (Table 2.17)	OECD Productivity database	High - Data quality assured by OECD
Trend data for 'Labour composition' and 'LFS hours' (Figures 2.8, 2.9 and 2.10)	ONS LFS, as analysed by ONS official	High (Official statistics - details in Acheson, 2011)
Manufacturing Sub-sector data tables (Tables 2.1, 2.11, 2.15, 2.16, 2.19, 3.4, 3.13, 3.22, 4.2, and 4.32)	2-digit SIC tables for official survey data provided by UKCES	High - Data presented generally based on *percentages*, rather than absolute numbers. Where absolute numbers shown, unreliable estimates suppressed in accordance with the agreed suppression strategy
Data provided	**Data Source(s)**	**Confidence level**
Employment estimates for R&D workers in detailed product groups (Table 4.4)	ONS R&D Inquiry	High - Data quality assured by ONS
Correlation mis-match statistics for Product Strategy vs. Skill Level (Table 4.3.3)	UKCES Evidence Report: NESS 09 results analysed by respected researcher	High

Where evidence is reported from published work, this is referenced, and qualitative statements about sub-sectors, where not referenced, come from Sector Skill Council assessments.

2 Current performance of sector

Summary

This Section examines the key factors of relevance to Sector performance, presenting:

- the economic and policy context for UK Manufacturing;
- the main characteristics of the 25 different manufacturing sub-sectors;
- the central importance of innovation to sustainable economic performance;
- the importance of Manufacturing within economic policy, both within the UK and and beyond.

It also provides quantitative evidence on key elements of Manufacturing:

- Gross Value Added (GVA);
- productivity estimates using per capita GVA;
- enterprise numbers;
- numbers of company start-ups and closures;
- employer size profiles;
- export growth and international productivity comparisons;
- employment levels (showing development of elements of Quality-Adjusted Labour Input for Manufacturing and comparators), including comparisons with other European Union Member States.

Over the recent past the sector has had to withstand increased competition from low labour cost countries. It has sought to counteract this by increasing its productivity levels in part by concentrating production in higher value goods and by investing in process innovations. Though the evidence relating to investments in innovation is somewhat mixed, the evidence nevertheless points to productivity increases taking place across the overall sector. With segments of the market which are dependent upon relatively labour intensive production systems increasingly located in countries with relatively low labour costs, and due to increases in the productivity levels in the UK based sector, employment in UK Manufacturing has continued its long-run decline.

Even though employment levels – as a proportion of overall employment – are unlikely to recover their 1970s levels, the Government has identified advanced manufacturing as one of its priority growth sectors. This relates very much to the strategic importance of sectors such as aerospace and defence, as well as the relatively high value, high skilled, high- wage employment associated with advanced manufacturing. There are also supply-chain relationships to consider and the potential for the sector to create demand for employment in other sectors of the economy. It is notable that other key competitor countries such as Germany and France have relatively large manufacturing sectors.

Manufacturing, however, is a heterogeneous sector. Alongside the advanced manufacturing sector which utilises the latest process techniques to produce relatively complex goods for the global market, there are also sectors of the industry which use more routine processes – often mass production techniques - to produce less complex products more dependent upon the domestic market. The key issue for the sector is that it adopts the appropriate product market strategies given the particular segment of the market in which it operates. The relatively high level of business failure of the recent past demonstrates just how difficult this is to achieve given current levels of domestic, European, and global demand for manufactured goods. This is particularly the case for those sub-sectors which are dependent upon the construction sector. Nevertheless there are employers operating in a variety of sub-sectors which have been able to grow in the current climate by investing in process and product technologies and using relatively high levels of skill in their workforces.

This evidence confirms a substantial, competitive UK Manufacturing sector, working to respond actively to fierce international competition, and currently presented with both UK and many export markets showing limited, or no growth, and with a number of challenges for its Business leaders for the future, including continuing lower measured productivity levels than for manufacturing in important competitor economies.

2.1 Economic and policy context

Manufacturing remains a major strength of the UK, in spite of stiff, and growing, competition in the global market-place. The industry has been, and continues to be, an important part of the British economy. UK Manufacturing has well established strengths in sectors such as engineering machinery, pharmaceuticals, aerospace, automotive and marine products, chemicals and electronics, and through diversification and recognising the need to evolve and embrace new, emerging and evolving markets, UK Manufacturing is in a strong position and well placed to respond to new challenges and opportunities.

The United Kingdom continues to be one of the world's largest manufacturers. The UK industries addressed in this report delivered, in 2010:

- over £145 billion of added value to the economy;
- over 55 per cent of UK exports and over 3m workforce jobs;
- 74 per cent of business Research and Development (R&D).

In addition,

- the UK is the third largest destination for inward foreign direct investment in manufacturing in the countries of the Organisation of Economic Cooperation and Development (OECD) (behind the United States and Netherlands)
- inward investment generated 94,000 jobs in 2009/10, a 20 per cent rise on the previous year
- Manufacturing is changing – 50 per cent of capital expenditure in manufacturing is already in intangible assets such as brands, training and design.

On gaining power in May 2010, the new government expressed its commitment to re-balancing the economy. The Coalition Programme for Government indicated that:

> The Government believes that business is the driver of economic growth and innovation, and that we need to take urgent action to boost enterprise, support green growth and build a new and more responsible economic model. We want to create a fairer and more balanced economy, where we are not so dependent on a narrow range of economic sectors, and where new businesses and economic opportunities are more evenly shared between regions and industries.

Following an extensive economic review of the position of UK Manufacturing in the global marketplace (BIS, 2010a, b), the Department for Business, Innovation and Skills (BIS) has developed and refined, in collaboration with Her Majesty's Treasury, a strategy for re-balancing the economy that includes significant expectations for "Advanced- and High-value Manufacturing".[7]

Ministers continue to stress the priority of re-balancing the economy in the direction of sectors such as Manufacturing. Her Majesty's Government's (HMG) commitment to Manufacturing is underlined with the launch in January 2012 of a new national programme which will focus on helping small and medium sized manufacturing businesses to grow. The new Manufacturing Advisory Service will provide tailored advice to businesses helping them to grow and thrive, with a specific focus on helping Small and Medium-sized Enterprises (SMEs) improve competitiveness and unlock their growth potential.

Manufacturing also holds a position of national strategic importance, especially so in those sub-sectors related to defence, energy security, and where global transportation is hazardous.

The sector comprises a number of distinct sub-sectors as indicated in Table 2.1. For each indicator presented in Table 2.1 it is possible to identify particularly strong performers:

- **Numbers of workplaces:** Fabricated Metal Products, Printing and Reproduction of Recorded Media, Other Manufacture, Machinery and Equipment, Wood and Wood Products, and Food Products
- **Employment:** Food Products, Machinery and Equipment, Fabricated Metal Products, Other Transport Equipment, Repair and Installation of Machinery and Equipment, Motor Vehicles, and Computer, Electronic and Optical Products
- **Turnover:** Food Products, Motor Vehicles, Chemical and Chemical Products, Coke and Refined Petroleum Products, Machinery and Equipment, and Fabricated Metal products
- **Added Value** (GVA): Food Products, Machinery and Equipment, Fabricated Metal Products, Chemical and Chemical Products, Computer, Electronic and Optical Products, Basic Pharmaceutical Products, and Other Transport Equipment (including Aerospace)
- **Exports:** Chemicals and Chemical products, Motor vehicles, Computer, Electronic and Optical Products, Basic Pharmaceutical Products, and Machinery and Equipment.

[7] **HMG defined scope**

Table 2.1: Sub-sectoral profile of manufacturing for five key indicators, 2010

Manufacturing Sub-Sector Source:	**No. Establish-ments**: % All Mfg IDBR	**Employ-ment**: % All Mfg ONS LFS	**Turnover** (2010 Prov.): % All Mfg ONS ABS	**GVA** (2010 Prov.): % All Mfg ONS ABS	**Exports** (BOP consistent basis): % All Mfg ONS Trade Stats.
Manufacture of food products	5.8%	11.7%	14.6%	13.6%	3.8%
Manufacture of beverages	0.8%	1.6%	3.8%	3.7%	2.5%
Manufacture of tobacco products	0.0%	*	2.0%	1.1%	0.1%
Manufacture of textiles	3.0%	2.1%	1.1%	1.4%	1.0%
Manufacture of wearing apparel	2.6%	1.2%	0.6%	0.7%	1.7%
Manufacture of leather and related good	0.4%	*	0.2%	0.2%	0.6%
Manufacture of wood and wood products	5.8%	2.3%	1.5%	1.7%	0.1%
Manufacture of paper and paper products	1.4%	2.3%	2.3%	2.3%	1.1%
Printing and reproduction of recorded media	10.9%	4.6%	2.2%	3.3%	0.0%
Manufacture of coke and refined petroleum products	0.1%	1.1%	6.9%	0.7%	7.3%
Manufacture of chemicals and chemical products	2.2%	3.6%	7.2%	7.3%	12.0%
Manufacture of basic pharmaceutical products	0.4%	3.9%	3.5%	5.9%	10.2%
Manufacture of rubber and plastic products	4.7%	5.7%	4.1%	4.8%	2.6%
Manufacture of other non-metallic products	3.9%	2.9%	2.9%	3.0%	0.9%
Manufacture of basic metals	1.1%	3.4%	3.8%	2.8%	5.1%
Manufacture of fabricated metal products	19.6%	8.2%	5.9%	8.0%	2.1%
Manufacture of computer, electronic and optical products	5.0%	5.9%	4.2%	5.9%	10.5%
Manufacture of electrical equipment	2.2%	2.7%	2.7%	3.2%	3.9%
Manufacture of machinery and equipment nec	6.8%	8.5%	6.7%	8.2%	10.1%
Manufacture of motor vehicles	2.2%	6.0%	9.3%	6.8%	11.2%
Manufacture of other transport equipment	1.5%	6.2%	5.6%	5.7%	9.0%
Manufacture of furniture	4.6%	3.1%	1.4%	2.0%	0.3%
Other manufacture	7.2%	3.1%	1.7%	2.5%	3.6%
Repair and installation of machinery and equipment	4.4%	6.2%	2.7%	3.8%	N/A
Scientific research and development	3.1%	3.7%	3.3%	2.8%	N/A

Sources as shown *(* sample size too small for reliable estimate):*
IDBR: Inter-Departmental Business Register
ONS LFS: Labour Force Survey 2010 (ONS)
ONS ABS: Annual Business Survey (2010 Provisional):
Total Turnover & Approx. Gross Value Added at basic prices (% for Food products and Beverages: 2009 data)
ONS Trade Stats: UK Trade in Goods by CPA (MQ10)

Table 2.1 provides a broad summary of the situation in the various sub-sectors. It is needs to be borne in mind when considering these statistics the variation in production processes and patterns of work organisation which exist in different sub-sectors. Manufacturing the wing of a large aircraft, for example, is a fundamentally different process than operating a production line for, say, packs of yoghurts, with significantly different skill requirements. These sector contexts can be explored further in the publications of the the various Sector Skill Councils which represent different aspects of the overall sector (see Section 1.3).

2.2 Economic performance

The central importance of *Innovation* and *Manufacturing within economic policy*

This section examines the contributions of Manufacturing to the United Kingdom economy and the profile of the companies which make this contribution. Beyond the statistics shown above in Table 2.1, sustainable economic performance depends on a number of factors, of which innovation is of prime importance. Innovation is one of the key elements of both future productivity and future international competitiveness. The productivity and competitiveness analysis of the UK economy undertaken by HMG (Department for Business, Enterprise and Regulatory Reform, 2009) lists five key drivers of productivity:

- investment
- innovation
- skills
- enterprise
- competition.

Innovation is both

a) a major component of what determines productivity, and as such can influence overall enterprise performance as well as, if ignored, thwart the positive contributions of other factors, like skills; and
b) a key element of skills requirement for successful businesses.

Its strategic importance was recognised, with the re-organisation of the former Department for Trade and Industry, by its explicit inclusion in the name of the Department of State, along with skills. Accordingly, any assessment of Manufacturing skills must emphasise innovation and take into account its policy context.

The 2009 'UK Innovation Survey' published in December 2010 (BIS, 2010e) was the sixth of the bi-annual surveys carried out as part of the EU Community Innovation Survey (CIS). The surveys check national progress on a number of indicators, covering issues within four key areas:

- product innovation - bringing to the market or into use by business, new and improved products, including both tangible goods and the provision of services. The degree of innovativeness is shown by the distinction between products new just to the business or which are also new to the market

- process innovation - significant changes in the way that goods or services are produced or provided, again differentiating between processes new to the business only or also new to the industry
- categories of innovation-directed investment - such as: R&D, capital goods and software acquisition, design activity, for implementing current innovations or directed to future product or process changes
- management related changes - sometimes referred to as soft or wider innovation, including strategic changes to the organisation of a business or its functions, in order to achieve gains in competitiveness through efficiency or service improvements.

Key findings from the 2009 report for the UK included:

- there were increases in the shares of firms with a product innovation and an increase in the shares of firms with a process innovation during the three year period 2006 to 2008 compared with the period 2004 to 2006
- nearly half of product innovations and a third of process innovations were 'leading edge' or novel
- smaller businesses were narrowing the gap with large firms on levels of engagement across a range of innovation related behaviours
- more firms were cooperating on their innovation projects than had been recorded.

These findings contributed to the government's Annual Innovation Report for 2010 (BIS/NESTA, 2011) which concluded:

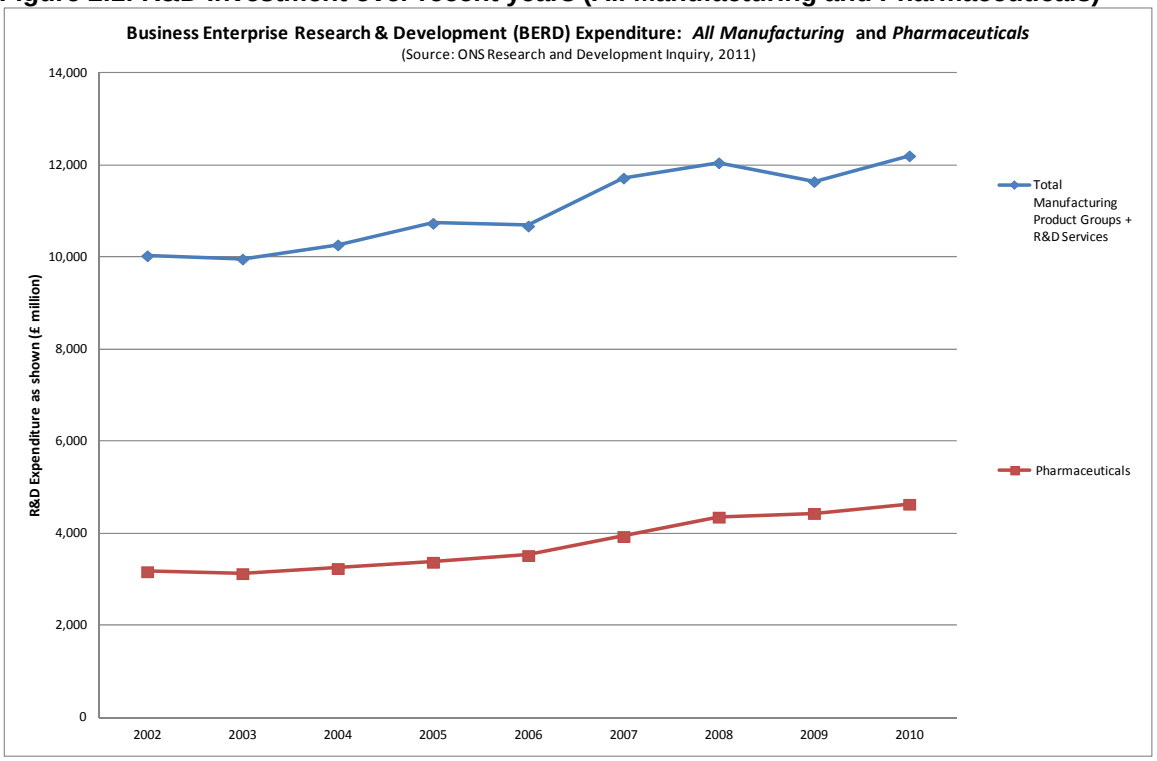
- R&D intensity in the UK, overall and in business, has remained below many major developed economies and business R&D dropped by 2.5 per cent between 2008 and 2009 to £15.5 billion
- overall total R&D intensity has remained broadly stable at around 1.9 per cent of Gross Domestic Product (GDP) from 1997 to 2008
- business R&D intensity has remained stable at just over one per cent of GDP
- nominal investments in intangible assets have risen 4.6 per cent a year since 2000 to £140 billion in 2008. They account for 14 per cent of private sector output
- innovation drives economic growth - it has accounted for 63 per cent of annual labour productivity growth since 2000, with investments in intangibles accounting for 23 per cent of productivity growth. Investment in intangibles in 2008 also helped reduce the negative impact on productivity of the start of the recession

- venture capital investment continued to decline, most likely as a result of the downturn, from €1.53 (~£1.28) billion in 2008 to €782 (~ £650) million in 2009
- the UK has seen a strong increase in science and technology human resources from 37 per cent of the labour force in 2001 to 44 per cent in 2009
- sales turnover for UK businesses from innovation products increased from less than 8.5 per cent in 2006 to 10.5 per cent in 2008
- university knowledge exchange income, valued at £3 billion in 2008/09, increased by six per cent per year between 2003/04 and 2008/09
- overall government investment in R&D, incorporating the science budget, higher education funding councils and direct government expenditure on R&D was valued at over £9.4 billion in 2008/09.

Innovation through companies' investment in R&D within Manufacturing

There are several phases of innovation, from initial research, through development, knowledge and technology transfer, to new technology monitoring, exploiting opportunities for new applications, culminating, for the enterprise, in new product development and introduction (NPDI). While few companies would be in a position to initiate and manage their own R&D, levels of business enterprise R&D (BERD) investment for each Manufacturing sub-sector give an indication of this crucial element of the innovation cycle. Figures 2.1 to 2.4 show how expenditure levels have developed over recent years. Although the 'Product Group' categories used in ONS's R&D statistics do not map precisely to the 2-digit SIC categories for which data are generally provided in this report, the degree of correspondence is good.

Figure 2.1: R&D Investment over recent years (All Manufacturing and Pharmaceuticals)

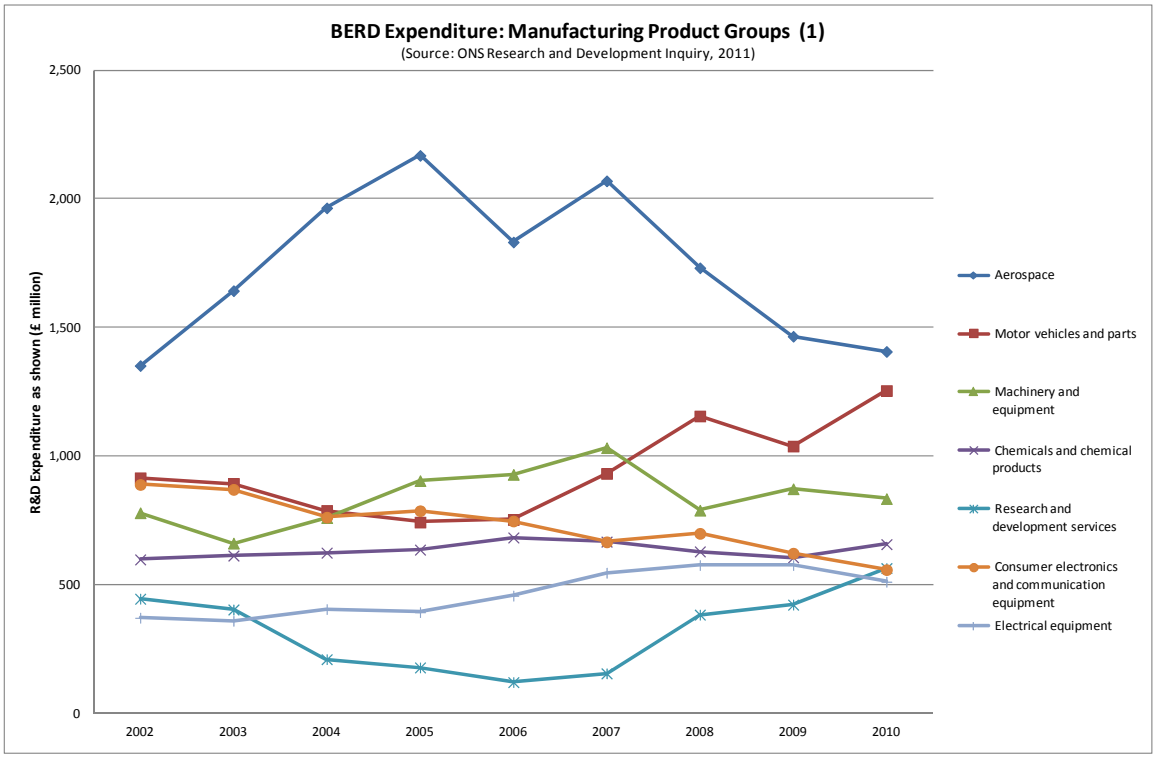


As can be seen:

- expenditure on R&D for Manufacturing as a whole (plus R&D services) is generally growing, with more than £10 billion invested in 2010;
- investment in R&D in Pharmaceuticals (over £4½ bn in 2010) confirms this industry both as a) the sector with by far the greatest expenditure, and b) continuing growth over the 2002 – 2010 period.

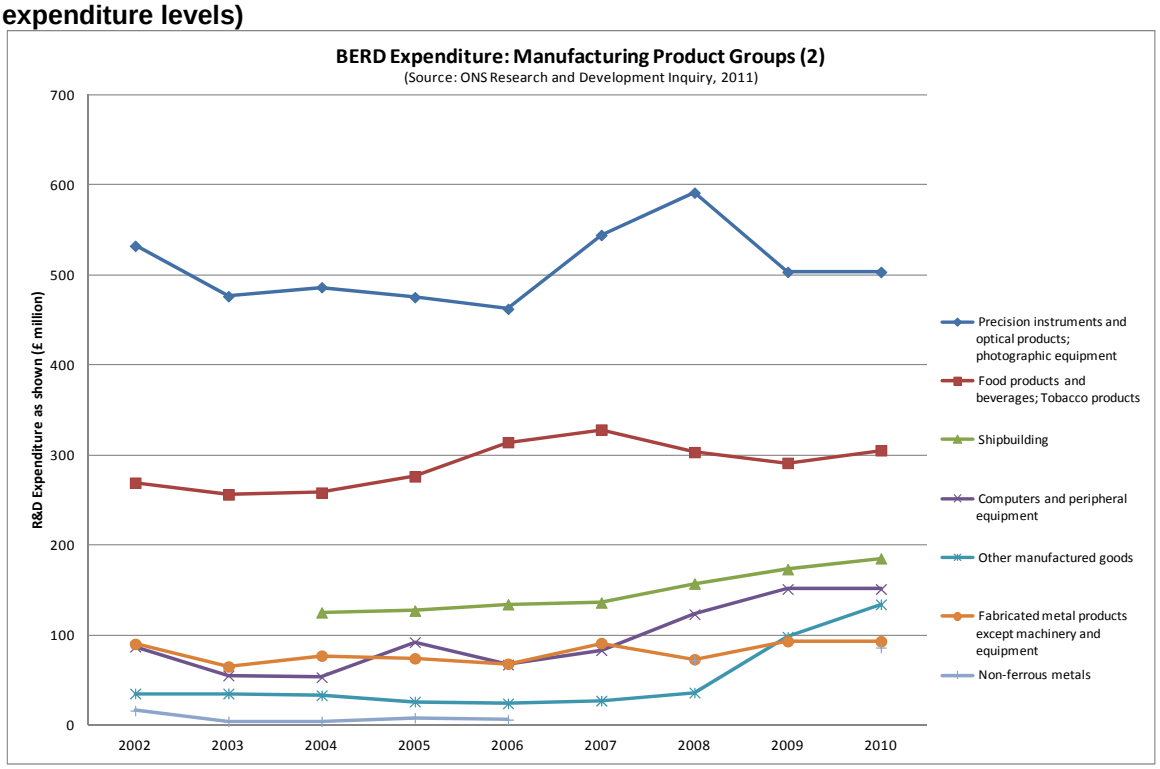
R&D investment in the remaining 'Product Groups' within Manufacturing is shown, for recent years, in the following charts.

Figure 2.2: R&D Investment over recent years (Manufacturing Product Groups with the highest expenditure)



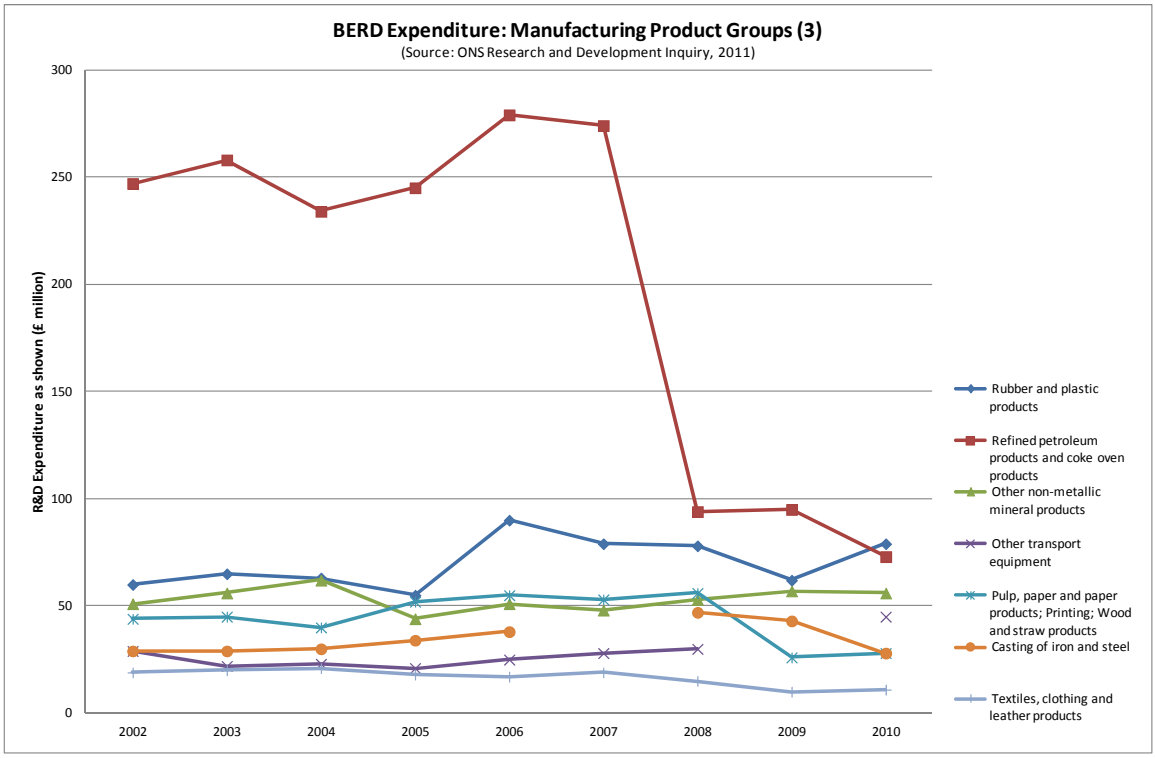
After Pharmaceuticals, the next largest manufacturing industry from an R&D point of view is Aerospace, although investment levels have varied fairly significantly, with peaks in 2005 and 2007. Next is Automotive Engineering research, which has grown after initial small falls.

Figure 2.3: R&D Investment over recent years (Manufacturing Product Groups with medium expenditure levels)



In the 'middle' level set of Manufacturing Product Groups, recent years have shown movement both up & down, although Shipbuilding R&D has shown encouraging growth.

Figure 2.4: R&D Investment over recent years (Manufacturing Product Groups with lowest expenditure levels)



The drop in expenditure (approximately. £180m) between 2007 and 2008 for Refined Petroleum Products and Coke Oven Products, with a corresponding significant loss of R&D jobs, appears to have arisen from two unconnected developments:

- classification changes associated with the move from SIC 2003 and SIC 2007 (specifically, Nuclear fuel production was moved from the "Refined Petroleum…" category to the "Non-Ferrous Metals" category - an increase of some £65m between 2006 and 2008 – see data points for 2008 and 2010 close to those for Fabricated Metals), and
- downsizing / outsourcing / off-shoring R&D operations of one very large company.

As with other indicators, conclusions from the statistics must be drawn with caution. In particular, comparisons between R&D investment levels must be made with care, since they take no direct account of the sizes of the sectors, or of the nature of their products and processes. This does not suggest that R&D investment in a particular industry is adequate just because it is high – simply that direct inter-sectoral comparisons are rather less meaningful than the changes of investment levels for each industry over time.

In addition, it is important to recognise that investment levels are subject to environmental policy. For example the recent growth in the importance of the low carbon economy, arising in particular from legislation introduced to increase sustainability, bring opportunities for a number of Manufacturing companies operating in various sub-sectors.

The importance of Manufacturing to Economic Policy

As well as policies being pursued in England by BIS the latest economic development strategies for the devolved administrations all envisage an important role for Manufacturing (see Scottish Government (2011), Welsh Assembly Government (2010) and NI Executive (2011)).

At the European Level, there is recognition of the challenges facing Manufacturing, but commitment to its continuing importance for Europe. The European Commission's position is laid out in Future of Manufacturing in Europe which states:

> Globalisation and technological change are likely to intensify in the coming years. Furthermore industry needs to adapt to the challenges posed by climate change and to grasp the opportunities of new low- energy and resource saving processes and products. The ability to adapt to changes is pivotal for the competitiveness of the European manufacturing and for achieving the EU's overall growth and job objectives. Industrial policy may have significant impact on the developments in this area. Industrial competitiveness policy must both support and stimulate the continuous process of adjustment to changing conditions and restructuring that is essential to remaining globally competitive.

The adjustment pressure for industry results from the following factors:

1. globalisation and global competition for scarce resources;
2. technological development;
3. changing consumer and business behaviour;
4. the uptake of new technologies;
5. institutional framework

Modern industrial competitiveness policy is mainly about improving the institutional framework i.e.:

1. transparent and coherent legal environment, a well functioning and easy accessible capital market
2. a labour market that has the right incentives to adapt to changes
3. a true single market for goods and services.

In Beyond Europe the OECD also monitors the health and progress of Manufacturing within its 34 industrialised member countries, as well as showing increasing interest in the skills dimension of economic performance. Amongst other thingsthe OECD has examined how the environmental / low-carbon agenda will affect the Manufacturing sector. In itsreview, Sustainable Manufacturing and Eco-Innovation (OECD, 2009), the OECD has worked on distilling a framework for reviewing practices of, and elaborating approaches to measuring, these developments:

> In recent years, the efforts of manufacturing industries to achieve sustainable production have shifted from end-of-pipe solutions to a focus on product lifecycles and integrated environmental strategies and management systems. Furthermore, efforts are increasingly made to create closed-loop, circular production systems and adopt new business models. Much attention has been paid to innovation as a way for industry and policy makers to work towards more radical and systemic improvements in environmental performance. The term eco-innovation calls attention to the positive contribution that industry can make to sustainable development and a competitive economy (OECD, 2009).

2.2.1 Current and recent economic performance and competitive position

Whilst trends sales turnover are an important indicator of business performance, in many respects the key performance indicator relates to added-value (the sum of all output less costs of intermediate inputs). Table 2.2shows GVA performance by UK Manufacturing compared with other sectors in the economy.[8]

[8] Regional Accounts data are not available at 2-digit SIC level, so that estimates in these tables are not fully consistent in scope with the equivalent sectors from other data sources

Table 2.2: GVA by nation (£m in current basic prices) (2008)

	UK	England	Scotland	Wales	Northern Ireland
	£m	£m	£m	£m	£m
Agriculture, hunting, forestry & fishing	9,715	7,982	1,180	145	407
Mining and quarrying of energy producing materials	2,661	1,298	1,277	60	27
Other mining and quarrying	2,365	1,777	282	134	173
Manufacturing	**150,298**	**124,860**	**13,555**	**7,734**	**4,149**
Electricity, gas and water supply	21,342	17,414	2,653	729	545
Construction	80,756	68,247	7,328	2,924	2,256
Wholesale and retail trade (including motor trade)	147,158	127,900	10,441	5,166	3,651
Hotels and restaurants	36,428	30,938	3,297	1,424	770
Transport, storage and communication	91,347	80,262	7,065	2,529	1,491
Financial intermediation	116,801	104,574	8,501	2,305	1,422
Real estate, renting and business activities	303,179	268,770	20,829	8,380	5,200
Public administration and defence	63,281	51,275	6,148	3,275	2,583
Education	76,493	64,478	6,322	3,502	2,191
Health and social work	93,775	76,336	9,851	4,788	2,800
Other services	65,563	57,177	4,804	2,420	1,162
All sectors	1,261,162	1,083,288	103,533	45,515	28,827

Source: Regional Accounts, ONS, 2010

Table 2.2 shows that Manufacturing produces 11.9 per cent of UK GVA; 17.0 per cent in Wales); 14.4 per cent in Northern Ireland; and 13.1 per cent in Scotland. In all of the devolved administrations Manufacturing GVA as a percentage of total GVA is greater than in England.

The contributions from each nation to UK Manufacturing GVA as a whole are 83 per cent (England), 9 per cent (Scotland), 5 per cent (Wales) and 2 per cent (Northern Ireland).

Manufacturing delivers the second largest Gross Added Value of all the sectors shown to the UK economy.

Table 2.3: GVA by English region (£m in current basic prices) (2008)

	North East	North West	Yorkshire and The Humber	East Midlands	West Midlands	East	London	South East	South West
	£m	£m	£m	£m	£m	£m	£m	£m	£m
Agriculture, hunting, forestry & fishing	303	777	966	996	915	1,387	86	1,168	1,383
Mining and quarrying of energy producing materials	81	90	140	130	82	164	280	270	61
Other mining and quarrying	178	142	156	379	84	132	60	202	442
Manufacturing	**6,706**	**19,336**	**14,332**	**13,299**	**13,974**	**13,518**	**13,651**	**18,084**	**11,961**
Electricity, gas and water supply	979	1,622	1,511	1,952	1,920	1,948	1,823	3,061	2,598
Construction	2,990	8,236	6,266	5,835	6,588	8,946	10,262	12,482	6,643
Wholesale and retail trade (including motor trade)	4,424	14,906	11,348	10,850	12,313	15,933	22,016	24,588	11,522
Hotels and restaurants	1,123	3,527	2,383	2,012	2,905	3,041	7,717	5,063	3,166
Transport, storage and communication	2,668	8,846	6,518	5,866	6,596	9,871	17,509	16,218	6,170
Financial intermediation	2,195	8,356	6,641	3,702	5,260	9,352	48,190	13,828	7,050
Real estate, renting and business activities	7,842	26,072	17,146	16,325	20,405	29,769	74,039	55,440	21,733
Public administration and defence	2,623	5,843	4,753	3,919	4,376	5,634	7,642	10,218	6,267
Education	3,156	8,008	6,302	4,877	6,541	6,725	11,972	10,861	6,036
Health and social work	4,004	10,080	7,552	5,894	7,215	8,201	13,719	11,975	7,696
Other services	1,715	5,174	3,459	3,314	4,583	5,577	18,190	10,551	4,615
All sectors	40,987	121,015	89,473	79,350	93,757	120,198	247,156	194,009	97,343

Source: Regional Accounts, ONS, 2010

- Each region of England makes a significant contribution to the country's Manufacturing added value (Table 2.3), with the North West and South East contributing 15 per cent, Yorkshire & the Humber, East and West Midlands, East of England, London and the South West around 10 per cent each, and the North East contributing a little over 5 per cent. Particular regions often specialise in a particular branch of manufacturing A summary of regional specialisation is listed below.There is a high concentration of Petrochemical, Pharmaceutical, Bio-resource and Polymer, Processing industries in the North East, while high value Pharmaceutical companies also have a strong cluster in the South East.
- Chemical Manufacture has developed a strong core around the large scale salt deposits in North West England.
- The Fashion and Textiles Manufacturing sector is mainly concentrated in the North West, London, the East Midlands, Yorkshire & Humber and Scotland. Centres of Textiles manufacture are in the East Midlands, North West, and Yorkshire & Humber. Concentrations of Clothing manufacture are in London, the East Midlands & the North West, with manufacturing of Leather products in East Midlands and the South West.
- The major centre of Mature Engineering industries is in the West Midlands, while the greatest share of Leading Edge Technology Engineering manufacture lies in the South East. The 'top ten' areas for employment within Engineering Manufacturing generally are Birmingham, Aberdeen City, Derby, Sheffield, Leeds, Sandwell, Cheshire East, South Gloucestershire, Coventry and Wiltshire.

- Food and Drink Manufacturing and Processing is concentrated in the North West of England, the East Midlands, Yorkshire & the Humber and Scotland.
- The Process & Manufacturing industries are particularly clustered in the North West and Yorkshire & the Humber, with specific concentrations for each market segment. These include Ceramics in the West Midlands, largely based around Stoke-on-Trent and "The Potteries"; Coatings in the North West, largely around Merseyside; Building Products in the Midlands, in the rural areas around Leicestershire and Derbyshire; Glass in the North West and Yorkshire, around Leeds and Merseyside; Furniture in the North West, South East and Yorkshire; and Print in the South East.

Table 2.4: UK GVA (£m in current basic prices) (1999-2008)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	£m	£m	£m	£m	£m	£m	£m	£m	£m	£m
Agriculture, hunting, forestry & fishing	9,022	8,532	8,333	9,007	9,807	10,670	7,530	7,792	8,632	9,715
Mining and quarrying of energy producing materials	2,059	1,998	1,874	1,661	1,456	1,643	2,055	2,297	1,861	2,661
Other mining and quarrying	1,700	1,784	1,750	1,469	1,519	1,848	2,115	2,145	2,291	2,365
Manufacturing	**151,157**	**150,009**	**149,223**	**146,308**	**144,845**	**145,689**	**148,110**	**151,455**	**154,726**	**150,298**
Electricity, gas and water supply	15,703	15,798	15,660	16,052	16,405	16,106	16,685	20,279	21,884	21,342
Construction	42,236	45,626	50,526	54,684	59,522	66,029	69,868	74,619	80,675	80,756
Wholesale and retail trade (including motor trade)	99,509	103,410	110,249	113,777	120,520	127,367	129,810	135,366	141,735	147,158
Hotels and restaurants	24,146	25,605	26,928	28,639	30,120	31,870	32,902	34,594	35,962	36,428
Transport, storage and communication	64,961	69,201	70,502	73,064	76,587	79,020	80,889	83,655	88,280	91,347
Financial intermediation	48,545	44,989	48,202	63,367	71,530	75,117	79,553	90,807	103,731	116,801
Real estate, renting and business activities	173,329	188,361	204,041	214,849	232,204	248,677	260,116	276,108	296,955	303,179
Public administration and defence	39,891	41,645	43,855	46,212	49,768	53,779	58,229	60,385	61,503	63,281
Education	44,914	48,111	51,675	55,099	58,328	61,934	65,739	68,926	72,766	76,493
Health and social work	51,577	55,282	59,549	64,492	70,593	75,154	79,965	85,965	89,381	93,775
Other services	39,821	42,085	44,560	48,311	51,804	54,947	57,961	60,166	62,824	65,563
All sectors	808,570	842,436	886,927	936,991	995,008	1,049,850	1,091,527	1,154,559	1,223,206	1,261,162

Source: Regional Accounts, ONS, 2010

Table 2.4 shows how overall GVA for manufacturing has been, more or less, static over the years from 1999 to 2008, while the All Sector level has increased by over 50 per cent. Although this could be viewed as disappointing, it also reflects the downward pressure on costs which most manufacturers have had to manage over recent years as economies with much lower labour costs have taken an increased share of the overall global market for manufactured goods. Since 2003, up to the 'credit-crunch' in 2008, there was evidence of growth in GVA.

Productivity of UK Manufacturing

Different measures can be used for productivity: Table 2.5 shows estimates of GVA per employee job for Manufacturing compared with other sectors in the economy[9].

Table 2.5: Estimated workplace gross value added (GVA) per employee job at current basic prices, 2009

SSA Sector	UK	England	Wales	Scotland	Northern Ireland
	£000s	£000s	£000s	£000s	£000s
Agriculture, forestry and fishing	35	41	11	21	25
Energy production and utilities	131	134	118	127	107
Manufacturing	52	51	49	61	53
Construction, building services, engineering and planning	65	66	54	60	56
Wholesale and retail trade	33	33	27	29	27
Transportation and storage	50	51	44	50	41
Hospitality, tourism and sport	23	23	21	22	20
Information and communication technologies	83	84	72	77	63
Creative media and entertainment	45	49	30	12	38
Financial, insurance & other professional services	86	89	57	69	63
Real estate and facilities management	85	86	103	67	98
Government services	39	40	33	35	40
Education	33	33	32	36	33
Health	27	27	26	25	23
Care	30	30	28	31	26
Not within scope	32	33	27	35	30
All sectors	46	47	38	43	38

Source: UK Commission estimates based on Regional Accounts; Annual Business Survey; Business Register and Employment Survey (BRES). See technical appendix for basis for estimates.

Notes: Figures for Real estate and facilities management sector include contribution from owner-occupier imputed rental. All figures exclude Extra-Regio element. Estimates will tend to overstate the level of GVA per job in those sectors with high levels of self-employment.

Table 2.5 shows that productivity performance, as measured by this indicator, for UK Manufacturing is well above the average for the economy as a whole, but not as high as in some other sectors. There are evident variations between the four nations, with Scotland outperforming the three other nations.

[9] It is essential to take into account, when considering GVA per person data that some GVA increases can arise from higher than average reductions in the corresponding employment levels. In addition it is important to recognise that different manufacturing contexts, with vastly different types of product and production processes, can have significantly different 'productivity' norms (e.g. some processes are simply inherently more labour intensive than others). Thus performance is most validly assessed from the increase of 'productivity' over time, rather than as compared with other sub-sectors.

Within Manufacturing, data at the 2-digit SIC level (ABI/BRES/ABS) confirm that there are considerable variations in per person GVA levels, with Manufacturing of Coke and Refined Petroleum Products, Basic Pharmaceuticals and Beverages achieving the highest productivity by this measure. In addition, enterprises in Chemicals, Machinery Repair and Installation, Electronics products, and Leather Products performed relatively well, while Textiles, Wearing Apparel, Wood and Wood products, and Furniture Manufacture scored less well on this indicator.

The variation in productivity by country is likely to reflect differences in the sub-sectoral composition of Manufacturing between each of the four nations.

The *Working Futures* model (Wilson and Homenidou, 2011) provides historic estimates of productivity (output per job) by sector on a constant price (chained volume measure) basis. This analysis indicates an average rate of productivity growth for the UK manufacturing sector for the first half of the last decade (2000-2005) of 4.3 per cent per annum, moderating to 2.5 per cent in the second half. This is much higher than the average rate over the two periods for the wider UK economy of 1.4 per cent and 0.7 per cent respectively. According to *Working Futures*, technological change and increasing global competition have driven long-term productivity growth in manufacturing and this is expected to continue into the future.

2.2.2 Employer Profile (numbers, size, start-ups and closures)

A range of data sources provides valuable evidence on the various dimensions of employer characteristics. The first indicator is the number of businesses there fall within scope of Manufacturing compared with other sectors in the economy. Table 2.6 shows a total of nearly 145,000 manufacturing companies, which represents 6 per cent of all UK companies. With some 9,400, 6,000 and 4,400 companies in Scotland, Wales and Northern Ireland respectively, the share of manufacturing employers in overall share of all employers in each of the devolved administrations, is a little below the UK average.

Table 2.6: Number of establishments by sector and nation (2010)

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry and fishing	144,895	6%	96,770	4%	17,625	9%	14,210	13%	16,290	19%
Energy production and utilities	13,290	1%	10,365	0%	1,495	1%	865	1%	565	1%
Manufacturing	**144,115**	**6%**	**124,235**	**6%**	**9,395**	**5%**	**6,040**	**5%**	**4,445**	**5%**
Construction, building services engineering and planning	358,455	14%	303,300	14%	27,845	14%	14,280	13%	13,030	15%
Wholesale and retail trade	509,215	20%	431,330	20%	38,165	20%	23,000	20%	16,720	20%
Transportation and storage	83,825	3%	70,685	3%	6,370	3%	3,925	3%	2,845	3%
Hospitality, tourism and sport	223,370	9%	185,390	8%	20,515	11%	11,580	10%	5,885	7%
Information and communication technologies	131,065	5%	120,095	5%	6,610	3%	3,130	3%	1,230	1%
Creative media and entertainment	134,115	5%	121,900	6%	6,830	4%	3,640	3%	1,745	2%
Financial, insurance & other professional services	255,000	10%	228,725	10%	14,770	8%	7,160	6%	4,345	5%
Real estate and facilities management	149,325	6%	129,340	6%	10,610	5%	5,730	5%	3,645	4%
Government services	52,210	2%	40,870	2%	5,625	3%	2,985	3%	2,730	3%
Education	67,125	3%	55,020	3%	5,535	3%	3,250	3%	3,320	4%
Health	55,135	2%	46,925	2%	3,895	2%	2,515	2%	1,800	2%
Care	85,935	3%	70,460	3%	7,810	4%	4,710	4%	2,955	4%
All economy	2,574,230	100%	2,183,845	100%	193,305	100%	112,810	100%	84,270	100%

Source: Inter-departmental Business Register (IDBR), ONS

The estimates of establishment numbers for manufacturing as a whole mask large variations between sub-sectors: estimates drawn from ABI, BRES, ABS data reveal a comparatively large numbers of small establishments: there are over 28,000 businesses producing Fabricated Metal Products and nearly 16,000 enterprises Printing and Reproduction of Recorded Media. In contrast, establishments producing Leather and Related Goods and Basic Pharmaceuticals number around 600, there are only some 200 manufacturing establishments of Coke and Refined Petroleum products, and fewer than 20 manufacturers of Tobacco Products.

Table 2.7: Number of establishments by sector and English region (2010)

	North East	North West	Yorkshire and The Humber	East Midlands	West Midlands	East	London	South East	South West
Agriculture, forestry and fishing	3,870	11,305	11,205	10,770	11,880	12,170	935	11,785	22,850
Energy production and utilities	475	1,460	1,155	1,025	1,065	1,320	950	1,605	1,310
Manufacturing	**4,650**	**15,950**	**13,100**	**12,915**	**15,930**	**15,235**	**13,350**	**20,025**	**13,080**
Construction, building services engineering and planning	10,845	35,520	26,035	24,975	28,750	41,485	42,520	58,785	34,385
Wholesale and retail trade	16,630	55,955	41,975	36,895	45,695	48,635	67,620	71,850	46,075
Transportation and storage	2,610	8,775	7,270	6,830	7,930	9,305	9,190	11,570	7,205
Hospitality, tourism and sport	8,395	23,095	17,600	14,030	16,700	19,290	32,470	31,885	21,925
Information and communication technologies	2,325	10,885	6,685	6,900	9,260	14,735	29,655	28,805	10,845
Creative media and entertainment	2,660	10,035	6,735	6,215	7,425	12,210	43,255	22,760	10,605
Financial, insurance & other professional services	5,440	23,475	14,900	14,950	18,300	23,850	61,915	45,495	20,400
Real estate and facilities management	4,185	14,800	10,225	9,390	11,925	15,045	27,475	22,980	13,315
Government services	1,815	4,810	4,260	4,270	4,040	4,215	6,495	6,340	4,625
Education	2,495	6,890	4,965	4,810	5,465	6,330	8,215	9,925	5,925
Health	2,010	6,255	4,265	3,830	4,570	4,850	8,045	8,280	4,820
Care	3,575	9,340	6,950	6,110	6,940	7,210	10,725	11,700	7,910
All economy	75,975	255,705	187,810	174,700	210,065	253,120	392,540	394,505	239,425

Source: Inter-departmental Business Register (IDBR), ONS

Numbers of business units in the different English regions somewhat mirror the geographical intensity illustrated in the GVA figures above (see Table 2.7): the South East has the highest number; the North East the lowest; and most other regions having between 13,000 and 16,000 units.

Table 2.8: Number of establishments by sector 2006-2010 (UK)

	2006	2007	2008	2009	2010	% Change 2006-2010
Agriculture, forestry and fishing	146,485	158,080	163,715	146,620	144,895	-1%
Energy production and utilities	18,170	18,260	11,435	12,980	13,290	-27%
Manufacturing	**165,675**	**163,525**	**167,335**	**151,165**	**144,115**	**-13%**
Construction, building services engineering and planning	230,610	240,535	258,055	374,320	358,455	55%
Wholesale and retail trade	533,105	532,905	532,060	520,070	509,215	-4%
Transportation and storage	70,425	70,750	71,665	86,680	83,825	19%
Hospitality, tourism and sport	219,770	222,920	227,430	229,690	223,370	2%
Information and communication technologies	136,395	140,505	144,080	134,805	131,065	-4%
Creative media and entertainment	125,100	130,185	131,180	132,225	134,115	7%
Financial, insurance & other professional services	271,310	283,920	287,015	256,915	255,000	-6%
Real estate and facilities management	180,305	191,195	201,915	155,855	149,325	-17%
Government services	159,395	164,690	54,875	52,060	52,210	-67%
Education	28,935	28,880	66,055	66,725	67,125	132%
Health	25,860	25,810	53,300	53,900	55,135	113%
Care	40,150	40,075	82,755	83,675	85,935	114%
All economy	2,533,855	2,600,065	2,643,215	2,634,790	2,574,230	2%

Source: Inter-departmental Business Register (IDBR), ONS

Note: Data for 2006-2008 is based on SIC 2003 whereas data beyond this use SIC 2007. Some of the data for 2006-2008 is based on estimates. For full details see Technical appendix.

Table 2.8 shows development of numbers of businesses over recent years, with a notable decline in the number of manufacturers since the credit crunch in 2008. More evidence on the changes in the 'employer population' can be seen from statistics for start-ups and closures in Table 2.9 below.

Table 2.9: Business (enterprise) start-ups and closures 2009 (UK)

	Start-ups	Closures
	Number	Number
Agriculture, forestry and fishing (SIC 75 only)	285	190
Energy production and utilities	1,270	408
Manufacturing	**10,570**	**15,445**
Construction, building services engineering and planning	35,835	51,040
Wholesale and retail trade	38,760	47,090
Transportation and storage	6,980	10,805
Hospitality, tourism and sport	23,345	28,030
Information and communication technologies	16,120	19,935
Creative media and entertainment	24,290	20,805
Financial, insurance & other professional services	25,640	25,765
Real estate and facilities management	12,805	16,275
Government services (SIC 94 only)	1,010	1,260
Education	3,485	3,160
Health	4,135	3,110
Care	2,745	2,165
Other sectors	28,750	32,135
All economy	**236,025**	**277,618**

Source: Business Demography - Enterprise Births, Deaths and Survivals 2009 (ONS)

Table 2.9 confirms the significant "rate of churn" in the number of businesses in the UK economy. The 'evolutionary' reality of both start-ups and closures within an open market is well-known in principle, but the fact that 2009, at least, saw fewer start-ups than closures in Manufacturing is of concern. Overall, start-ups in the UK ran at only 85 per cent of closures in the year – perhaps understandable given the 'credit-crunch' in the preceding year. This does not prevent six of the 15 sectors achieving more start-ups than closures – the more than 300 per cent greater number of start-ups than closures in Energy Production and Utilities is of particular note, though this sector has a comparatively small number of companies (less than one tenth of the number of all Manufacturing companies), and a changing regulatory context that can strongly influence such change. The 68 per cent ratio of start-ups to closures in Manufacturing was the second lowest of all fifteen sectors.

It is important in assessing the economic health of particular sectors to be aware of the state of activity in the relevant supply chains. For example, the severe downturn in the number of new construction projects resulted in, from 2008 onwards, depressed demand for construction materials, and until this recovers, rates of start-up in this market segment are not expected to recover too.

Start-ups and closures within Manufacturing

Table 2.10 shows the estimates for 'deaths and births' of enterprises in 2009 within the 25 Manufacturing Sub-sectors, together with some additional analysis:

Table 2.10: Business (enterprise) start-ups and closures by Manufacturing sub-sector 2009 (UK)

	Start-ups	Closures		Total # E (2008, ABI)	Start-up fraction	Closure fraction	# S-Us/ # Cs
Manufacture of food products	630	665		6,491	9.7%	10.2%	95%
Manufacture of beverages	95	110		952	10.0%	11.6%	86%
Manufacture of tobacco products	0	0		12	0.0%	0.0%	
Manufacture of textiles	335	525		4,255	7.9%	12.3%	64%
Manufacture of wearing apparel	375	710		3,825	9.8%	18.6%	53%
Manufacture of leather and related good	100	80		532	18.8%	15.0%	125%
Manufacture of wood and products	585	1,055		7,891	7.4%	13.4%	55%
Manufacture of paper and paper products	135	280		2,629	5.1%	10.7%	48%
Printing and reproduction of recorded media	990	1,885		16,516	6.0%	11.4%	53%
Manufacture of coke and refined petroleum products	25	45		244	10.2%	18.4%	56%
Manufacture of chemicals and chemical products	210	300		2,865	7.3%	10.5%	70%
Manufacture of basic pharmaceutical products	65	50		375	17.3%	13.3%	130%
Manufacture of rubber and plastic products	370	655		6,639	5.6%	9.9%	56%
Manufacture of other non-metallic products	285	455		4,404	6.5%	10.3%	63%
Manufacture of basic metals	120	165		1,583	7.6%	10.4%	73%
Manufacture of fabricated metal products	1,400	2,745		26,606	5.3%	10.3%	51%
Manufacture of computer, electronic and optical products	460	955		7,099	6.5%	13.5%	48%
Manufacture of electrical equipment	265	290		3,287	8.1%	8.8%	91%
Manufacture of machinery and equipment nec	395	940		10,084	3.9%	9.3%	42%
Manufacture of motor vehicles	255	430		3,319	7.7%	13.0%	59%
Manufacture of other transport equipment	200	240		1,769	11.3%	13.6%	83%
Manufacture of furniture	525	820		6,397	8.2%	12.8%	64%
Other manufacture	1,005	1,105		9,384	10.7%	11.8%	91%
Repair and installation of machinery and equipment	1,370	460		4,624	29.6%	9.9%	298%
Scientific research and development	375	480		3,998	9.4%	12.0%	78%

Source of Start-up & Closure estimates: Business Demography - Enterprise Births, Deaths and Survivals 2009 (ONS)

As well as the number of start-ups and closures, Table 2.10 also shows: a) the number of start-ups and closures, respectively, as fractions (percentages) of all enterprises in January 2009; and b) the ratio of Start-ups to Closures.

The significance, as compared to the total number of enterprises within the sub-sector, of the start-ups and closures varies considerably between sub-sectors, with comparatively high closure fractions in Wearing Apparel (18.6 per cent), Coke and Refined Petroleum Products (18.4 per cent), and Leather and Related Goods (15 per cent), and comparatively high start-up fractions in Leather and Related goods (18.8 per cent), Pharmaceutical Products (17.3 per cent), and, above all, Repair and Installation of Machinery and Equipment, at nearly 30 per cent.

Considering the ratio of start-ups to closures, sub-sectors that appear, in 2009, to be more in decline (with numbers of start-ups less than half the number of closures) are Manufacture of *Machinery and Equipment* (42 per cent) and *Paper and Paper Products* and *Computer, Electronic and Optical Products* (both at 48 per cent). On a more positive note, three sub-sectors had more start-ups than closures in 2009: *Leather and Related Goods* (with 125 per cent),[10] *Basic Pharmaceutical Products* (130 per cent), and, above all, *Repair and Installation of Machinery and Equipment*, with nearly three times as many start-ups as closures.[11]

These estimates provide a glimpse of the different levels of 'upheaval' within the different sub-sector markets, though – as already indicated - it is important to note that 2009 was a comparatively unusual year, since increased levels of closures (and upheaval generally) were to be expected in the year following the 'credit-crunch'[12]. On the other hand, the figures might be particularly interesting for this very reason, showing, for example, sub-sectors that were 'more resilient' to financial shocks than others. A longer time-series would be of particular interest.

Sizes of Manufacturing enterprise establishments

Table 2.11 shows the distribution of business size in the different sectors.[13] While it is known that Manufacturing includes comparatively large numbers of smaller businesses, the sector is unusual in this regard. In fact the range of percentage shares confirms that a number of other sectors are even more strongly characterised by large numbers of Small & Medium-sized Enterprises (SMEs) (in fact all the other sectors apart from Energy Production and Utilities, Transportation and Storage, Government Services, Education, Health, and Care have a higher percentage of establishments with <10, <25, and <50 employees than Manufacturing). In fact, Manufacturing's share of the very smallest businesses, and those with 10-24 employees, is below average for the economy as a whole.

[10] An equal number of start-ups and closures would record a score of 100 per cent.
[11] When comparisons are made between sub-sectors, it is essential to remember that the market context of each is different. For example both start-ups and closures can be strongly influenced by changes either 'up' or 'down' a sub-sector's value chain.
[12] Across the whole economy in 2009, start-ups were down (at 10.1 per cent), and closures were up (at 11.9 per cent), continuing trends that had already started in 2008 (see ONS, 2010).
[13] Note that the total numbers of establishments across all size-bands are (sometimes significantly) less than the figures in the 'number of establishments' tables. This is because the size-bands do not include establishments of 0-1 employees.

Table 2.11: Size of establishments by sector (UK) (2010) (percentages)

	Percentage of employers in each employee no. sizeband						
	2-4	5-9	10-24	25-49	50-250	251+	All
	%	%	%	%	%	%	Number
Agriculture, forestry and fishing	80	14	5	1	0	0	97,910
Energy production and utilities	36	22	20	10	10	2	10,265
Manufacturing	**43**	**22**	**18**	**8**	**8**	**1**	**108,050**
Construction	67	18	10	3	2	0	211,710
Wholesale and retail trade	49	27	16	4	3	1	385,760
Transportation and storage	48	20	16	7	8	1	52,620
Hospitality, tourism and sport	42	30	19	6	3	0	198,630
Information and communication technologies	68	15	10	4	3	1	56,710
Creative media and entertainment	66	17	10	4	3	0	62,305
Financial, insurance & other professional services	57	21	14	4	3	1	134,900
Real estate and facilities management	62	21	11	3	3	1	95,270
Government services	34	21	20	10	12	4	41,505
Education	20	14	20	23	21	2	56,740
Health	31	24	25	10	7	2	47,570
Care	26	24	28	13	8	0	75,725
All economy	52	22	15	6	4	1	1,742,370

Source: Inter-departmental Business Register (IDBR), ONS

Table 2.12 and Table 2.13 show the size distribution of employers across the four nations, for the economy as a whole, and for Manufacturing. The tables support the conclusion that Manufacturing does not have as many small companies as most other sectors, and has more medium sized enterprises. Scotland appears to have somewhat fewer of the very smallest establishments and slightly more medium-sized operations, while England has proportionately fewer very large companies.

Table 2.12: Size of establishments for *whole economy* by nation – six sizebands (2010)

	England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
2-4	767,415	52	66,560	48	44,675	54	30,175	52
5-9	323,815	22	33,775	24	18,005	22	13,395	23
10-24	215,295	15	23,090	17	11,910	14	9,175	16
25-49	82,055	6	8,330	6	4,170	5	3,265	6
50-250	63,865	4	6,405	5	3,130	4	2,145	4
251+	9,915	1	1,030	1	505	1	270	0
Total	1,462,360	100	139,190	100	82,395	100	58,425	100

Source: Inter-departmental Business Register (IDBR), ONS

Table 2.13: Size of *Manufacturing* establishments by nation – six sizebands (2010)

	England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
2-4	40,275	43	2,770	39	2,025	43	1,495	43
5-9	20,675	22	1,540	22	945	20	795	23
10-24	16,500	18	1,335	19	830	18	665	19
25-49	7,310	8	635	9	360	8	265	8
50-250	6,785	7	710	10	425	9	220	6
251+	1,220	1	115	2	100	2	55	2
Total	92,765	100	7,105	100	4,685	100	3,495	100

Source: Inter-departmental Business Register (IDBR), ONS

Table 2.14 shows the considerable variation in size profiles of businesses across the sub-sectors of Manufacturing.

Table 2.14: Size distribution of establishments by Manufacturing sub-sector (UK, 2010)

	Number of employers in each employee no. sizeband									
SIC07	2-4	5-9	10-24	25-49	50-99	100-199	200-250	251-499	500+	Total
Manufacture of food products	2,155	1,725	1,395	660	495	355	80	205	135	7,205
Manufacture of beverages	345	165	160	90	45	40	10	20	10	885
Manufacture of tobacco products	0	0	5	0	0	0	0	0	5	10
Manufacture of textiles	1,555	765	565	230	140	65	10	20	0	3,350
Manufacture of wearing apparel	1,460	680	420	145	75	15	0	5	0	2,800
Manufacture of leather and related good	215	115	75	30	20	5	0	5	0	465
Manufacture of wood and products	3,215	1,465	1,030	325	150	45	5	10	0	6,245
Manufacture of paper and paper products	520	295	295	210	165	120	20	25	5	1,655
Printing and reproduction of recorded media	5,840	2,550	1,645	560	280	110	25	30	5	11,045
Manufacture of coke and refined petroleum products	60	30	15	15	15	5	0	0	5	145
Manufacture of chemicals and chemical products	745	480	500	315	235	140	25	60	25	2,525
Manufacture of basic pharmaceutical products	150	50	65	70	50	25	10	40	15	475
Manufacture of rubber and plastic products	1,760	1,350	1,315	670	455	235	30	55	10	5,880
Manufacture of other non-metallic products	1,930	1,020	780	365	235	115	15	40	5	4,505
Manufacture of basic metals	400	240	265	205	120	70	15	20	20	1,355
Manufacture of fabricated metal products	8,980	4,850	4,115	1,610	745	245	25	40	15	20,625
Manufacture of computer, electronic and optical products	2,300	1,025	905	445	275	150	20	55	25	5,200
Manufacture of electrical equipment	790	485	555	355	215	120	20	45	15	2,600
Manufacture of machinery and equipment nec	2,905	1,755	1,555	765	430	230	50	85	30	7,805
Manufacture of motor vehicles	960	495	445	255	195	95	30	50	40	2,565
Manufacture of other transport equipment	655	285	185	95	85	60	20	35	50	1,470
Manufacture of furniture	2,555	1,100	855	340	175	85	25	25	5	5,165
Other manufacture	3,990	1,755	940	285	135	65	15	25	10	7,220
Repair and installation of machinery and equipment	1,770	765	780	310	150	90	25	45	25	3,960
Scientific research and development	1,310	510	465	220	165	105	25	55	40	2,895

Source: Inter-departmental Business Register (IDBR), ONS

The *percentage share* distributions are shown in Table 2.15.

Table 2.15: Size distribution of establishments by Manufacturing sub-sector (row percentages) (UK, 2010)

	Number of employers in each employee no. sizeband									
SIC07	2-4	5-9	10-24	25-49	50-99	100-199	200-250	251-499	500+	Total
Manufacture of food products	30%	24%	19%	9%	7%	5%	1%	3%	2%	100%
Manufacture of beverages	39%	19%	18%	10%	5%	5%	1%	2%	1%	100%
Manufacture of tobacco products	0%	0%	50%	0%	0%	0%	0%	0%	50%	100%
Manufacture of textiles	46%	23%	17%	7%	4%	2%	0%	1%	0%	100%
Manufacture of wearing apparel	52%	24%	15%	5%	3%	1%	0%	0%	0%	100%
Manufacture of leather and related good	46%	25%	16%	6%	4%	1%	0%	1%	0%	100%
Manufacture of wood and products	51%	23%	16%	5%	2%	1%	0%	0%	0%	100%
Manufacture of paper and paper products	31%	18%	18%	13%	10%	7%	1%	2%	0%	100%
Printing and reproduction of recorded media	53%	23%	15%	5%	3%	1%	0%	0%	0%	100%
Manufacture of coke and refined petroleum products	41%	21%	10%	10%	10%	3%	0%	0%	3%	100%
Manufacture of chemicals and chemical products	30%	19%	20%	12%	9%	6%	1%	2%	1%	100%
Manufacture of basic pharmaceutical products	32%	11%	14%	15%	11%	5%	2%	8%	3%	100%
Manufacture of rubber and plastic products	30%	23%	22%	11%	8%	4%	1%	1%	0%	100%
Manufacture of other non-metallic products	43%	23%	17%	8%	5%	3%	0%	1%	0%	100%
Manufacture of basic metals	30%	18%	20%	15%	9%	5%	1%	1%	1%	100%
Manufacture of fabricated metal products	44%	24%	20%	8%	4%	1%	0%	0%	0%	100%
Manufacture of computer, electronic and optical products	44%	20%	17%	9%	5%	3%	0%	1%	0%	100%
Manufacture of electrical equipment	30%	19%	21%	14%	8%	5%	1%	2%	1%	100%
Manufacture of machinery and equipment nec	37%	22%	20%	10%	6%	3%	1%	1%	0%	100%
Manufacture of motor vehicles	37%	19%	17%	10%	8%	4%	1%	2%	2%	100%
Manufacture of other transport equipment	45%	19%	13%	6%	6%	4%	1%	2%	3%	100%
Manufacture of furniture	49%	21%	17%	7%	3%	2%	0%	0%	0%	100%
Other manufacture	55%	24%	13%	4%	2%	1%	0%	0%	0%	100%
Repair and installation of machinery and equipment	45%	19%	20%	8%	4%	2%	1%	1%	1%	100%
Scientific research and development	45%	18%	16%	8%	6%	4%	1%	2%	1%	100%

Source: Inter-departmental Business Register (IDBR), ONS

Table 2.15 shows that sub-sectors with particularly high percentages of micro-businesses (companies with less than 10 employees) are producers of Wearing Apparel, Leather and Related Goods, Wood and Wood products, Printing and Recorded Media, Furniture and Other Manufacturing, while those with the highest percentages of large companies are Other Transport Equipment (inc. Aerospace), Petroleum Products, Pharmaceuticals, and (above all) Tobacco products.[14]

2.2.3 International competition

British Manufacturers have a long tradition of exporting. While competition for global markets has grown, and will continue to grow, and price pressure is inevitably fierce from enterprises in economies with labour costs well below the UK's, growth prospects in some export markets are likely to be better for a while than those in the domestic market or in the Eurozone, and many manufacturers are gearing up their export commitment in response. Exports of Manufactured Products reached nearly £230bn in 2010, and looks likely to exceed £250bn in 2011.

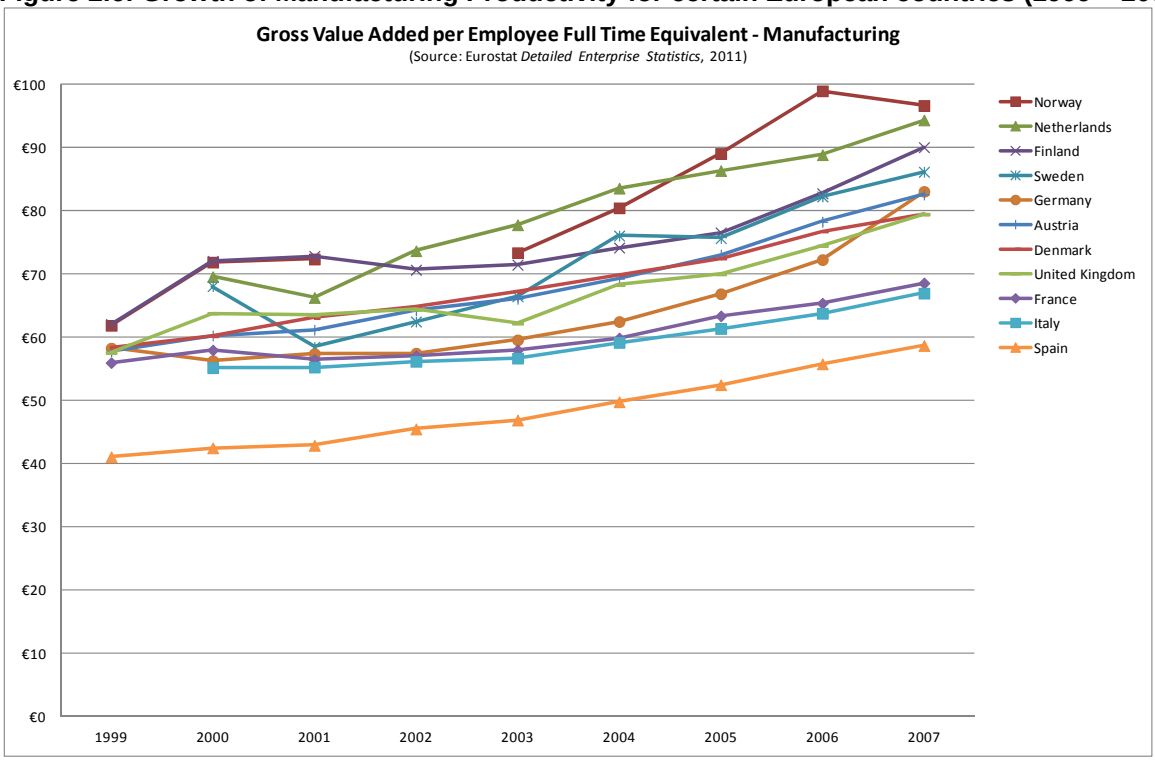
[14] More information about these sub-sectors measures can be found on the websites of the relevant Sector Skills Councils (see Section 1.3)

An indication of the importance of exports to UK Manufacturers can be seen from the *quarterly* export flows for Manufactured products (Figure 2.5).

Figure 2.5: Value of Quarterly Exports of Manufactured Products (1998 – 2011)

The strong growth in exports since mid 2009 (some 35 per cent in just over two years), following falls arising from the 2008 'credit crunch', suggests that Britain's manufacturing continues to be competitive on international markets, though there is certainly no reason for complacency. One Eurostat productivity indicator (GVA per Full-Time-Equivalent – FTE - Employee) for the UK in comparison with other European countries over recent years shows that, though performance has improved, the UK Manufacturing workforce continues under competitive pressure from competitors within Europe (see Figure 2.6).

Figure 2.6: Growth of Manufacturing Productivity for certain European countries (1999 – 2007)



Beyond Europe, growth in UK Manufacturing's labour productivity over recent years, while encouraging (over 30 per cent in 10 years), is not as strong as growth in Sweden, the United States, or Korea (see annual growth rates from OECD data (Table 2.16).

Table 2.16: Labour productivity per unit labour input, Manufacturing annual growth rate (%)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Growth 2000 - 2009
France	0.37	6.81	5.05	5.53	6.86	2.57	3.79	4.46	2.73	4.57	2.78	3.17	-0.89	..	..	..
Germany	2.80	5.88	0.40	2.44	6.98	2.61	0.98	3.56	3.76	4.33	8.34	2.75	-4.59	-9.17	6.94	20%
Ireland	3.04	16.87	9.41	10.94	6.47	6.98	15.78	2.29	3.52	4.61	3.38	10.36	..	..	..	..
Italy	0.45	2.01	-1.36	0.68	5.25	0.28	-1.19	-2.14	1.46	1.51	1.81	0.47	-3.14	-6.15	6.96	-2%
Japan	5.20	2.77	-1.11	2.48	7.20	-2.86	3.51	7.70	8.13	6.02	1.88	3.46	1.40	-14.44	..	22%
Korea	9.36	13.28	11.82	16.25	8.50	4.11	10.71	7.29	7.77	8.73	9.77	10.34	7.66	3.24	..	78%
Netherlands	2.17	0.33	2.89	4.08	7.27	0.44	3.00	2.14	6.75	4.49	3.78	5.12	-2.23	-4.43	9.61	26%
Sweden	3.45	9.59	6.52	9.01	7.16	-2.33	11.82	8.21	11.07	6.49	8.46	2.72	-5.83	-7.35	13.42	40%
United Kingdom	0.50	1.30	0.09	5.04	5.58	2.97	2.74	4.67	6.83	4.48	4.41	2.48	1.89	-5.41	6.88	31%
United States	2.71	4.28	5.13	8.05	4.02	1.40	10.53	5.15	11.43	4.95	1.62	4.79	-1.66	1.87	..	44%
OECD - Average	2.74	4.20	2.61	4.67	5.57	0.51	5.08	4.81	6.81	4.67	3.67	3.97	-0.66	-2.90	..	32%

Source: OECD Productivity Database (2012)

.. Data not available

Most UK manufacturing exports are destined for countries all around the world (though the distribution varies between sub-sectors), but countries in the European Union have, and continue to, represent a substantial element of export demand. As a result, the continuing financial problems for Eurozone economies pose real challenges to UK export volumes, and companies are beginning to respond by strengthening their marketing push beyond Europe. For example the European Union has been the largest market for UK Fashion and Textiles

goods, but there is also increasing emphasis on emerging markets overseas where there is growth and where the British brand is increasingly sought after.

2.3 Employment

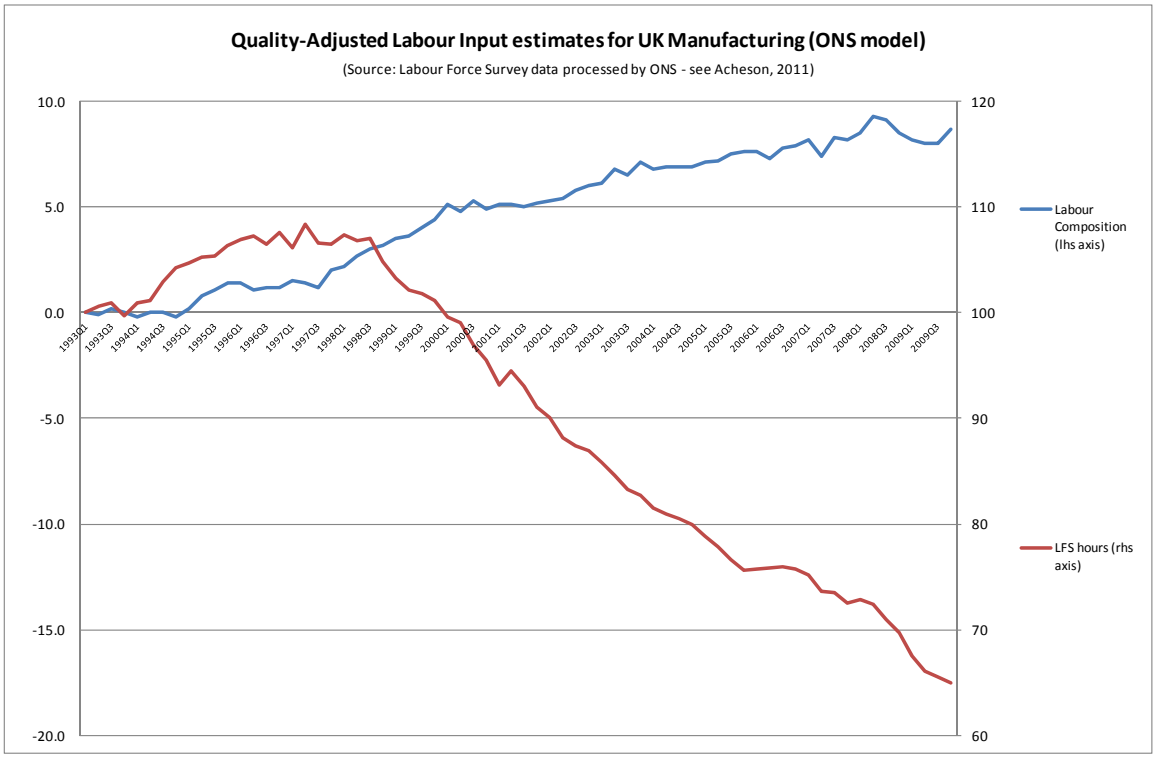
It is well known that employment levels in Manufacturing have fallen significantly over recent years in the UK, as they have in most traditional industrial countries. This development has not occurred, as sometimes assumed, only because of a loss of business to overseas competitors with lower labour costs. Much of it relates to responses to global competition involving off-shoring and outsourcing certain elements of production, as well as the raising of productivity levels through management action and appropriate automation, which still continues apace.[15] In any event, there are still nearly three million people employed in UK Manufacturing, representing more than 10 per cent of the country's workforce. This section shows how the Manufacturing workforce is distributed between producing the different types of products and around different parts of the UK.

A valuable overview and insight into what has happened in UK Manufacturing over recent years, in relation to workforce skills, can be seen from Figure 2.7. The Quality-Adjusted Labour Input (QALI) measure shows both the amount of labour input actually applied and its 'quality' in terms of skill levels.[16] The Office for National Statistics has been developing and refining QALI measures over recent years, and these new results help summarise the development of both the composition of labour, and its utlilisation (number of hours worked) (Acheson, 2011). Both these indicators are normalised to the starting point (in this case 1993Q1) – labour composition shows percentage increases from the starting value, while the LFS hours relate subsequent values back to the starting value (set at 100 per cent). The data underlying these measures are drawn from the Labour Force Survey, and Composition of Labour is measured by highest qualification achieved, in six categories:

i. higher degrees
ii. first or other degrees
iii. certificates of education or equivalent
iv. A-levels or trade apprenticeships
v. GCSEs or equivalent
vi. no qualifications.

[15] Engineering and Machinery Alliance (EAMA) (2010)
[16] These QALI indicators enable more valid and precise measures of productivity to be developed and assessed, in particular in relation to the changing contribution of different levels of *Human Capital* within the workforce, as measured by achievement of educational qualifications

Figure 2.7: Labour Composition and Hours Worked (1993-2008) (normalised) for Manufacturing



From a 1993 level base, the amount of labour applied grew till 1996, and then fell back to its 1993 level in 2000, and has fallen steadily to 65 per cent by 2009. This steady fall reflects the loss of jobs within UK Manufacturing arising from the factors mentioned above. On the other hand, the composition of the Manufacturing workforce has become increasingly skilled in the period to 2009 level to stand at 9 percentage points above its 1993 level. This rise in the 'quality' of labour applied will have arisen from different influences, although the strong growth of numbers going through Higher Education over this period will have made a substantial contribution.

In fact the growth in the 'quality' of labour over this period is reflected in what has happened elsewhere in the economy. Figure 2.8 shows the equivalent trends for the economy as a whole. The amount of labour applied, unlike for Manufacturing, rose steadily till 2008, but has fallen since, while the 'quality' of the UK workforce has risen (the labour composition indicator) at just over nine per cent, in line with the growth within Manufacturing.

A rather different development is to be observed in the Financial Intermediation sector (Figure 2.9): considerable fluctuations in the total amount of labour applied are to be seen over the period, with a dip in 2003-4 and again in 2009, and net growth well below that for the economy as a whole, but the 'quality' of the workforce in this sector has grown even

more strongly than Manufacturing and the overall economy average, with this measure achieving a measure of 25 per cent by 2009.

Figure 2.8: Labour Composition and Hours Worked (1993-2008) (normalised) for Whole Economy

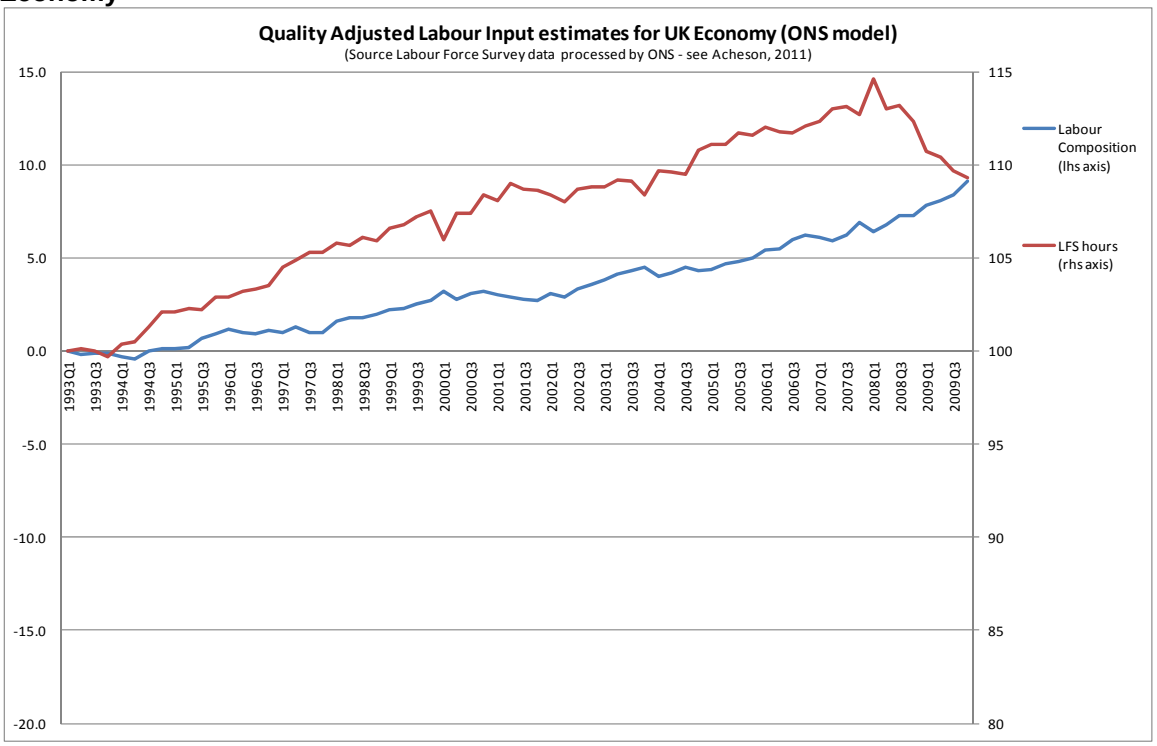
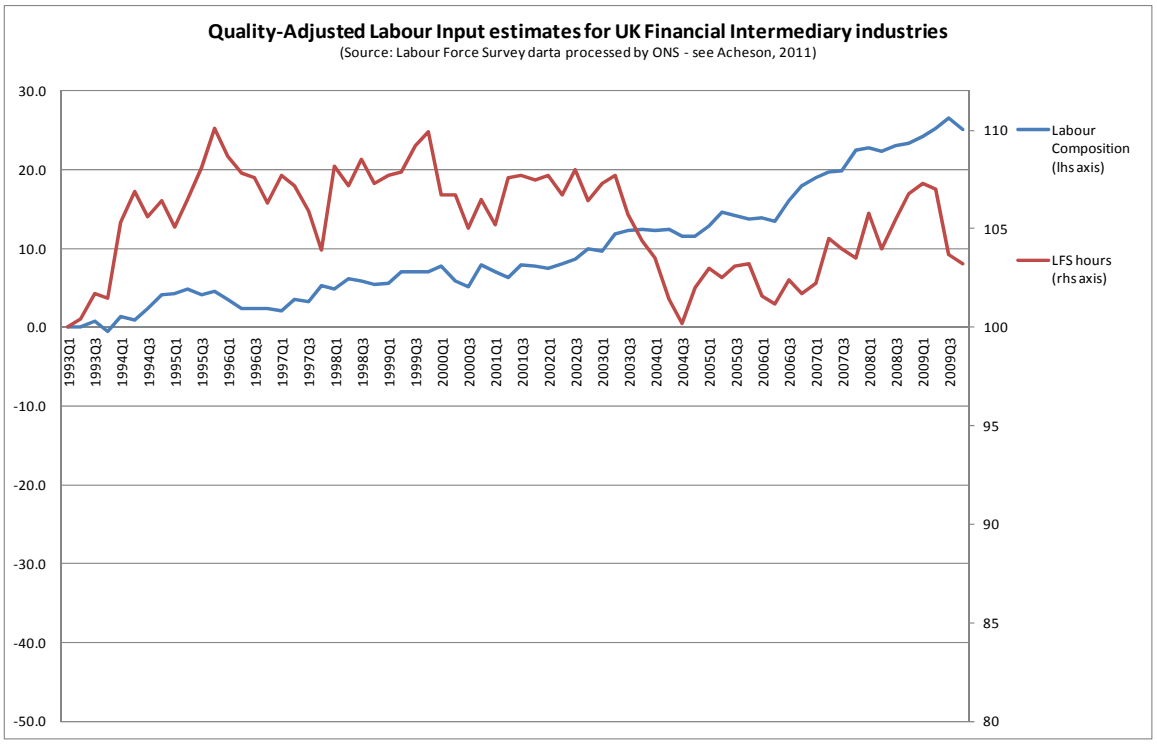


Figure 2.9: *Labour Composition* and *Hours Worked* (1993-2008) (normalised) for Financial Intermediation



It is difficult to conclude anything other than that work in Financial Intermediation has, over the last 15-20 years, attracted significantly more of those with higher educational

qualifications to join its workforce than other sectors have managed, and that Manufacturing will need to find a way, overall, of making itself considerably more attractive than it currently is, if it is to manage to bring in more of those with higher qualifications.

2.3.1 Employment levels

Table 2.17 shows how employment in the United Kingdom is distributed between the 15 major sectors and the four 'home' nations.

Table 2.17: Total employment by sector nation (2010)

	UK		England		Scotland		Wales		Northern Ireland	
	000s	%	000s	%	000s	%	000s	%	000s	%
Agriculture, forestry and fishing	406	100	296	73	51	13	31	8	27	7
Energy production and utilities	473	100	346	73	88	19	25	5	14	3
Manufacturing	**2,970**	**100**	**2,542**	**86**	**199**	**7**	**138**	**5**	**91**	**3**
Construction, building services engineering and planning	2,697	100	2,270	84	244	9	113	4	71	3
Wholesale and retail trade	4,140	100	3,471	84	353	9	205	5	112	3
Transportation and storage	1,448	100	1,252	86	117	8	46	3	33	2
Hospitality, tourism and sport	2,046	100	1,704	83	198	10	100	5	44	2
Information and communication technologies	761	100	675	89	56	7	18	2	13	2
Creative media and entertainment	987	100	876	89	65	7	32	3	14	1
Financial, insurance & other professional services	2,001	100	1,768	88	138	7	53	3	41	2
Real estate and facilities management	978	100	848	87	75	8	38	4	18	2
Government services	2,209	100	1,835	83	173	8	111	5	89	4
Education	3,088	100	2,625	85	235	8	154	5	75	2
Health	2,087	100	1,713	82	199	10	111	5	64	3
Care	1,729	100	1,409	81	183	11	97	6	40	2
Whole Economy	28,855	100	24,331	84	2,446	8	1,312	5	766	3
Unweighted bases	*194.448*	100	*161.501*	83	*17.022*	9	*8.693*	4	*7.232*	4

Source: Labour Force Survey 2010, ONS

The table shows that estimated total employment in the UK Manufacturing sector stands at nearly three million,[17] representing over 10 per cent of the overall workforce, and the third largest of the 15 broad sectors. It is notable that these estimates show manufacturing employment in Scotland as representing a little less than the share of the economies in the other nations.

2.3.2 Distribution of employment

As already indicated, it is important to examine, within the overall figures for Manufacturing, the distribution of characteristics for each indicator between the different sub-sectors, and spatially across the English regions.

[17] LFS estimates of sectoral employment are known to be at odds with those estimated from employer surveys (in particular the Annual Business Survey). This is because individual employee respondents in household surveys often use different words for their employer's main business activity than respondents representing their employer. For example, the 2010 point estimate of total employment in Manufacturing plus Scientific Research and Development from the ABS is some 2,572,000.

As with most measures, the *size of the workforce* in each of the 25 different sub-sectors varies substantially. Table 2.18 shows the estimated 2010 employment within each of the 25 different types of Manufacturing, ranked in order of workforce size.

Table 2.18: Total employment by Manufacturing sub-sector (UK) (2010)

Sub-sector	size
Manufacture of food products	345,302
Manufacture of machinery and equipment nec	251,813
Manufacture of fabricated metal products	242,137
Repair and installation of machinery and equipment	183,574
Manufacture of other transport equipment	182,045
Manufacture of motor vehicles	176,149
Manufacture of computer, electronic and optical products	174,660
Manufacture of rubber and plastic products	167,075
Printing and reproduction of recorded media	137,430
Manufacture of basic pharmaceutical products	115,771
Scientific research and development	110,758
Manufacture of chemicals and chemical products	107,808
Manufacture of basic metals	100,340
Other manufacture	93,105
Manufacture of furniture	90,526
Manufacture of other non-metallic products	85,465
Manufacture of electrical equipment	79,120
Manufacture of wood and products	68,690
Manufacture of paper and paper products	67,351
Manufacture of textiles	61,909
Manufacture of beverages	46,228
Manufacture of wearing apparel	36,545
Manufacture of coke and refined petroleum products	33,479
Manufacture of leather and related good	*
Manufacture of tobacco products	*

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate*

As can be seen, there is considerable variation in workforce size between the different sub-sectors, with Food Products, (Mechanical) Machinery and Equipment, and Metal Products having the largest employment levels, and Production of Tobacco, Leather, Coke and Refined Petroleum Products, Wearing Apparel, and Beverages having comparatively smaller workforces.

Within England the employment split between the regions is shown in Table 2.19.

Table 2.19: Total employment by sector and English region, % share within region (2010)

	London	South East	East of England	South West	West Midlands	East Midlands	Yorkshire and the Humber	North West	North East
Agriculture, forestry and fishing	*	1.1	1.3	2.6	1.6	1.6	1.4	0.9	1.0
Energy production and utilities	0.8	1.5	1.2	1.6	1.5	1.7	1.5	1.6	2.1
Manufacturing	**4.2**	**8.6**	**11.1**	**11.3**	**14.2**	**15.1**	**12.1**	**11.6**	**11.1**
Construction, building services, engineering and planning	8.7	10.1	10.5	9.2	9.2	8.7	8.9	8.9	9.4
Wholesale and retail trade	11.6	13.7	13.9	14.4	14.1	15.9	16.2	15.6	14.9
Transportation and storage	5.2	5.3	5.4	3.9	5.4	5.7	5.3	5.3	4.3
Hospitality, tourism and sport	7.8	6.6	6.4	7.5	6.6	6.7	6.8	7.4	7.2
Information and communication technologies	3.5	4.0	3.3	2.6	2.3	2.0	1.7	2.1	1.8
Creative media and entertainment	8.1	3.6	3.2	3.4	2.1	2.4	2.1	2.3	2.3
Financial, insurance & other professional services	13.3	7.6	8.1	5.7	5.6	4.7	5.5	5.5	4.5
Real estate and facilities management	4.5	3.6	3.2	3.5	3.0	2.6	3.0	3.7	3.3
Government services	7.8	7.6	7.2	7.5	7.1	6.6	7.8	7.6	9.3
Education	10.1	11.4	10.9	11.0	10.8	11.0	10.6	10.4	10.9
Health	5.8	6.8	6.3	7.0	7.3	7.2	7.8	8.3	7.7
Care	5.3	5.5	5.1	6.3	6.4	5.4	6.0	6.1	7.6
Whole Economy	100	100	100	100	100	100	100	100	100
Weighted base	3,726	4,147	2,779	2,515	2,413	2,099	2,382	3,126	1,145
Unweighted bases	*18.925*	*26.614*	*18.998*	*17.015*	*16.534*	*15.044*	*17.467*	*22.418*	*8.486*

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate*

The variations in the percentages of the regional workforces shown suggest the relative importance of Manufacturing for employment in the different Regions – in particular the relatively high levels in the West and East Midlands, and the relatively low levels in London and the South East. Note, again, however, that the variations shown are for Manufacturing employment as a whole, and may well mask significant differences between sub-sectors: for example, Pharmaceutical Manufacturing activity is relatively high in London and the South East, and there are notable clusters of Print and Paper makers in the South East, and Clothing manufacturing in the London area.

2.3.3 Changes in employment patterns

Table 2.20 shows the significant fall in Manufacturing employment since 2002 (by 28.5 per cent over eight years), though the fall in employed was checked in 2010, even though overall UK employment continued to fall. This fall in manufacturing employment is well documented, and arises from several factors, not least the increase in productivity observed in many sub-sectors, which has allowed production at the same, or higher volumes, but with fewer people.

Table 2.20: Total employment by sector, 2002-2010 (UK) (000s)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	000s	000s	000s	000s	000s	000s	000s	000s	000s
Agriculture, forestry and fishing	394	389	396	421	417	422	448	364	406
Energy production and utilities	434	389	407	422	436	479	486	483	473
Manufacturing	**4,153**	**3,870**	**3,687**	**3,615**	**3,562**	**3,575**	**3,368**	**2,915**	**2,970**
Construction, building services engineering and planning	2,223	2,333	2,434	2,500	2,560	2,615	2,639	2,875	2,697
Wholesale and retail trade	4,368	4,545	4,536	4,489	4,404	4,349	4,446	4,143	4,140
Transportation and storage	1,486	1,485	1,461	1,511	1,501	1,490	1,517	1,489	1,448
Hospitality, tourism and sport	1,718	1,720	1,730	1,714	1,773	1,807	1,799	1,991	2,046
Information and communication technologies	813	813	839	832	835	851	871	784	761
Creative media and entertainment	1,102	1,139	1,108	1,111	1,138	1,142	1,156	975	987
Financial, insurance & other professional services	1,671	1,662	1,623	1,677	1,696	1,744	1,736	2,038	2,001
Real estate and facilities management	898	869	924	946	984	1,036	1,028	948	978
Government services	2,115	2,166	2,194	2,251	2,282	2,285	2,323	2,265	2,209
Education	2,295	2,414	2,543	2,580	2,642	2,636	2,664	2,939	3,088
Health	1,811	1,881	1,980	2,048	2,079	2,033	2,118	2,038	2,087
Care	1,288	1,338	1,408	1,456	1,479	1,446	1,506	1,721	1,729
Whole Economy	27,908	28,172	28,456	28,740	28,987	29,164	29,382	28,811	28,855
Unweighted base	*247.273*	*238.005*	*230.951*	*227.794*	*222.196*	*221.046*	*217.000*	*203.221*	*194.448*

Source: Labour Force Survey 2010, ONS

In addition to the overall falls from 2002 to 2010 within the four home nations, two other features are worthy of note:

- While the fall in employment in Manufacturing in England and Northern Ireland was halted in 2010 (with increases of 3.4 per cent and 6.3 per cent respectively), the workforce continued to shrink in Wales (by 7 per cent) and Scotland (by over 10 per cent).
- Over the eight years, the lowest net fall in Manufacturing employment was in Northern Ireland (by less than 10 per cent), followed by England (with a fall of 28.3 per cent), Wales (30.9 per cent), and Scotland, with a fall of 35.7 per cent.

2.3.4 European Comparisons

Table 2.21 and Table 2.22 show estimates of employment levels in Manufacturing within European Union Member States and selected other countries. International comparisons are particularly difficult to make with precision, since they are generally subject to different classifications,[18] and survey methodologies. For example, the Eurostat estimates of UK Manufacturing employment show 2.78 million, while the UK LFS estimates for the same year show 3.37 million (although the latter includes Scientific R&D, which the Eurostat estimates do not).[19]

The employment estimates for each sector give a comparative feel for the scale of the workforce in other European countries, enabling initial assessments of comparative sizes of the workforces in countries which would be considered the home of competitive businesses. For Manufacturing, the relatively large size of the German workforce is strongly evident (over 7.5 million), and France, Italy and Turkey all have larger Manufacturing workforces than the UK. But it must be remembered that it is productivity as well as (probably more than) size which matters in international competitiveness (see 2.1.3).

The fraction of each country's total workforce within the different sectors is also of interest. Manufacturing represents twice the proportion of Germany's working population as compared with that in the UK, and the average share of Manufacturing within the EU-27 as a whole is 16 per cent, compared to the UK's 10 per cent.

[18] In particular the boundaries of sectors shown are not identical to those used in this report for UK data
[19] Eurostat estimates allow reliable comparisons to be made between EU Member States.

Table 2.21: Employment by sector by European nation (2008) (000s)

SSA sector	1 Agriculture, forestry and fishing	2 Energy production and utilities	3 Manufacturing	4 Construction	5 Wholesale and retail trade	6 Transportation and storage	7 Accommodation, food and tourism activities (1)	8 Information and communication	9 Creative media and entertainment (2)	10 Financial, insurance & other professional services (3)	11 Real estate and facilities management	12 Government	13 Education	14 & 15 Health and Care	 Not in scope (4)	 Total
European Union (EU27)	10,025	4,038	33,699	16,390	29,953	10,844	9,381	6,087	3,342	16,796	1,607	15,636	15,721	21,875	17,047	212,439
Germany (including former GDR)	580	652	7,674	2,543	5,152	1,790	1,452	1,211	533	3,174	250	2,828	2,347	4,620	3,266	38,073
United Kingdom	297	467	2,780	2,162	3,882	1,401	1,388	992	718	2,926	264	1,911	2,993	3,698	2,231	28,110
France	735	427	3,369	1,895	3,343	1,335	961	737	336	2,124	300	2,591	1,750	3,354	2,322	25,578
Italy	815	362	4,221	1,923	3,270	1,065	1,171	527	261	2,040	134	1,414	1,522	1,636	2,136	22,497
Turkey	4,932	278	4,193	1,424	3,285	1,004	1,077	204	101	693	59	1,293	1,016	587	1,858	22,003
Spain	777	240	2,361	1,645	2,886	904	1,362	506	324	1,300	81	1,394	1,171	1,350	2,003	18,304
Poland	1,948	565	2,946	1,277	2,358	882	349	314	196	846	170	1,044	1,235	918	673	15,718
Romania	2,371	297	1,646	704	1,132	444	180	126	50	291	19	471	384	402	306	8,822
Netherlands	213	78	793	453	1,084	379	336	290	160	681	60	538	564	1,350	1,240	8,220
Czech Republic	148	154	1,227	460	588	326	188	135	79	305	39	326	287	334	215	4,809
Portugal	326	67	816	477	709	173	280	105	35	240	25	311	364	341	391	4,659
Belgium	58	74	650	321	582	266	140	152	65	351	22	448	413	604	306	4,451
Sweden	82	51	541	299	548	235	151	178	106	437	59	264	486	685	311	4,436
Greece	512	73	466	319	784	208	300	85	48	327	6	370	320	242	248	4,305
Austria	190	55	620	338	616	196	249	109	70	358	36	286	259	390	252	4,021
Hungary	166	96	783	276	543	258	158	95	60	226	20	304	316	253	197	3,749
Bulgaria	201	108	632	266	525	175	158	70	38	136	10	224	181	156	128	3,010
Denmark	62	29	338	157	389	122	84	115	60	225	26	159	225	508	156	2,654
Norway	59	75	232	176	337	136	68	90	50	181	22	146	202	519	136	2,428
Finland	100	33	359	170	295	154	82	94	53	195	20	116	172	376	191	2,409
Slovakia	75	72	529	257	305	145	103	56	26	122	14	188	163	156	95	2,306
Ireland	71	30	208	117	263	90	118	72	41	188	8	105	146	230	113	1,799
Croatia	187	52	251	115	202	94	88	39	26	86	5	95	90	99	57	1,485
Lithuania	117	26	207	93	241	90	33	24	21	70	13	82	142	89	67	1,315
Slovenia	66	21	233	58	116	51	46	32	18	68	3	59	76	55	39	941
Latvia	78	30	128	66	148	81	29	29	20	44	17	62	93	45	48	916
Estonia	23	16	107	47	78	43	19	12	14	29	9	40	54	32	28	549
Cyprus	11	4	31	43	71	15	27	8	7	40	2	31	27	16	39	373
Luxembourg	2	0	12	14	18	9	6	9	2	42	1	38	18	21	26	217
Malta	2	4	24	12	26	10	13	5	3	12	:	14	14	13	8	160
Iceland	9	1	17	10	20	8	8	7	5	17	:	8	20	20	8	157

Source: Eurostat, 2011

Table 2.22: Employment by sector by European nation (2008) (%)

SSA sector	1 Agriculture, forestry and fishing	2 Energy production and utilities	3 Manufacturing	4 Construction	5 Wholesale and retail trade	6 Transportation and storage	7 Accommodation, food and tourism activities (1)	8 Information and communication	9 Creative media and entertainment (2)	10 Financial, insurance & other professional services (3)	11 Real estate and facilities management	12 Government	13 Education	14 & 15 Health and Care	Not in scope (4)	Total
European Union (EU27)	5%	2%	16%	8%	14%	5%	4%	3%	2%	8%	1%	7%	7%	10%	8%	100%
Germany (including former GDR fro	2%	2%	20%	7%	14%	5%	4%	3%	1%	8%	1%	7%	6%	12%	9%	100%
United Kingdom	1%	2%	10%	8%	14%	5%	5%	4%	3%	10%	1%	7%	11%	13%	8%	100%
France	3%	2%	13%	7%	13%	5%	4%	3%	1%	8%	1%	10%	7%	13%	9%	100%
Italy	4%	2%	19%	9%	15%	5%	5%	2%	1%	9%	1%	6%	7%	7%	9%	100%
Turkey	22%	1%	19%	6%	15%	5%	5%	1%	0%	3%	0%	6%	5%	3%	8%	100%
Spain	4%	1%	13%	9%	16%	5%	7%	3%	2%	7%	0%	8%	6%	7%	11%	100%
Poland	12%	4%	19%	8%	15%	6%	2%	2%	1%	5%	1%	7%	8%	6%	4%	100%
Romania	27%	3%	19%	8%	13%	5%	2%	1%	1%	3%	0%	5%	4%	5%	3%	100%
Netherlands	3%	1%	10%	6%	13%	5%	4%	4%	2%	8%	1%	7%	7%	16%	15%	100%
Czech Republic	3%	3%	26%	10%	12%	7%	4%	3%	2%	6%	1%	7%	6%	7%	4%	100%
Portugal	7%	1%	18%	10%	15%	4%	6%	2%	1%	5%	1%	7%	8%	7%	8%	100%
Belgium	1%	2%	15%	7%	13%	6%	3%	3%	1%	8%	0%	10%	9%	14%	7%	100%
Sweden	2%	1%	12%	7%	12%	5%	3%	4%	2%	10%	1%	6%	11%	15%	7%	100%
Greece	12%	2%	11%	7%	18%	5%	7%	2%	1%	8%	0%	9%	7%	6%	6%	100%
Austria	5%	1%	15%	8%	15%	5%	6%	3%	2%	9%	1%	7%	6%	10%	6%	100%
Hungary	4%	3%	21%	7%	14%	7%	4%	3%	2%	6%	1%	8%	8%	7%	5%	100%
Bulgaria	7%	4%	21%	9%	17%	6%	5%	2%	1%	5%	0%	7%	6%	5%	4%	100%
Denmark	2%	1%	13%	6%	15%	5%	3%	4%	2%	8%	1%	6%	8%	19%	6%	100%
Norway	2%	3%	10%	7%	14%	6%	3%	4%	2%	7%	1%	6%	8%	21%	6%	100%
Finland	4%	1%	15%	7%	12%	6%	3%	4%	2%	8%	1%	5%	7%	16%	8%	100%
Slovakia	3%	3%	23%	11%	13%	6%	4%	2%	1%	5%	1%	8%	7%	7%	4%	100%
Ireland	4%	2%	12%	6%	15%	5%	7%	4%	2%	10%	0%	6%	8%	13%	6%	100%
Croatia	13%	4%	17%	8%	14%	6%	6%	3%	2%	6%	0%	6%	6%	7%	4%	100%
Lithuania	9%	2%	16%	7%	18%	7%	3%	2%	2%	5%	1%	6%	11%	7%	5%	100%
Slovenia	7%	2%	25%	6%	12%	5%	5%	3%	2%	7%	0%	6%	8%	6%	4%	100%
Latvia	9%	3%	14%	7%	16%	9%	3%	3%	2%	5%	2%	7%	10%	5%	5%	100%
Estonia	4%	3%	19%	9%	14%	8%	3%	2%	3%	5%	2%	7%	10%	6%	5%	100%
Cyprus	3%	1%	8%	12%	19%	4%	7%	2%	2%	11%	1%	8%	7%	4%	10%	100%
Luxembourg	1%	0%	6%	6%	8%	4%	3%	4%	1%	19%	1%	17%	8%	9%	12%	100%
Malta	1%	3%	15%	7%	16%	6%	8%	3%	2%	8%	n.a	9%	9%	8%	5%	100%
Iceland	5%	1%	11%	6%	12%	5%	5%	4%	3%	11%	n.a	5%	12%	13%	5%	100%

Source: Eurostat, 2011

3 The workforce

Summary

This Section examines a wide range of dimensions of the Manufacturing workforce, with comparisons with the UK workforce as a whole, variations in characteristics between the four UK nations and 25 Manufacturing sub-sectors, and information on recent trends.

The Manufacturing workforce:

- consists mainly of people working in Managerial, Skilled Trades or Production Operative types of occupation, with significant numbers working in Professional, and a smaller level of Associate Professional employment
- composition of employment is broadly the same around the United Kingdom, though in Scotland, Wales and Northern Ireland the proportion of the higher level occupations is a little lower, and the proportion of the lower level occupations a little higher
- occupational composition varies considerably across the 25 manufacturing sub-sectors. For example, comparatively high percentages of the workforce reside in the higher level occupations in the Manufacture of Pharmaceutical-, Chemical-, and Electronic Products and Beverages, as well as Scientific R&D; and higher percentages of the workforce are found in the lower level occupations in the production of Food Products, Wearing apparel, Paper Products, Textiles and Rubber & Plastics
- has decreased significantly in size since 2002, with the loss of Skilled Trades and Production Operatives workers being particularly large
- has more Production, Works and Maintenance Managers than any other single occupation, as well as significant numbers of Marketing/Sales Managers, Metal-working Fitters and Food, Drink and Tobacco Operatives
- has comparatively traditional working patterns compared to the UK workforce as a whole, with fewer part-time, self-employed, and temporary workers than average
- still has fewer than a quarter of its number being women (despite campaigns addressing this issue over a number of years)
- is an ageing workforce, with greater numbers of its workers in the older age-bands than across the economy as a whole, and this property has increased since 2002;
- has slightly lower proportions of its workers from Black, Asian or Minority Ethnic communities

- has slightly lower proportions of its workforce comprised of migrant workers than the economy as a whole: this varies considerably between sub-sectors (with – e.g. - significant migrant worker contributions in Food Products and Wearing Apparel). Overall, the number of migrants workers from other EU countries exceed numbers from beyond Europe.

3.1 The jobs people do

Working in British manufacturing could be considered in broad terms to cover two main types of activity: (i) that associated with the technicalities of the design, development and production process for the sub-sector's products; and (b) those associated with what is needed to run any production enterprise (including the activities of Sales/Marketing teams, Accountants, Human Resources staff, Purchasing executives, Health and Safety officers, Legal advisers, *etc.*).

3.1.1 The Sector's Occupational Structure

Quantitative evidence of occupational structure in the UK is based on the Standard Occupational Classification (SOC). The classification is hierarchical, with nine 'Major Groups' (1-digit categories), and, in addition, 2-digit, 3-digit and 4-digit categories. Table 3.1 shows the distribution of employment between the SOC Major Groups for Manufacturing, as compared with the economy as a whole. Broad definitions of the occupations within each SOC Major Group are given in Annex C.

Table 3.1: Employment by occupational group and sector, 2010 (UK)

	Manufacturing		All economy	
	000s	%	000s	%
Managers and Senior Officials	575	19	4,455	15
Professional Occupations	342	12	4,028	14
Associate Professional and Technical	272	9	4,265	15
Administrative and Secretarial	218	7	3,181	11
Skilled Trades Occupations	622	21	3,061	11
Personal Service Occupations	*	*	2,544	9
Sales and Customer Service Occupations	61	2	2,146	7
Process, Plant and Machine Operatives	603	20	1,907	7
Elementary Occupations	270	9	3,257	11
All occupations	2,969	100	28,842	100
Unweighted base	*20.400*		*194.372*	

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate*

As shown in Table 3.1, the Manufacturing workforce is characterised by comparatively large proportions of employees in three main broad occupational groups:

- Management (19 per cent compared with. 15 per cent across all sectors)
- Skilled Trades (21 per cent compared with 11 per cent)
- Process, Plant and Machine Operatives (20 per cent compared with 7 per cent generally)

It is notable that the fraction of Manufacturing employment within Associate Professional and Technical occupations is well below that in the economy as a whole (9 per cent compared with 15 per cent).

The distribution across the four nations of employment among the nine SOC major groups for the economy as a whole is shown in Table 3.2.

Table 3.2: Employment by occupational group and nation, *All Economy*, 2010 (UK)

	UK		England		Scotland		Wales		Northern Ireland	
	000s	%	000s	%	000s	%	000s	%	000s	%
Managers and Senior Officials	4,455	15	3,866	16	331	14	173	13	85	11
Professional Occupations	4,028	14	3,454	14	299	12	176	13	100	13
Associate Professional and Technical	4,265	15	3,638	15	353	14	186	14	88	12
Administrative and Secretarial	3,181	11	2,670	11	270	11	135	10	106	14
Skilled Trades Occupations	3,061	11	2,502	10	285	12	149	11	125	16
Personal Service Occupations	2,544	9	2,123	9	226	9	131	10	64	8
Sales and Customer Service Occupations	2,146	7	1,772	7	209	9	111	8	54	7
Process, Plant and Machine Operatives	1,907	7	1,570	6	174	7	99	8	63	8
Elementary Occupations	3,257	11	2,724	11	300	12	153	12	81	11
All occupations	28,842	100	24,319	100	2,446	100	1,311	100	765	100
Unweighted base	*194.372*		*161.438*		*17.020*		*8.690*		*7.224*	

Source: Labour Force Survey 2010, ONS

The distribution of the different occupational groups across the four home nations shows certain differences, with slightly higher proportions of Management occupations in England than in the devolved administrations, and slightly lower percentages in England of Skilled Trades and Process, Plant and Machine Operatives than in Scotland, Wales and Northern Ireland.

Table 3.3: Employment by occupational group and nation, *All Economy*, 2010 (UK)

	England		Scotland		Wales		Northern Ireland	
	000s	%	000s	%	000s	%	000s	%
Managers and Senior Officials	509	20	35	17	17	13	13	14
Professional Occupations	307	12	18	9	13	9	*	*
Associate Professional and Technical	239	9	17	9	11	8	*	*
Administrative and Secretarial	188	7	16	8	9	6	*	*
Skilled Trades Occupations	523	21	44	22	29	21	26	29
Personal Service Occupations	*	*	*	*	*	*	*	*
Sales and Customer Service Occupations	53	*	*	*	*	*	*	*
Process, Plant and Machine Operatives	493	19	44	22	40	29	25	28
Elementary Occupations	224	9	19	10	17	12	9	10
All occupations	2,541	100	199	100	138	100	91	100

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate*

While sample sizes are limited, as for the economy as a whole, Table 3.3 does suggest higher fractions of the lower level occupational groups in Scotland, Wales and Northern Ireland, and lower fractions of the higher level occupational groups, than in England.

Table 3.4 shows the distribution of the workforces of each of the 25 Sub-sectors across the nine occupational groups. These statistics must be considered in the context of the often very different types of production process in the different Manufacturing sub-sectors. For example, some production processes (such as those in. Food and Drink) require significant numbers of 'operators' to manage mass production lines, while production of aircraft wings would require smaller teams with much higher skill levels.

Table 3.4: Employment by occupational group *within* Manufacturing (UK)

Manufacturing Sub-sector	Managers, Directors and Senior Officials	Professional Occupations	Associate Professional and Technical Occupations	Administrative and Secretarial Occupations	Skilled Trades Occupations	Caring, Leisure and other Service Occupations	Sales and Customer Service Occupations	Process, Plant and Machine Operatives	Elementary Occupations
	Percentage of Sub-sector workforce within each occupational group								
Manufacture of food products	13.5%	2.1%	6.4%	5.2%	10.4%	0.1%	2.6%	35.8%	24.0%
Manufacture of beverages	27.9%	5.1%	10.4%	9.2%	6.5%	0.4%	4.8%	26.6%	9.1%
Manufacture of tobacco products	13.5%	12.7%	14.1%	12.8%	16.2%	0.0%	0.0%	24.1%	6.6%
Manufacture of textiles	17.8%	1.3%	6.5%	7.9%	19.1%	0.0%	3.7%	35.2%	8.7%
Manufacture of wearing apparel	16.2%	4.0%	6.1%	12.2%	15.7%	0.0%	3.9%	23.6%	18.1%
Manufacture of leather and related good	17.2%	0.0%	14.9%	5.7%	37.2%	0.0%	3.9%	7.9%	13.0%
Manufacture of wood and products	16.2%	0.3%	5.2%	5.7%	43.6%	0.9%	0.7%	22.1%	5.2%
Manufacture of paper and paper products	15.6%	5.6%	7.3%	9.7%	11.9%	0.0%	2.1%	31.1%	16.6%
Printing and reproduction of recorded media	22.8%	2.7%	10.2%	5.7%	29.6%	0.2%	4.0%	7.7%	17.0%
Manufacture of coke and refined petroleum products	16.5%	24.1%	8.3%	13.9%	11.5%	0.0%	2.3%	21.1%	2.2%
Manufacture of chemicals and chemical products	25.3%	18.4%	10.6%	7.0%	3.9%	0.6%	1.5%	22.0%	10.7%
Manufacture of basic pharmaceutical products	26.4%	27.0%	19.4%	7.9%	1.9%	0.7%	0.3%	9.1%	7.3%
Manufacture of rubber and plastic products	18.5%	4.4%	5.9%	9.8%	17.8%	0.0%	2.4%	31.7%	9.4%
Manufacture of other non-metallic products	21.5%	2.5%	4.0%	9.9%	17.8%	0.2%	2.6%	32.6%	9.0%
Manufacture of basic metals	20.5%	7.8%	8.6%	6.4%	25.9%	0.0%	0.3%	20.8%	9.8%
Manufacture of fabricated metal products	20.5%	8.0%	7.3%	8.0%	32.1%	0.0%	0.6%	16.9%	6.5%
Manufacture of computer, electronic and optical products	26.9%	23.4%	13.1%	7.0%	10.4%	0.0%	2.3%	14.5%	2.4%
Manufacture of electrical equipment	21.5%	14.0%	11.7%	5.3%	15.4%	0.0%	4.5%	20.8%	6.9%
Manufacture of machinery and equipment nec	22.0%	11.3%	10.9%	8.7%	23.7%	0.3%	1.5%	15.6%	5.9%
Manufacture of motor vehicles	13.0%	12.0%	6.0%	6.9%	25.3%	0.0%	1.7%	28.6%	6.6%
Manufacture of other transport equipment	15.9%	22.8%	9.9%	5.3%	28.4%	0.2%	0.8%	14.3%	2.3%
Manufacture of furniture	14.5%	2.3%	5.0%	9.5%	40.9%	0.0%	3.2%	17.2%	7.3%
Other manufacture	26.4%	5.6%	17.1%	7.6%	17.8%	0.3%	5.8%	10.5%	8.9%
Repair and installation of machinery and equipment	16.4%	10.1%	6.7%	6.0%	45.5%	0.2%	1.6%	10.6%	3.0%
Scientific research and development	20.0%	51.9%	15.8%	7.6%	1.3%	0.5%	0.0%	1.9%	1.0%

Source: Labour Force Survey 2010, ONS

= percentages of a particularly small workforce

Table 3.4 shows considerable variation across the sub-sectors:

- Sub-sectors with particularly high proportions of Senior Managers are the Manufacture of Beverages, Chemicals & Chemical products, Basic Pharmaceuticals, Computer-, Electronic- & Optical- Products, and Other Manufacturing.
- The Sub-sector with the highest fraction of Professional Occupations is Scientific Research and Development, followed by Manufacture of Coke and Refined Petroleum Products, Basic Pharmaceutical Products, Computer-, Electronic- and Optical-Products, and Other Transport Equipment.

- Sub-sectors with a high share of Associate Professional and Technical occupations are Basic Pharmaceutical Products, Other Manufacture, Scientific Research and Development, and Computer-, Electronic- and Optical- products.
- Sub-sectors with the highest proportions of Skilled Trades Occupations are Repair and Installation of Machinery and Equipment, Wood & Products, Furniture, and Fabricated Metal Products.
- Sub-sectors with the highest percentages of Process, Plant and Machine operatives are the Manufacture of Food products, Textiles, Rubber and Plastics Products, Other Non-metallic Products, and Paper and Paper Products.
- Sub-sectors with the highest percentages of Elementary occupations are the Manufacture of Food products, Wearing Apparel, Printing and Reproduction of Recorded Media, and Paper and Paper Products.

The share of the Manufacturing workforce employed in Caring, Leisure and Other Service occupations and Sales and Customer Service occupations is comparatively low (less than 1 per cent and 6 per cent, respectively, in each case).

As already discussed, manufacturing employment has fallen significantly over recent years. The distribution of this across the main occupational groups is shown in Table 3.5.

Table 3.5: Manufacturing employment by occupational group (UK, 000s)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Managers and Senior Officials	673	643	645	630	661	658	631	581	575
Professional Occupations	377	358	341	377	365	383	370	309	342
Associate Professional and Technical	419	392	362	349	366	368	343	267	272
Administrative and Secretarial	331	327	301	289	282	281	270	241	218
Skilled Trades Occupations	885	825	778	747	701	718	672	614	622
Personal Service Occupations	*	*	*	*	*	15	13	*	*
Sales and Customer Service Occupations	91	77	64	68	67	77	67	58	61
Process, Plant and Machine Operatives	1022	908	864	841	814	785	716	596	603
Elementary Occupations	346	331	324	307	296	288	285	247	270
All occupations	4,152	3,868	3,686	3,613	3,560	3,573	3,367	2,915	2,969

Source: Labour Force Survey 2010, ONS

* Sample size too small for reliable estimate

As evident from Table 3.5, within Manufacturing the overall fall in employment levels in, and the split of employment between, the different occupational groups have varied over recent years. Probably the most significant development over the eight years has been the major reduction in numbers of both Skilled Trades and Operative occupations – the Manufacturing workforce lost over 250,000 of the former, and nearly 420,000 of the latter between 2002 and 2010. These occupations were evidently the greatest 'victims' of certain production off-shoring and automation measures to improve the overall competitiveness of UK enterprises. In comparative terms, numbers in Sales and customer services, Administrative and

Secretarial, and above all Associate Professional and Technical occupations fell nearly as much as those in Operatives occupations.

While the overall fall in Manufacturing employment over the eight years amounted to 28 per cent, the numbers of Managers/Senior officials fell by only 15 per cent, and the reduction in Professional Occupations was only 9 per cent: this led to an increase in the share of Managers of 20 per cent and an increase of 27 per cent in the number of people employed as Professionals. The greater than average fall in Associate Professional and Technical occupations is of concern, since this is an area of likely growing future need in a manufacturing sector which might be characterised as relatively advanced.

3.1.2 Prevalent Core Jobs

More detailed and valuable information about specific occupations of importance, within both the economy as a whole and within Manufacturing, is available at the most detailed level of the SOC classification (the 4-digit 'Unit Group'). Tables 3.6 and 3.7 show the SOC Unit Groups with the highest employment levels within the UK workforce.

Table 3.6: Largest occupational categories for the *Whole Economy*, UK (2010)

Rank	Occupation	000s	% work-force
1	7111 Sales and retail assistants	1,233	4
2	6115 Care assistants and home carers	741	3
3	4150 General office assistants or clerks	656	2
4	9233 Cleaners, domestics	588	2
5	1132 Marketing and sales managers	532	2
6	4122 Accnts wages clerk, bookkeeper	523	2
7	6124 Educational assistants	513	2
8	3211 Nurses	509	2
9	2314 Secondary eductn teaching prfsnals	445	2
10	2315 Prim & nurs eductn teaching profs	432	1
11	1121 Prod. works & maintenance managers	414	1
12	9223 Kitchen and catering assistants	411	1
13	1163 Retail and wholesale managers	394	1
14	9149 Oth good hndlng & storage occup nec	382	1
15	2132 Software professionals	327	1
	Other occupations	20,742	72
	Total workforce	28,842	100
	Unweighted base (000s)	*194.372*	

Source: Labour Force Survey 2010, ONS

Table 3.7 shows the largest Unit Group occupations in the UK Manufacturing workforce, ranked in descending order of numbers in the workforce.

Table 3.7: Largest occupational categories within *Manufacturing*, UK (2010)

Rank	Occupation	000s	% workforce
1	1121 Prod. works & maintenance managers	209	7
2	1132 Marketing and sales managers	122	4
3	5223 Mtl working prod & maintnce fitter	112	4
4	8111 Food, drink & tobac process operat	108	4
5	9134 Packers, bottlers, canners, fillers	77	3
6	9149 Oth good hndlng & storage occup nec	74	2
7	8125 Metal working machine operatives	60	2
8	4150 General office assistants or clerks	58	2
9	4122 Accnts wages clerk, bookkeeper	57	2
10	3542 Sales representatives	55	2
11	5241 Electricians, electrical fitters	51	2
12	5215 Welding trades	51	2
13	5221 Metal mach setter & setter-operator	50	2
14	8133 Routine inspectors and testers	46	2
15	2132 Software professionals	42	1
	Other occupations	1,796	60
	Total workforce	2,969	100
	Unweighted base (000s)	*20.4*	

Source: Labour Force Survey 2010, ONS

As can be seen, the largest occupational category within Manufacturing is Production, Workers and Maintenance Managers (a SOC unit group category that features within the all-economy top 15, and evidently exists in considerable numbers in other sectors). Other occupational categories with comparatively large numbers of workers within Manufacturing include:

- Marketing and Sales Managers;
- Metal Working Production and Maintenance Fitters (a 'Skilled Trades' occupation),
- Food, Drink and Tobacco Process Operatives (a 'Process, Plant and Machine operatives' occupation).

It is important to recognise that not all of the most prevalent occupations in Manufacturing are what might be expected – 'technical' occupations related to the technologies of importance to the product being manufactured. Present in the 'top ten' categories are two occupations related to the generic needs of manufacturing businesses to market and sell their products, as well as the need to track the finances and keep the offices working efficiently. The presence of another generic occupation, Software Professionals, confirms the increasing importance of effective IT systems to manufacturing operations.

Detailed specifications of the most important non-generic, non-elementary occupational categories in Manufacturing – listed below – are provided in Annex D:

- 1121 PRODUCTION, WORKS AND MAINTENANCE MANAGERS
- 5223 METAL WORKING PRODUCTION AND MAINTENANCE FITTERS
- 8111 FOOD, DRINK AND TOBACCO PROCESS OPERATIVES
- 8125 METAL WORKING MACHINE OPERATIVES
- 5241 ELECTRICIANS, ELECTRICAL FITTERS
- 5215 WELDING TRADES
- 5221 METAL MACHINING SETTERS AND SETTER OPERATORS

The 'definitions' in Annex D include:

summary specification of occupational activity

typical entry routes and associated qualifications

main tasks performed, and

related job titles.

3.2 Working patterns

3.2.1 Full and Part-time employment

As would be expected, employers find that a combination of full-time and part-time contracts can provide the right level of human resource and flexibility. Table 3.8 shows the split of the workforce, for Manufacturing and the other main sectors of the UK economy, between those working full-time and those who only work part-time.

Table 3.8: Working hours split by sector, 2010 (UK)

	Full-time	Part-time	Full-time	Part-time	Weighted base	Unweighted base
	000s	000s	%	%	000s	000s
Agriculture, forestry and fishing	326	79	80	19	406	2.976
Energy production and utilities	435	38	92	8	473	3.244
Manufacturing	**2,688**	**281**	**91**	**9**	**2,969**	**20.400**
Construction, building services engineering and planning	2,435	260	90	11	2,695	17.917
Wholesale and retail trade	2,549	1,590	62	39	4,139	27.571
Transportation and storage	1,218	229	84	16	1,447	9.729
Hospitality, tourism and sport	1,127	920	55	44	2,046	13.183
Information and communication technologies	682	79	90	10	761	4.875
Creative media and entertainment	737	249	75	25	986	6.186
Financial, insurance & other professional services	1,623	377	81	18	2,001	12.804
Real estate and facilities management	643	334	66	35	977	6.561
Government services	1,800	408	82	19	2,208	15.098
Education	1,872	1,215	61	40	3,087	21.537
Health	1,344	742	64	34	2,086	14.742
Care	1,056	672	61	37	1,728	12.001
All economy	21,083	7,760	73	27	28,843	194.363

Source: Labour Force Survey 2010, ONS

As can be seen, the Manufacturing workforce has a comparatively high proportion of full-time workers, as compared to most other sectors. Only Energy Production and Utilities have a higher share, with Information and Communication Technologies (ICT) and Construction workforces with slightly lower proportions full time employed.

The split between full-time and part-time working is shown in Table 3.9 for the four home nations. As can be seen, for Manufacturing, only England has a slightly lower percentage of full time staff than the overall national figure – the percentages in Scotland, Wales and Northern Ireland are all higher than for the UK.

Table 3.9: Working hours split by sector and nation, 2010 (%)

	England				Scotland				Wales				Northern Ireland			
	Full-time	Part-time	Weighted base	Unweighted base	Full-time	Part-time	Weighted base	Unweighted base	Full-time	Part-time	Weighted base	Unweighted base	Full-time	Part-time	Weighted base	Unweighted base
	%	%	000s	000s	%	%	000s	000s	%	%	000s	000s	%	%	000s	000s
Agriculture, forestry and fishing	79	21	296	2.112	83	17	51	0.385	85	*	31	0.198	88	*	27	0.281
Energy production and utilities	92	8	346	2.336	91	9	88	0.620	96	*	25	0.157	92	*	14	0.131
Manufacturing	**90**	**10**	**2,541**	**17.233**	**92**	**8**	**199**	**1.431**	**93**	**7**	**138**	**0.905**	**93**	*	**91**	**0.831**
Construction, building services engineering	90	10	2,268	14.834	93	7	244	1.702	93	7	112	0.717	93	*	71	0.664
Wholesale and retail trade	62	38	3,469	22.822	58	42	352	2.369	57	42	205	1.325	63	37	112	1.055
Transportation and storage	84	16	1,251	8.292	83	17	117	0.822	80	23	46	0.308	87	*	33	0.307
Hospitality, tourism and sport	55	45	1,704	10.849	52	48	198	1.295	51	49	100	0.636	62	38	44	0.403
Information and communication technologie	90	10	675	4.269	89	11	56	0.377	88	*	18	0.114	88	*	13	0.115
Creative media and entertainment	75	25	875	5.406	68	32	64	0.436	70	23	32	0.214	72	*	14	0.130
Financial, insurance & other professional ser	82	18	1,768	11.123	78	22	138	0.948	77	22	53	0.358	81	19	41	0.375
Real estate and facilities management	65	35	847	5.623	73	27	75	0.519	63	35	38	0.254	74	*	18	0.165
Government services	81	19	1,835	12.302	84	16	173	1.210	81	23	111	0.744	84	16	89	0.842
Education	60	40	2,624	18.075	64	36	234	1.677	66	32	154	1.059	67	33	75	0.726
Health	64	36	1,712	11.931	65	35	198	1.409	67	31	111	0.771	71	29	64	0.631
Care	61	39	1,409	9.629	60	40	183	1.308	61	40	97	0.665	62	38	40	0.399
All economy	73	27	24,321	161.435	73	27	2,444	17.008	72	27	1,311	8.689	77	23	766	7.231

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate.*

In general the proportion of contracts for part-time work has grown steadily over recent years. Between 2002 and 2010, part-time working across the UK workforce as a whole has increased significantly, while full-time work has reduced. Within Manufacturing, the loss of jobs over the eight years has been only half as great for part-time workers than for full-time workers (15 per cent compared with 30 per cent), resulting in the share of part-time workers rising from 8 per cent to 10 per cent.

There is probably no single reason for this trend. Legislative changes over the period have given part-time workers greater rights, but – while this would encourage individuals to consider part-time work more seriously – it would in principle reduce its attractiveness to employers. Certainly reduction of hours has become more seriously considered over recent years as an alternative to redundancy, not least for workers whose contribution is particularly valued (and might otherwise be lost to the business), and part-time working allows additional flexibility to both employer (from cost, and fluctuating demand, points of view) and employee (from a time perspective).

3.2.2 Self-employment

In assessing the state of sectoral employment and the relevant labour markets, it is important to know the split between those employed and those self-employed. Table 3.10 shows the splits for the United Kingdom, by sector.

Table 3.10: Employment status by sector, UK, 2010

	Employee	Self-employed	Employee	Self-employed	Weighted base	Unweighted base
	000s	000s	%	%	000s	000s
Agriculture, forestry and fishing	189	202	47	50	405	2.973
Energy production and utilities	446	25	95	5	472	3.240
Manufacturing	**2,776**	**184**	**94**	**6**	**2,968**	**20.397**
Construction, building services engineering and planning	1,716	964	64	36	2,692	17.897
Wholesale and retail trade	3,731	390	90	9	4,133	27.534
Transportation and storage	1,194	250	83	17	1,447	9.729
Hospitality, tourism and sport	1,817	219	89	11	2,044	13.168
Information and communication technologies	635	124	84	16	761	4.871
Creative media and entertainment	672	310	68	31	987	6.191
Financial, insurance & other professional services	1,706	291	85	15	2,001	12.804
Real estate and facilities management	744	229	76	23	977	6.561
Government services	2,145	58	97	3	2,207	15.091
Education	2,891	188	94	6	3,082	21.507
Health	1,928	155	92	7	2,085	14.740
Care	1,577	140	92	8	1,723	11.971
All economy	24,774	3,952	86	14	28,817	194.200

Source: Labour Force Survey 2010, ONS

Weighted & unweighted bases also include unpaid family workers

Manufacturing employment shows a greater fraction of employed-status workers than the all economy average, with only 6 per cent of the workforce self-employed, as compared with 14 per cent for the economy as a whole.

Table 3.11 shows the percentage sectoral splits between employee- and self-employed-status for the four nations.

Table 3.11: Employment status by sector and nation, 2010 (%)

	England				Scotland				Wales				Northern Ireland			
	Employee	Self-employed	Weighted base	Unweighted base	Employee	Self-employed	Weighted base	Unweighted base	Employee	Self-employed	Weighted base	Unweighted base	Employee	Self-employed	Weighted base	Unweighted base
	%	%	000s	000s	%	%	000s	000s	%	%	000s	000s	%	%	000s	000s
Agriculture, forestry and fishing	50	46	295	2.110	49	50	51	0.385	33	62	31	0.197	*	75	27	0.281
Energy production and utilities	94	6	346	2.334	95	*	87	0.619	99	*	25	0.157	95	*	14	0.130
Manufacturing	**93**	**6**	**2,540**	**17.229**	**95**	**5**	**199**	**1.432**	**94**	**6**	**138**	**0.905**	**93**	**7**	**91**	**0.831**
Construction, building services engineering a	63	37	2,266	14.822	77	23	244	1.701	65	35	112	0.717	55	45	70	0.657
Wholesale and retail trade	91	9	3,466	22.800	91	9	351	2.359	86	14	204	1.323	84	16	112	1.052
Transportation and storage	83	17	1,252	8.294	85	15	117	0.820	76	23	46	0.308	77	23	33	0.307
Hospitality, tourism and sport	89	10	1,702	10.836	89	11	198	1.295	87	12	100	0.634	82	17	44	0.403
Information and communication technologie	84	16	674	4.266	82	18	56	0.377	77	*	18	0.113	87	*	13	0.115
Creative media and entertainment	68	32	875	5.409	76	24	65	0.438	60	39	32	0.214	75	*	14	0.130
Financial, insurance & other professional ser	85	15	1,768	11.122	90	10	138	0.948	81	19	53	0.359	92	*	41	0.375
Real estate and facilities management	75	24	847	5.624	85	15	75	0.520	78	21	37	0.252	67	*	18	0.165
Government services	97	3	1,834	12.298	97	3	173	1.209	97	*	111	0.742	99	*	89	0.842
Education	94	6	2,619	18.049	95	5	234	1.676	96	4	153	1.056	95	*	75	0.726
Health	92	8	1,712	11.930	94	6	199	1.410	92	8	111	0.769	95	*	64	0.631
Care	91	9	1,404	9.601	93	6	183	1.306	95	*	97	0.665	90	*	40	0.399
All economy	86	14	24,301	161.314	89	11	2,442	16.995	85	14	1,309	8.674	84	16	765	7.217

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate.*

Weighted & unweighted bases also include unpaid family workers

The table shows that Manufacturing has a comparatively low share of self-employed as compared with other sectors: 6 per cent in England and Wales (compared with the 14 per cent all-economy average), with a slightly higher percentage in Northern Ireland and a slightly lower percentage in Scotland.

Numbers of self-employed people in UK Manufacturing have fallen less sharply than employed-status numbers over recent years: between 2002 and 2010: while the number of employees fell by 29 per cent, the corresponding fall in the self-employed was only 15 per cent.

3.2.3 Permanent and Temporary employment

As with all sectors, Manufacturing employers make use of temporary employment contracts to handle additional flexibility in human resource management (HRM). Table 3.12 shows that the share of the workforce on temporary contracts is comparatively small, in particular in comparison with the Hospitality and Education sectors.

Table 3.12: Permanent and temporary employees by sector, UK, 2010 (000s and %)

	Permanent	Temporary	Perm-anent	Temp-orary	Weighted base	Un-weighted base
	000s	000s	%	%	000s	000s
Agriculture, forestry and fishing	181	8	96	4	189	1.306
Energy production and utilities	430	16	96	4	446	3.060
Manufacturing	**2,652**	**123**	**96**	**4**	**2,775**	**18.984**
Construction, building services engineering and planning	1,648	66	96	4	1,714	11.317
Wholesale and retail trade	3,573	156	96	4	3,728	24.614
Transportation and storage	1,132	62	95	5	1,194	7.970
Hospitality, tourism and sport	1,631	183	90	10	1,814	11.563
Information and communication technologies	612	22	97	3	635	4.048
Creative media and entertainment	615	56	92	8	671	4.181
Financial, insurance & other professional services	1,651	55	97	3	1,706	10.835
Real estate and facilities management	704	39	95	5	743	4.957
Government services	2,028	117	95	5	2,145	14.642
Education	2,563	327	89	11	2,890	20.195
Health	1,825	103	95	5	1,928	13.639
Care	1,474	103	93	7	1,576	10.953
All economy	23,247	1,513	94	6	24,760	166.200

Source: Labour Force Survey 2010, ONS

Two comments can be made with reference to the changes of employment of permanent versus temporary staff over recent years:

- the relative fall in temporary employment in Manufacturing from 2002 to 2010 (25 per cent) has been less than the fall in permanent employment (29 per cent); and
- overall, over the same period, employment levels of permanent staff have increased from by 2 per cent, while those of temporary staff have fallen by five per cent.
- There are variations between the Manufacturing sub-Sectors. These are summarised in Table 3.13 in terms of percentages for each sub-sector that are: a) full-time; b) employed status; and c) on permanent contracts.

Table 3.13: Working patterns by sub-sector, UK, 2010

Manufacturing Sub-sector	F-T %	Emp'd %	Perm %
Manufacture of food products	88.9%	97.8%	93.8%
Manufacture of beverages	90.1%	96.3%	94.5%
Manufacture of tobacco products	100.0%	100.0%	100.0%
Manufacture of textiles	74.9%	82.4%	95.3%
Manufacture of wearing apparel	73.5%	85.3%	90.8%
Manufacture of leather and related good	88.1%	87.5%	95.7%
Manufacture of wood and products	89.7%	82.6%	95.3%
Manufacture of paper and paper products	94.6%	97.3%	96.9%
Printing and reproduction of recorded media	85.9%	91.7%	96.4%
Manufacture of coke and refined petroleum products	97.9%	95.4%	96.6%
Manufacture of chemicals and chemical products	90.0%	96.8%	93.7%
Manufacture of basic pharmaceutical products	90.5%	98.4%	92.6%
Manufacture of rubber and plastic products	92.3%	95.6%	97.4%
Manufacture of other non-metallic products	92.1%	92.3%	96.7%
Manufacture of basic metals	93.2%	95.1%	96.9%
Manufacture of fabricated metal products	90.3%	90.9%	96.6%
Manufacture of computer, electronic and optical products	91.3%	97.3%	98.1%
Manufacture of electrical equipment	95.6%	97.9%	95.9%
Manufacture of machinery and equipment nec	92.3%	95.2%	96.1%
Manufacture of motor vehicles	95.5%	97.1%	95.9%
Manufacture of other transport equipment	96.4%	96.7%	96.1%
Manufacture of furniture	88.9%	83.3%	98.6%
Other manufacture	84.5%	88.7%	98.7%
Repair and installation of machinery and equipment	91.6%	86.2%	96.3%
Scientific research and development	84.9%	95.5%	86.3%

Source: Labour Force Survey 2010, ONS

The Manufacturing sub-sectors with particularly high or low percentages for each indicator are as follows:

Full-time/Part time

Industries that have comparatively low proportions of Part-Time staff (< five per cent not full-time) are:

Tobacco Products (no part-time workers identified);

Coke and Refined Petroleum Products (97.9 per cent of workforce full-time);

Other Transport Equipment (96.4 per cent full-time)

Electrical Equipment (95.6 per cent full-time); and

Motor Vehicles (95.5 per cent F-T).

Industries that have comparatively high proportions of Part-Time staff (> 15 per cent not Full-Time) are:

Scientific research and development (84.9 per cent F-T);

Other Manufacture (84.5 per cent full-time);

Textiles (74.9 per cent full-time); and

Wearing Apparel (73.5 per cent full-time).

Employed/Self employed

Industries that have comparatively low proportions of Self-Employed staff (< 3 per cent not Employed status) are:

Tobacco Products (no Self-employed workers identified)

Basic Pharmaceutical Products (98.4 per cent of workforce has employed status)

Electrical Equipment (97.9 per cent employed status)

Food Products (97.8 per cent employed status)

Computer, Electronic and Optical Products (97.3 per cent employed status)

Paper and Paper Products (97.3 per cent employed status)

Motor Vehicles (97.1 per cent employed status).

Industries with comparatively high proportions of Self-Employed staff (> 15 per cent not Employed status):

Furniture (83.3 per cent employed status);

Food and Wood Products (82.6 per cent employed status); and

Textiles (82.4 per cent employed status).

Permanent/Temporary contracts

Industries that have comparatively low proportions of Temporary contracts (< 3 per cent not permanent) are:

Tobacco Products (no temporary contracts identified);

Other Manufacture (98.7 per cent permanent contracts);

Furniture (98.6 per cent Permanent contracts);

Computer, Electronic and Optical Products (98.1 per cent permanent staff); and

Rubber and Plastic Products (97.4 per cent permanent contracts).

Industries that have comparatively high proportions of Temporary contracts (> 5 per cent not Permanent) are:

Beverages (94.5 per cent permanent contracts);

Food Products (93.8 per cent permanent contracts);

Chemicals and Chemical Products (93.7 per cent permanent contracts);

Basic pharmaceutical products (92.6 per cent permanent contracts); and

Scientific Research & Development (86.3 per cent permanent contract).

3.3 Workforce characteristics

In addition to the working patterns, the structure of the demographic composition of the Manufacturing workforce needs to be understood.

3.3.1 Gender characteristics

The gender split within the manufacturing workforce is shown in Table 3.14, and by comparison with the split across all sectors of the UK workforce inTable 3.15.

Table 3.14: Employment within Manufacturing by gender and nation (2010)

	Male	Female	Total	Male	Female	Total	Unweight-ed base
	000s	000s	000s	%	%	%	000s
UK	2,260	710	2,970	76	24	100	*20.406*
England	1,932	609	2,542	76	24	100	*17.238*
Scotland	148	51	199	75	25	100	*1.432*
Wales	110	28	138	79	21	100	*0.905*
Northern Ireland	70	21	91	77	23	100	*0.831*

Source: Labour Force Survey 2010, ONS

Table 3.15: Employment by gender and nation, *Whole economy* (2010)

	Male	Female	Total	Male	Female	Total	Unweighted base
	000s	000s	000s	%	%	%	000s
UK	15,439	13,416	28,855	54	46	100	*194.448*
England	13,081	11,250	24,331	54	46	100	*161.501*
Scotland	1,257	1,189	2,446	51	49	100	*17.022*
Wales	692	620	1,312	53	47	100	*8.693*
Northern Ireland	409	358	766	53	47	100	*7.232*

Source: Labour Force Survey 2010, ONS

As can be seen, women make up just under a quarter of the UK Manufacturing workforce, as compared with nearly half of the total UK workforce. The proportion of women in Manufacturing in Scotland is a little higher than the UK average, while the proportion in Wales and Northern Ireland is lower. These differences (apart from Scotland) are at odds with the gender splits in these nations for all sectors.

In spite of the considerable upheavals involved in the reduction of the Manufacturing workforce, there has been little change in the percentage of the workforce made up of women. The proportion has remained, since 2002, at between 23.5 per cent and 25 per cent, with no evidence of increasing numbers of women, in spite of a range of promotional efforts. In fact the share in 2010 was the lowest of any year.

There are a number of significant exceptions, within the 25 Manufacturing sub-sectors, to the rather low average percentage of women. These are in the manufacture of:

Wearing Apparel, where women are estimated to constitute		67 per cent of workforce;
Pharmaceuticals	"	44 per cent;
Textiles and Other manufacture	"	43 per cent;
Scientific Research and Development	"	39 per cent;
Food Products	"	33 per cent;

In addition, women are estimated to constitute some 43 per cent of the workforce in "Other Manufacturing" – a miscellaneous category with a combined workforce of over 90,000.

Table 3.16 shows the gender split for each of the SOC Major Groups: the proportion of women within the different occupational groups for Manufacturing is, as would be expected given the

commentary above, generally well below that for the economy as a whole – although comparatively higher in the Associate Professional group and – perhaps surprisingly[20] – higher than for the economy as a whole in the case of Machine Operatives.

Table 3.16: Gender profile by broad occupational group (UK)

	Manufacturing			All economy		
	Male	Female	Total	Male	Female	Total
	%	%	000s	%	%	000s
1 Managers and Senior Officials	78	22	575	65	35	4,455
2 Professional occupations	83	17	342	56	44	4,028
3 Associate Professional and Technical	69	31	272	50	50	4,265
4 Administrative and Secretarial	23	77	218	22	78	3,181
5 Skilled Trades Occupations	93	7	622	92	8	3,061
6 Personal Service Occupations	*	*	5	17	83	2,544
7 Sales and Customer Service Occupations	52	48	61	35	65	2,146
8 Process, Plant and Machine Operatives	80	20	603	88	12	1,907
9 Elementary Occupations	73	27	270	55	45	3,257
All occupations	76	24	2,969	54	46	28,842

Source: Labour Force Survey 2010 (ONS)

** Sample size too small for reliable estimate*

It is interesting to note that changes over recent years in the men / women split for these main occupational groups within the Manufacturing sector do show a pattern. LFS data shows that the female workforce has consistently increased at the higher skills levels: from 2002 to 2010, the share of women in Major Group 1 (Managers) rose from 18 per cent to 22 per cent, for Major Group 2 (Professionals) the increase was from 15 per cent to 17 per cent, and for Major Group 3 (Associated Professionals) the proportion rose from 29 per cent to 31 per cent.

At the lower skill end of the Major Groups, the proportion of female workers *fell*, over the eight years, from 63 per cent to 48 per cent for Major Group 7 (Sales and Customer Service), 27 per cent to 20 per cent for Major Group 8 (Process, Plant and Machine Operatives), and 30 per cent to 27 per cent for Major Group 9 (Elementary Occupations).

[20] Probably influenced by higher ratios in *Pharmaceuticals* and *Food products*

3.3.2 Age Profile

Understanding of the age distribution of the workforce is important in a number of ways, and in particular for assessment of the future development of skills supply. As will be seen in Section 7, a major element of future skills demand is expected to be the replacement demand arising from people leaving the workforce, in particular on retirement or for other age-related reasons. Overall, as seen from Tables 3.17 and 3.18, Manufacturing has an ageing workforce, with comparatively high proportions of its workforce in the 45-59 age-band, and three percentage points fewer in the Under 25 age-band compared with the whole UK workforce.

Table 3.17: Age profile of *Manufacturing* workforce by nation

	UK		England		Scotland		Wales		Northern Ireland	
	000s	%	000s	%	000s	%	000s	%	000s	%
Under 25	257	9	220	9	18	9	10	7	9	10
25-34	651	22	547	22	42	21	30	22	32	35
35-44	766	26	659	26	52	26	33	24	23	25
45-59	1,037	35	890	35	73	37	51	37	23	25
60+	259	9	227	9	15	7	13	9	5	5
Total	2,970	100	2,542	100	199	100	138	100	91	100
Unweighted base (000s)	*20.406*		*17.238*		*1.432*		*0.905*		*0.831*	

Source: Labour Force Survey 2010, ONS

In terms of the four home nations, the age distribution of the Manufacturing workforce in England and Wales is more or less the same as for the UK, but the Scottish workforce in Manufacturing is slightly skewed towards the older age groups with fewer 25-34 year olds, and more 45-59 year olds than the UK average. The splits for Northern Ireland show a more 'youthful' workforce than the average, with proportionately more workers in the 25-34 age-band, and correspondingly fewer in the 45-49 year old group.

Table 3.18: Age profile of *Whole Economy* workforce by nation, 2010

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
under 18	673	2	569	2	58	2	35	3	10	1
19-24	3,037	11	2,541	10	274	11	136	10	85	11
25-34	6,324	22	5,365	22	500	20	267	20	192	25
35-44	7,029	24	5,932	24	589	24	311	24	197	26
45-59	9,331	32	7,826	32	834	34	434	33	236	31
60-64	1,631	6	1,394	6	129	5	79	6	30	4
65 +	831	3	702	3	62	3	49	4	17	2
Total	28,855	100	24,331	100	2,446	100	1,312	100	766	100
Unweighted base	*194.448*		*161.501*		*17.022*		*8.693*		*7.232*	

Source: Labour Force Survey 2010, ONS

The distribution patterns for Scotland and Northern Ireland appear also to be present for the workforce across all sectors (Table 3.18).

Examining the development of the age distributions of the workforce over recent years shows how the workforce has gradually aged. Table 3.19 shows how the numbers employed in each age-band have changed from 2002 to 2010 for the economy as a whole.

Table 3.19: Age profile of *Whole Economy* workforce 2002-2010 (UK)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	000s	000s	000s	000s	000s	000s	000s	000s	000s
Under 18	1,078	1,076	1,077	1,028	976	938	925	765	673
19-24	2,948	2,973	3,072	3,097	3,179	3,224	3,221	3,048	3,037
25-34	6,505	6,361	6,279	6,289	6,250	6,242	6,279	6,186	6,324
35-44	7,317	7,416	7,490	7,525	7,533	7,528	7,442	7,241	7,029
45-59	8,474	8,638	8,748	8,915	9,017	9,046	9,171	9,182	9,331
60-64	1,107	1,186	1,252	1,306	1,405	1,545	1,652	1,650	1,631
65 +	479	522	538	580	625	641	693	739	831
Total	27,908	28,172	28,456	28,740	28,987	29,164	29,382	28,811	28,855
Unweighted base	*247.273*	*238.005*	*230.951*	*227.794*	*222.196*	*221.046*	*217.000*	*203.221*	*194.448*

Source: Labour Force Survey 2010, ONS

This development testifies to a slowly ageing workforce: the proportion of the UK workforce in the first half of their working lives has fallen over the eight years (Under 18s: four per cent -> two per cent; 25-34s: 23 per cent -> 22 per cent, and 35-44s 26 per cent->24 per cent), while the proportion of those towards the end of their careers has grown (45-59s: 30 per cent -> 32 per cent, 60-64s: 4 per cent -> six per cent, and 65+: 2 per cent -> 3 per cent).

Table 3.20 shows how the numbers employed in each age-band have changed from 2002 to 2010 for the Manufacturing sector.

Table 3.20: Age profile of *Manufacturing* workforce 2002-2010 (UK)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	000s	000s	000s	000s	000s	000s	000s	000s	000s
Under 25	461	411	384	377	343	374	346	250	257
25-34	982	882	810	789	761	753	721	628	651
35-44	1,144	1,064	1,067	1,024	1,003	982	887	784	766
45-59	1,342	1,283	1,200	1,206	1,206	1,185	1,138	1,018	1,037
60+	224	230	227	218	249	281	277	234	259
Total	4,153	3,870	3,687	3,615	3,562	3,575	3,368	2,915	2,970
Unweighted base (000s)	*36.924*	*32.844*	*30.016*	*28.920*	*27.601*	*27.224*	*25.104*	*20.990*	*20.406*

Source: Labour Force Survey 2010, ONS

In fact the profile of the Manufacturing workforce has, over the eight years (Table 3.21), notably aged rather more strongly than for the economy as a whole: the proportions within the lower age-groups have reduced, while the proportions in the higher age-groups have increased.

Table 3.21: UK *Manufacturing* workforce: age band share changes 2002-2010

	2002	2010
	%	%
Under 25	11%	9%
25-34	24%	22%
35-44	28%	26%
45-59	32%	35%
60+	5%	9%
Total	100%	100%
Unweighted base (000s)	*36.924*	*20.406*

Source: Labour Force Survey 2010, ONS

As with other indicators, there is considerable variation between the Manufacturing Sub-sectors. Table 3.22 shows estimates of employment levels for the sub-sectors across the age-bands (sample size problems result in cell estimates being suppressed for significant numbers of cells).

Table 3.22: Employment by age band in Manufacturing sub-sectors (000s) (UK)

	19-24	25-34	35-44	45-59	60-64	65 +	Total
Manufacture of food products	37	99	82	104	17	*	339
Manufacture of beverages	*	11	15	14	*	*	40
Manufacture of tobacco products	*	*	*	*	*	*	*
Manufacture of textiles	*	7	14	25	*	*	46
Manufacture of wearing apparel	*	*	9	14	*	*	23
Manufacture of leather and related good	*	*	*	*	*	*	*
Manufacture of wood and products	*	15	19	20	*	*	54
Manufacture of paper and paper products	*	13	18	25	*	*	56
Printing and reproduction of recorded media	11	24	41	47	9	*	131
Manufacture of coke and refined petroleum products	*	9	9	12	*	*	30
Manufacture of chemicals and chemical products	11	21	27	37	9	*	105
Manufacture of basic pharmaceutical products	9	30	39	36	*	*	114
Manufacture of rubber and plastic products	10	38	43	60	7	6	165
Manufacture of other non-metallic products	8	17	24	28	*	*	78
Manufacture of basic metals	8	21	23	38	6	*	96
Manufacture of fabricated metal products	18	53	48	87	23	10	240
Manufacture of computer, electronic and optical products	13	38	47	64	9	*	171
Manufacture of electrical equipment	*	17	18	31	*	*	66
Manufacture of machinery and equipment nec	18	43	67	94	21	7	249
Manufacture of motor vehicles	12	42	47	63	10	*	172
Manufacture of other transport equipment	11	34	48	76	10	*	179
Manufacture of furniture	8	17	20	35	7	*	87
Other manufacture	10	20	25	30	*	*	84
Repair and installation of machinery and equipment	12	36	46	65	14	9	182
Scientific research and development	7	36	33	28	*	*	104

Source: Labour Force Survey 2010, ONS
** Sample size too small for reliable estimates - all estimates for 'Under 19' employment suppressed*

Against an ageing workforce for Manufacturing as a whole, percentage estimates suggest that sub-sectors with a comparatively *younger* workforce in 2010 include:

- Food Products
- Pharmaceuticals
- Scientific Research and Development.
- Sub-sectors with more ageing workforces include:
- Textiles, Leather
- Petroleum Products
- Fabricated Metals
- Machinery and Equipment
- Other Transport Equipment.

The loss of experienced workers can be particularly serious for an enterprise, particularly where: a) their expertise includes often very valuable ‘tacit’ skills which are not always

recognised; and b) work in the sector may not be perceived as particularly attractive to labour market entrants or younger workers.

3.3.3 Ethnicity

As can be seen from Table 3.23, the share of the Manufacturing workforce represented by those from *Black, Asian or Minority Ethnic* (BAME) communities is not as high as in most other sectors, although it is not the lowest.

Table 3.23: Ethnicity of workforce within sectors, UK (2010)

	White	BAME	Total	White	BAME	Total
	'000	**'000**	**'000**	**%**	**%**	**%**
Agriculture, forestry and fishing	402	*	402	100	*	100
Energy production and utilities	453	20	472	96	4	100
Manufacturing	**2,769**	**199**	**2,968**	**93**	**7**	**100**
Construction, building services engineering and planning	2,567	130	2,697	95	5	100
Wholesale and retail trade	3,722	416	4,139	90	10	100
Transportation and storage	1,266	180	1,445	88	12	100
Hospitality, tourism and sport	1,766	280	2,045	86	14	100
Information and communication technologies	660	100	760	87	13	100
Creative media and entertainment	913	73	986	93	7	100
Financial, insurance & other professional services	1,776	224	2,000	89	11	100
Real estate and facilities management	852	125	977	87	13	100
Government services	2,037	171	2,208	92	8	100
Education	2,875	210	3,085	93	7	100
Health	1,814	272	2,086	87	13	100
Care	1,526	200	1,726	88	12	100
All economy	**26,151**	**2,686**	28,837	91	9	100

Source: Labour Force Survey 2010, ONS

** Sample size too small for reliable estimate*

Some Manufacturing industry segments do have stronger BAME involvement in their workforces: for example, in clothing manufacturing (in particular from communities from the Indian sub-continent), and manufacturers of ethnic food and fashion products, and 'factories' in cities with significant ethnic minority populations.

More generally, although no formal investigations have been carried out into the possible reasons for this situation, possible causes could include:

- low expectations from BAME communities of employment in industries that have traditionally been predominantly white
- comparatively low barriers to labour market entry
- employers not getting beyond their customary practice of drawing, in their recruitment, from a limited range of communities.

3.3.4 Workers from overseas

It is important to note that the migrant worker dimension is particularly complex, and public policy on inward migration is particularly sensitive and contentious. This makes clarification of the factual basis of migrant worker flows and stocks both important and challenging. For example, the use of country of birth as an indicator in the LFS, while understandable, is subject to misinterpretations, including the fact that there are many UK nationals who were not born in Britain. Drawing conclusions from these data should therefore be done with caution.

Table 3.24: Employment by country of birth grouping and sector, UK (2010)

	UK	Rest of Europe (EU 27)	Rest of world	Total	UK	Rest of Europe (EU 27)	Rest of world	Total
	'000	'000	'000	'000	%	%	%	%
Agriculture, forestry and fishing	377	21	8	406	93	5	2	100
Energy production and utilities	431	15	26	472	91	3	6	100
Manufacturing	**2,567**	**210**	**193**	**2,969**	**86**	**7**	**6**	**100**
Construction, building services engineering and planning	2,446	124	126	2,696	91	5	5	100
Wholesale and retail trade	3,644	177	318	4,140	88	4	8	100
Transportation and storage	1,213	77	158	1,448	84	5	11	100
Hospitality, tourism and sport	1,630	156	260	2,046	80	8	13	100
Information and communication technologies	640	33	88	761	84	4	12	100
Creative media and entertainment	850	51	87	987	86	5	9	100
Financial, insurance & other professional services	1,719	79	202	2,001	86	4	10	100
Real estate and facilities management	808	55	114	978	83	6	12	100
Government services	2,011	46	152	2,208	91	2	7	100
Education	2,769	106	213	3,088	90	3	7	100
Health	1,737	83	266	2,086	83	4	13	100
Care	1,490	65	174	1,729	86	4	10	100
Other sectors	722	43	71	836	86	5	9	100
All economy	25,054	1,340	2,457	28,851	87	5	9	100

Source: Labour Force Survey 2010, ONS

As can be seen in Table 3.24), the UK's Manufacturing workforce has a slightly below average proportion of 'foreign workers' overall, with those workers born outside the UK coming more from the rest of the European Union than from countries beyond, both in absolute terms and as compared with the average for the UK workforce as a whole. Some Manufacturing sub-sectors depend to a significant degree on supply chains on the continent of Europe, and this may well play a role in that characteristic.

Table 3.25 shows, for the economy as a whole, the distribution of migrant workers across the home nations.

Table 3.25: Employment by country of birth and nation (Whole economy), 2010

	UK		England		Scotland		Wales		Northern Ireland	
	000s	%	000s	%	000s	%	000s	%	000s	%
UK	25,054	87	20,856	86	2,264	93	1,228	94	706	92
Rest of Europe (EU 27)	1,340	5	1,176	5	85	3	37	3	42	5
Rest of world	2,457	9	2,295	9	96	4	47	4	18	2
Total	28,851	100	24,327	100	2,446	100	1,312	100	766	100
Unweighted base	194.426		161.480		17.022		8.693		7.231	

Source: Labour Force Survey 2010, ONS

The most notable features are:

- the lower 'penetration' of overseas workers into Scotland, Wales and Northern Ireland in general
- in the case of Scotland and Wales the proportion of the UK workforce from other European Union (EU) countries and beyond are both reduced, while the penetration from other EU countries was no lower than for the UK as a whole.

The proportion of overseas workers within Britain has, since 2002, grown both generally and within Manufacturing. For the economy as a whole, the share of 'foreign workers' has risen from just under 9 per cent in 2002 to over 13 per cent in 2010. There was a 76 per cent increase over the eight years for workers from other European Union countries and some 38 per cent rise over the same period for those from beyond the EU.

The proportion of overseas worker in Manufacturing has grown even more strongly, from 7.0 per cent of the workforce in 2002 to 13.6 per cent in 2010. This growth has come largely from workers from other EU countries, whose share of the workforce has grown from 2.1 per cent to 7.1 per cent, though workers from beyond the EU have also increased their share – from 4.9 per cent to 6.5 per cent. It is important to note that these increases have occurred over a period in which the Manufacturing workforce has been reducing in size overall. This suggests either that migrant workers have been kept on, or that they have been disproportionately recruited.

There are also substantial variations within Manufacturing. Tables 3.26, 3.27, and 3.28 show the 2-digit sub-sectors with more than a small number of overseas workers, ranked by the fraction of workers born outside the UK, showing:

- the sub-sectors with the largest fraction of 'migrant workers' overall, in descending order
- the sub-sectors with the largest proportion of workers born in other EU countries, ranked in descending order
- the sub-sectors with the largest proportion of workers born in countries beyond the EU, also in descending order.

Table 3.26: Employment by country of birth grouping and sub-sector, UK (2010)
(ranked by share of workforce from those born outside the UK)

Manufacturing Sub-sector	born in UK
Manufacture of food products	66.6%
Manufacture of wearing apparel	77.1%
Manufacture of rubber and plastic products	84.7%
Manufacture of furniture	85.0%
Manufacture of basic pharmaceutical products	85.3%
Manufacture of computer, electronic and optical products	87.3%
Manufacture of motor vehicles	87.5%
Scientific research and development	87.7%
Manufacture of machinery and equipment nec	89.4%
Manufacture of other transport equipment	91.6%
Manufacture of electrical equipment	92.1%
Manufacture of chemicals and chemical products	93.5%
Manufacture of fabricated metal products	94.4%
Printing and reproduction of recorded media	94.6%
Repair and installation of machinery and equipment	95.5%
Manufacture of leather and related good	97.7%

Source: Labour Force Survey 2010, ONS

Table 3.26 shows how large a dependence on migrant workers there is in some sub-sectors, with more than a third of the Food Product Manufacturing workforce not born in the UK, with nearly a quarter of the Wearing Apparel workforce born abroad. Seven additional manufacturing sub-sectors have > 10 per cent of their workforce from abroad.

Table 3.27: Employment by country of birth grouping and sub-sector, UK (2010)
(ranked by contribution from other EU countries)

Manufacturing Sub-sector	UK	Rest of Europe (EU 27)	Rest of world
Manufacture of food products	66.6%	21.4%	12.1%
Manufacture of rubber and plastic products	84.7%	13.9%	8.2%
Manufacture of furniture	85.0%	7.5%	7.0%
Manufacture of chemicals and chemical products	93.5%	6.4%	*
Manufacture of basic pharmaceutical products	85.3%	5.9%	8.7%
Manufacture of computer, electronic and optical products	87.3%	5.4%	7.1%
Manufacture of machinery and equipment nec	89.4%	5.3%	5.2%
Manufacture of motor vehicles	87.5%	5.1%	7.5%
Manufacture of other transport equipment	91.6%	4.7%	3.7%
Manufacture of fabricated metal products	94.4%	2.8%	2.9%

Source: Labour Force Survey 2010, ONS
** Sample size too small for reliable estimate*

In terms of migrant workers 'from within the European Union', again, the Food industry stands out (Table 3.27) awith more than one fifth 'from other European countries', and the Rubber and Plastic Products industry also drawing on 'workers from other EU countries' for more than an eighth of their workforce.

The sub-sector with the greatest proportion of 'workers from beyond the EU' (subject to UK migration policy) is (Table 3.28) the Manufacturing of Clothes, with getting on for a quarter of its workforce coming from these countries, and both Food Products and Scientific R&D have around one eighth of their workers from these countries.

Table 3.28: Employment by country of birth grouping and sub-sector, UK (2010)
(ranked by contribution from countries beyond EU)

Manufacturing Sub-sector	UK	Rest of Europe (EU 27)	Rest of world
Manufacture of wearing apparel	77.1%	*	23.7%
Scientific research and development	87.7%	*	12.7%
Manufacture of food products	66.6%	21.4%	12.1%
Manufacture of basic pharmaceutical products	85.3%	5.9%	8.7%
Manufacture of rubber and plastic products	84.7%	13.9%	8.2%
Manufacture of electrical equipment	92.1%	*	8.1%
Manufacture of motor vehicles	87.5%	5.1%	7.5%
Manufacture of computer, electronic and optical products	87.3%	5.4%	7.1%
Manufacture of furniture	85.0%	7.5%	7.0%
Manufacture of machinery and equipment nec	89.4%	5.3%	5.2%
Printing and reproduction of recorded media	94.6%	*	5.1%
Repair and installation of machinery and equipment	95.5%	*	4.5%
Manufacture of other transport equipment	91.6%	4.7%	3.7%
Manufacture of fabricated metal products	94.4%	2.8%	2.9%

Source: Labour Force Survey 2010, ONS
** Sample size too small for reliable estimate*

Surveys into the recruitment of migrant workers have been carried out in recent years for selected Manufacturing sub-sectors. Some of the SSC assessments, generally based only on anecdotal evidence) include:

- Within the Science-based industries, recruitment of migrant workers has taken place for lower-skilled occupations for cost-related reasons[21], while there appears to be some recruitment for higher-level specialist roles.
- This appears also to be true for Engineering Manufacture, where the very large companies already operate at a global level, increasingly viewing skills acquisition as seeking the best global talent (where vacancies are shown on websites, recruitment in any case becomes a de facto global activity. In addition some recruitment has been reported of (fresh) graduates from (longer HE courses in) continental European countries, where some (larger) employers have found new graduates to be more knowledgeable about the deeper STEM principles and sometimes 'more rounded'.
- Reasons provided in a survey for the Food and Drink industries for recruitment of migrants cited (for both skilled and unskilled roles) lack of local labour, job roles suit migrant

[21] Growing volume of research (see, e.g., Ruhs and Vargas-Silver, 2012) confirms that inward migration into the UK is having an effect on wage rates at the lower levels, which supports the *wage cost* element of migrant labour recruitment.

workers, unwillingness of local labour to perform roles, and lower cost than local labour (although this reason was cited in comparatively few responses).

- Within Fashion and Textiles, the image of the industry has, as a result of lack of awareness that things have moved on, been an over-arching issue with the indigenous population – people are aware of the sector's decline over recent years: and it is not often (wrongly) seen as a growing sector with many job opportunities or as an attractive career choice. As a result, the sector has lost employees during the past two decades.
- Employers have therefore been able to take advantage of the availability of skilled labour from the EU Accession countries.
- More generally, migrant workers have been able to find employment opportunities in market segments where barriers to entry are not very high, and where wages are comparatively low.

4 Demand for, use of, and value of skills

Summary

This Section probes a number of dimensions of the skills within, and needs of, UK Manufacturing. This assessment suggests that:

In summary, the overall picture to emerge is that of a sector which is dependent upon people working in managerial, professional occupations, skilled trades and machine operative occupations.

The qualifications profile of the sector reflects the relatively aged workforce with many people not possessing qualifications or possessing relatively low qualifications given their occupation and seniority.

The pattern of skill demand reflects the heterogeneous nature of the sector with there being a range of sectors which have a strong demand for high level skills typically with a STEM element, and those which are still relatively labour intensive and dependent upon machine operatives.

The rather mixed picture with respect to the demand side is replicated on the supply side. The evidence reveals that, overall, employers in the sector are less likely to have supplied training to their employees and, compared with their European counterparts, will have supplied fewer training hours.

Even though many of the original high performance working studies were conducted in the manufacturing sector – often with a view to improving the sector's performance – the evidence suggests that there is still considerable scope for HPW to be taken up by employers. Again, all of this relates to the heterogeneous nature of the sector and the differences in the approach of the leading employers in the various sub-sectors compared with the rest.

This assessment aims to provide evidence relating to the skills position within UK Manufacturing. This section:

- summarises the key types of skills that are important to Manufacturing employers;
- examines the central importance to Manufacturing of Innovation and the Science, Technology, Engineering and Mathematics (STEM) skills needed for it; and
- investigates indicators which provide, through the best proxy available – qualifications and occupations – relevant quantitative evidence around skills supply and demand.

4.1 Nature of skills used

The concept of skills is not a straightforward one, and there is no single indicator which provides an adequate measure of all its dimensions. Probably the most useful practical way of thinking about skills relates to the requirements of capabilities for performing various elements of work, as articulated within roles or occupations. Occupational activity is generally categorised into types of activity and the skill levels required for effective performance of the occupation.

Section 4.1 will investigate the key characteristics of the most significant skills required across the different branches of Manufacturing by examining the demand for:

- basic skills;
- employability skills;
- intermediate skills; and
- higher skills; and
- the more specific skill-sets needed in the various sub-sectors that make up Manufacturing as a whole.

Table 4.1 provides a broad-brush summary of the main elements of the skills required within the six main SOC *Major Group* occupational categories of relevance to Manufacturing:

- Managers
- Professionals
- Associate Professionals
- Skilled Trades
- Operatives
- Elementary Occupations.

Table 4.1: Summary of main Skill areas of importance to Manufacturing

Broad occupational group	Sector occupations	Predominant level of skill required	Predominant type of skill required	Minimum qualification level typically required
Managers	Directors and Managers of production and related facilities, supervisors, unit managers, area managers	Higher level technical and managerial skills, basic skills	Technical and other leadership and managerial skills	N/SVQ Level 4+
Professionals	Science and Engineering Professionals, other Professionals	High level technical skills, inter-personal skills basic skills	Job specific technical skills and transferable communication / customer service skills	N/SVQ Level 4+
Associate Professionals	Higher Technicians	Higher intermediate level technical skills	Job specific technical skills + advanced technical support	N/SVQ Level 3+
Skilled trades	Technicians and Fitters	Intermediate skills, basic skills, employability skills	Job specific technical skills	N/SVQ Level 2/3
Operatives	Food, drink, and tobacco process operatives Metal working machine operatives	Sound basic technical skills	Experience with production processes	N/SVQ Level 2
Elementary	Goods handling and storage; kitchen and catering assistant	Employability skills, basic skills	Transferable communication / customer service skills	N/SVQ Level 1/2

The most prevalent occupations within Manufacturing generally require a certain technical knowledge and understanding, as well as practical skills associated with the product or the manufacturing process. While basic skills and employability skills are generally taken for granted, Manufacturing employers are generally looking for understanding, and ideally experience, of the manufacturing environment.

The more specific skills sought within Manufacturing sectors relate to the sub-sector and its products – e.g. some understanding of the underlying science for Chemicals, Pharmaceuticals, and the Food and Drink industry, and of technological principles for the Engineering Manufacturing sub-sectors, familiarity with acoustics in musical instrument manufacturing, or product design and materials properties in many *processing* industries.

The distribution of these skills areas across the different workforces within Manufacturing sub-sectors are shown in the structure of employment in the main occupational groups across the sub-sectors (see Table 3.4 – Section 3.1.1).

In addition, it is possible to examine the qualification levels achieved by those within the different Manufacturing sub-sector workforces, drawing on data from the Labour Force Survey of the highest qualification achieved reported by respondents. While it has a number of limitations (see below), the use of (highest) qualification level data for assessing skill levels almost certainly represents the best proxy currently available.

The five qualification levels used in this analysis relate to the 'learning outcomes' from various qualifications in terms of N/SVQ competence specifications, as follows:

Level	Definition of National/Scottish Vocational Qualification (learning outcome) level
5	Competence that involves the application of a range of fundamental principles across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources features strongly, as do personal accountabilities for analysis, diagnosis, design, planning, execution and evaluation
4	Competence that involves the application of knowledge in a broad range of complex, technical or professional work activities performed in a variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources is often present.
3	Competence that involves the application of knowledge in a broad range of varied work activities performed in a wide variety of contexts, most of which are complex and non-routine. There is considerable responsibility and autonomy and control or guidance of others is often required.
2	Competence that involves the application of knowledge in a significant range of varied work activities, performed in a variety of contexts. Collaboration with others, perhaps through membership of a work group or team, is often a requirement.
1	Competence that involves the application of knowledge in the performance of a range of varied work activities, most of which are routine and predictable.

The estimated percentages for the distribution of qualification levels across the sub-sector workforces (drawing on 2010 LFS data) are shown in Table 4.2.

Table 4.2: Highest qualification levels within the Manufacturing workforce, UK

	Percentage of Sub-sector workforce with Qualifications at:					
Manufacturing Sub-Sector	Level 5	Level 4	Level 3	Level 2	Level 1	No qualif-ications
Manufacture of food products	2.6%	14.0%	17.6%	24.8%	27.7%	13.4%
Manufacture of beverages	2.3%	37.6%	21.0%	21.4%	12.4%	5.2%
Manufacture of tobacco products	0.0%	35.4%	17.7%	26.5%	15.4%	5.1%
Manufacture of textiles	2.8%	16.3%	18.4%	23.9%	19.0%	19.6%
Manufacture of wearing apparel	4.3%	16.7%	14.1%	18.6%	25.2%	21.2%
Manufacture of leather and related good	3.1%	16.9%	6.8%	16.7%	28.0%	28.5%
Manufacture of wood and products	0.7%	11.6%	25.5%	27.4%	24.1%	10.8%
Manufacture of paper and paper products	2.6%	16.6%	18.7%	25.5%	25.4%	11.2%
Printing and reproduction of recorded media	2.0%	15.4%	27.1%	25.4%	20.7%	9.4%
Manufacture of coke and refined petroleum products	16.5%	32.3%	27.2%	12.8%	9.9%	1.3%
Manufacture of chemicals and chemical products	6.2%	32.6%	16.2%	20.6%	17.8%	6.6%
Manufacture of basic pharmaceutical products	17.4%	39.9%	14.7%	12.7%	13.5%	1.8%
Manufacture of rubber and plastic products	0.7%	14.7%	22.6%	24.4%	27.4%	10.2%
Manufacture of other non-metallic products	3.4%	15.0%	22.4%	25.5%	22.3%	11.3%
Manufacture of basic metals	3.2%	22.2%	25.8%	18.9%	20.3%	9.7%
Manufacture of fabricated metal products	3.0%	19.8%	23.3%	22.8%	18.5%	12.6%
Manufacture of computer, electronic and optical products	10.6%	37.8%	18.2%	15.3%	13.2%	4.8%
Manufacture of electrical equipment	6.0%	27.2%	18.9%	20.5%	18.2%	9.2%
Manufacture of machinery and equipment nec	4.0%	25.5%	24.6%	22.3%	17.0%	6.6%
Manufacture of motor vehicles	3.9%	22.5%	24.8%	23.0%	18.6%	7.2%
Manufacture of other transport equipment	7.5%	29.1%	29.1%	16.1%	13.9%	4.3%
Manufacture of furniture	3.0%	13.0%	26.5%	23.8%	20.8%	12.9%
Other manufacture	6.7%	29.0%	14.1%	24.3%	18.4%	7.5%
Repair and installation of machinery and equipment	2.8%	20.4%	34.4%	22.5%	13.8%	6.1%
Scientific research and development	48.1%	31.3%	8.5%	6.6%	5.0%	0.5%

Source: Labour Force Survey 2010 (ONS) = percentages of a particularly small workforce

As can be seen, there is considerable variation in highest qualification levels between the workforces in the different sub-sectors of Manufacturing:

- the sub-sector in which high proportions of the workforce hold qualifications at the highest level (N/SVQ Level 5) is Scientific Research and Development (where nearly half the workforce have Level 5), followed by the Manufacture of Basic pharmaceuticals, Manufacture of Coke and Refined Petroleum Products, and the Manufacture of Computer-, Electronic- and Optical Products.
- All Manufacturing Sub-sectors have more than 10 per cent of their workforce with Level 4 Qualifications, but those with the highest share (more than 30 per cent) are Manufacture of Basic Pharmaceuticals, Manufacture of Computer-, Electronic- and Optical products,

Manufacture of Beverages, Manufacture of Tobacco Products (within a small workforce), Coke and Refined Petroleum Products, and Chemical and Chemical Products.

- The sub-sector workforces with the highest fraction of those qualified up to Level 3 are Repair and Installation of Machinery and Equipment (with more than a third of its workforce qualified to this level), followed by Manufacture of Other Transport Equipment, Coke and Refined Petroleum Products, Printing and Reproduction of Recorded Media, Furniture, Basic Metals and Wood and Wood Products - all with more than a quarter of its people qualified to Level 3.

Workforces with higher proportions of lower-, or not- qualified staff:[22]

- sub-sectors with more than a fifth of their workforce with no higher than Level 1 qualifications are (within a very small workforce) Manufacture of Leather and Related Goods, the Manufacture of Food Products, Rubber and Plastic Products, Other Non-metallic Products, Wearing Apparel, Paper and Paper Products, Wood and Wood products, Furniture, and Printing & Reproduction of Recorded Media.
- Sub-sectors with the highest fractions of their workforce holding no qualifications are Manufacture of Leather and Related goods (a small workforce), and the Manufacture of Textiles, and of Wearing Apparel.

It is clear from these characteristics that the distribution of levels of the highest qualification achieved vary in relation to the nature of the activity – with Scientific Research and Development (and other science- based sectors) having a comparatively very highly qualified workforce, and those involved in the production of fabrics and clothes having significant numbers of low and not-qualified staff.

These statistics, together with those for the distributions of the different workforces across the different occupational groups - (see Table 3.4) - confirm the very considerable diversity in the workforce characteristics across and among the 25 Manufacturing sub-sectors. This heterogeneity is, of course, the reason for the 'designing' of the different sectoral representations that have led to the specification of the scope of the seven different Sector Skills Councils whose remit, together, covers all of Manufacturing. The sectoral 'footprint' of the different SSCs, which extends beyond their Manufacturing element in most cases, arises from other considerations as well – for example combining sub-sectors and 'industry

[22] As indicated elsewhere, since most instances of 'highest qualification level' within the LFS tend to relate to educational achievement levels, comparisons of Qualification Levels between sub-sector workforces must not be viewed simplistically. In particular, notwithstanding the current availability of good vocational qualifications in most occupational areas, there are many older workers with modest educational achievements but long experience in the occupation, whose practical/craft skills can be at a very high level, but which are not reflected as being high level in the indicator used.

segments' which have common characteristics or traditional links with each other. As already indicated, considerably more detail is available about all the different workforces from the SSC research websites (see Section 1.3).

While it is important not to underestimate the level of diversity between the 25 workforces, it is possible, from a 'top-down' perspective, to draw on occupational- and qualification- level distribution evidence to elicit a tentative 'comparative structure' for broad skills characteristics across the Manufacturing sub-sectors, as defined by the SIC 2-digit classification, along the following lines:

Occupational/qualification characteristics of skills for Manufacturing sub-sectors:

A) sub-sectors with comparatively high-level skill characteristics within their current workforce;

B) sub-sectors with comparatively low-level skill characteristics within their current workforce; and

C) sub-sectors with a comparatively even spread of skill level characteristics within their current workforce.

Higher-level skill characteristics:

Sub-sectors with comparatively high proportions of staff in both the highest level occupations (Managers and Professionals) and with the highest level of qualifications (N/SVQ Level 5):

- Scientific Research & Development;
- Manufacture of Basic Pharmaceutical Products; and
- Manufacture of Computer, Electronic and Optical Products.

Sub-sectors with comparatively high proportions of the workforce in either the top or second-top occupational levels and either the top or second top qualification levels:

- Manufacture of Chemicals and Chemical Products;
- Manufacture of Coke and refined Petroleum Products;
- Manufacture of Beverages; and
- Other Manufacture.

Lower-level skills characteristics:

Sub-sectors with comparatively high proportions of staff in both the lowest level occupations and with the lowest level of qualifications:

- Manufacture of Wearing Apparel

Sub-sectors with comparatively high proportions of the workforce in either the lowest or second lowest occupational levels (operatives, and elementary occupations) and either the lowest or second lowest qualification levels (Level 1 or no qualifications):

- Manufacture of Food Products;
- Manufacture of Textiles;
- Manufacture of Paper and Paper Products;
- Printing and Reproducing Recorded Media;
- Manufacture of Rubber and Plastic Products;
- Other Non-metallic Products.

Comparatively even spread of skill levels:

- Basic Metals;
- Fabricated Metal Products;
- Electrical Equipment;
- Machinery and Other Equipment;
- Motor Vehicles;
- Other Transport Equipment;
- Wood and Wood Products;
- Furniture;
- and – based on estimates from a small workforces: Tobacco Products; and Leather and Related Goods.

In fact in assessing the overall broad skills position of industrial sectors it is necessary to draw on evidence about *both* occupational and qualification data. Both indicators have definite limitations:

- the meaning of an occupation in a set of (often fast-) changing workforces is in any case problematical, and even the most detailed categories of the official occupational classifications (the 4-digit unit group) are known to be too broad to represent many real jobs in the UK workforce; and
- qualifications, while the best proxy indicator available for skill supply that is available, are known to have a range of limitations and weaknesses (not least that there is no evidence whatever that the highest qualification achieved was directly relevant to the content of the current work).

When data from the two are taken together, the resulting picture is more useful. In particular, occupational data shows that the numbers of people who are actually performing a relevant job, while the qualification level (though not necessarily directly relevant) probably contains some information about the worker's general abilities.

This leads to the conclusion that a two-dimensional mapping for the broad skills characteristics of each Manufacturing sub-sector workforce, drawing on the above distribution data from the Labour Force Survey, could bring certain insights. Table 4.3 shows a comparative structure of this kind.

Table 4.3: : 'Comparative structure' for broad skills characteristics of Manufacturing sub-sector workforces

	Higher Level *Qualification* characteristics	Balanced *Qualification* level distribution	Lower level *Qualification* characteristics
Higher Level Occupational characteristics	• **Basic Pharmaceutical Products** • **Coke and refined petroleum Products** • **Chemicals and Chemical Products** (lower fraction of L5 qualifications) • **Computer, Electronic and Optical Products** (lower fraction of L5 qualifications) • **Other Manufacture** (lower fraction of professionals, lower fraction of L5 quals.) • **Scientific Research & Development**		• **Beverages** (high fraction of Managers but low fraction of L5 qualifications; low fraction of Professionals but high fraction with L4 qualifications)
Balanced Occupational level distribution	• **Tobacco products***	• **Furniture** (High fractions of Skilled Trades and L3 qualifications) • **Repair and Installation of Machinery & Equipment** (High fractions of Skilled Trades and L3 qualifications) • **Basic Metals** and **Fabricated Metal Products** • **Printing and Reproduction of Recorded Media** • **Electrical Equipment** • **Machinery and Other Equipment** • **Motor Vehicles**, and **Other Transport Equipment** (lower fractions of Associate Professionals, high fractions of Skilled Trades)	• **Leather and Related Goods*** • **Wood and Wood Products** (High fractions of Skilled Trades and L1 L2 & L3 qualifications)
Lower level Occupational characteristics			• **Food Products** (lower fraction with no qualifications) • **Paper and Paper Products** (lower fraction with no qualifications) • **Rubber and Plastic Products** and **Other Non-metallic Products** (lower fractions with no qualifications and in elementary occupations) • **Textiles** (lower fraction with no qualifications and in elementary occupations) • **Wearing Apparel**

* based on estimates from a comparatively *very small workforce*
Source: Analysis from LFS datasets provided by UKCES

While the mapping in Table 4.3 is interesting, there are two very important caveats to be borne in mind when attempting to interpret possible conclusions and policy implications:

1) the occupational categories used include more than the core technical occupations that determine the skill requirements that Skills policy considers in relation to each sector, and

2) while vocational qualifications are included within data on highest qualification achieved, the manual (motor) skills of key importance in many of the sub-sectors in the bottom right hand cell are often not reflected in particular qualification achievement levels. Many highly skilled manual workers who produce world-beating products left formal education early, and never completed the relevant vocational qualification. Data on highest qualification achieved are, as mentioned, particularly poor in reflecting levels of performance of valuable practical or craft skills. Data can therefore be particularly misleading with respect to older, experienced workers, since not only are these skills much more valuable than suggested by the value of the indicator from the LFS, but also such skills are increasingly at risk of being lost in ageing workforces.

Analysis of occupational and achieved qualification distributions quickly raises questions about occupational / qualification relationships at N/SVQ Level 3 and Associate Professional & Skilled Trades levels. While the specifics must be considered within the sectoral and - above-all - occupational context, the 'middle' level occupations and qualifications contain considerable complexity. Recent work on examining the development of the 'intermediate skills' picture to examining the 'hollowing-out of work' proposition (e.g. Holmes and Mayhew, 2010) confirm that simplistic assumptions about the 'middle ground' are probably misguided.

The importance to Manufacturing of Innovation and of expertise in Science, Technology, Engineering and Mathematics (STEM)

In addition to the broad structure of the skill level characteristics shown in Table 4.3, it is necessary to take into account the importance of STEM expertise needed for innovation.

The manufacture of excellent, attractive and competitive products depends fundamentally on the effective use of science and technology. This is because both the products themselves, and the production processes for manufacturing them, are centrally dependent on the cost-effective harnessing of science and technology. A successful manufacturing company depends on quite a lot more besides, but since without sound deployment of STEM

knowledge and skills, there will be no competitive products and there will be no efficient production, these are most important to UK Manufacturing.

These realities were present from the early days of the industrial revolution, but in a world of growing international competition for a wide range of today's products, the emphasis has shifted from effective deployment of STEM-related skills for current products (however successful) to effective deployment of these skills in development, fast and cost-effectively, the next set, and the next generation, of world-beating products. This confirms the over-riding importance of innovation to the continuing success of the UK economy, in particular for Manufacturing (as summarised in Section 2). An adequate supply, and sound deployment, of high quality STEM skills is of particular importance.

Attention to the STEM skills agenda has therefore been rising over recent years (DIUS, 2009), with growing recognition of their strategic importance (for example in National Security (MoD, 2012)). It is essential to recognise that a) understanding of STEM-related knowledge is of value well beyond Manufacturing (so that many labour market entrants with STEM qualifications go and work in non-STEM related occupations), and that, even within STEM occupations b) labour market entrants can work in sectors beyond Manufacturing (BIS, 2011). Thus it is essential not to assume an over-simplistic 'linear model' for the 'first destinations' of those with STEM qualifications. Greenwood et al (2011) have examined the economic returns to STEM qualifications, and the payback to individuals for their monetary and time investment is evidently very mixed, both for HE and Vocational Education and Training (VET) qualifications.

As generally, the needs of individual employers, in terms of the scale and types of STEM expertise needed, can vary considerably, and as a result the assessment of skill shortages relating to STEM qualifications at the national level must be examined carefully: Semta analysis of Higher Education Statistics Agency (HESA) data from the Survey of Destinations of Leavers from Higher Education (DLHE) (for Engineering degrees)[23] does not suggest consistent shortages of Engineering graduates (for recruiting Engineering Manufacturing employers), and analysis by Smith and Gorard (2011) suggest little evidence of shortage of science skills.

[23] Semta (2011) (unpublished)

The ONS Research and Development Inquiry that furnishes data on levels of R&D investment in different Manufacturing areas (shown in Section 2.1) also asks companies about their staff employed on R&D. These data can help augment the more general occupational data available from the Labour Force Survey.

Table 4.4 shows, for each 'Detailed Product Group' (corresponding broadly to the 2-digit SIC sub-sector categories) estimates of:

- total R&D employment;
- numbers of scientists and engineers;
- numbers of technicians, laboratory assistants and draughtsmen; and
- numbers of support staff working directly on R&D activities.

Table 4.4: Employment on R&D performed in UK Businesses, detailed product groups, 2010

Full time equivalent in thousands

	R&D Employment	Scientists and Engineers	Technicians laboratory assistants and draughtsmen	Administrative clerical and others
TOTAL (All Economy)	155	84	42	29
Food products and beverages; Tobacco products	3	1	1	1
Textiles, clothing and leather products	-	-	-	-
Pulp, paper and paper products; Printing; Wood and straw products	1	-	-	-
Refined petroleum products and coke oven products	-	-	-	-
Chemicals and chemical products	8	3	3	1
Pharmaceuticals	25	11	4	9
Rubber and plastic products	1	1	1	-
Other non-metallic mineral products	1	-	-	-
Casting of iron and steel	-	-	-	-
Non-ferrous metals	1	-	-	-
Fabricated metal products except machinery and equipment	1	1	-	-
Machinery and equipment	9	5	3	2
Computers and peripheral equipment	1	1	-	-
Electrical equipment	5	3	1	1
Consumer electronics and communication equipment	6	4	1	-
Precision instruments and optical products; photographic equipment	8	6	1	1
Motor vehicles and parts	11	5	3	3
Other transport equipment	1	-	-	-
Shipbuilding	1	1	-	-
Aerospace	12	8	3	1
Other manufactured goods	2	1	1	-
Research and development services	9	6	1	1
Total Manufacturing Product Groups + R&D Services	**106**	**57**	**23**	**20**

Source: ONS Research and Development Inquiry

\- denotes nil, figures unavailable or too small to display

As can be seen, *Manufacturing* and *R&D Services* represent the majority of employment in Research & Development work in UK businesses across the economy as a whole: over 68 per cent of all Full Time Equivalent (FTE) R&D employment. Within the three broad occupational categories of R&D work identified in the survey, Manufacturing also represents

over two thirds of all scientists and engineers, and 69 per cent of administrative, clerical and other R&D staff, but only some 55 per cent of technicians, laboratory assistants and draughtsmen (2010 estimates).

Staffing levels understandably broadly reflect expenditure levels within the various 'product groups', with the largest numbers in all three occupational categories in the Pharmaceuticals industry: some 11,000 FTE scientists and engineers, 4,000 FTE Technicians and lab assistants and some 9,000 FTE 'other staff'. Correspondingly, responses to the ONS R&D Inquiry confirmed that Aerospace has 8,000 Scientists and Engineers, 3,000 Technicians and some 1,000 other staff.

Other Product Groups with significant R&D staff include: Chemicals and Chemical Products, Machinery and Other Equipment, Precision Instruments, and, not surprisingly R&D Services.

In conclusion, it is important to note that, although R&D is a crucial strategic activity, it is only the first stage in effective management of innovation overall.

Summary broad assessment of sectoral skill requirements across the sub-sectors

The above analysis confirms the broad picture of skill needs for Manufacturing, recognising that the emphasis varies, sometimes considerably, between the different sub-sectors. Considering the balance of need as between basic, employability, intermediate and higher Skills, the conclusions could be summarised in the following way:

Basic skills:

Given the comparatively small proportion of the Manufacturing workforce employed in Elementary occupations (less than 10 per cent) it is likely that basic skills are required for all jobs in the sector. Overall, only 9 per cent of the Manufacturing workforce has no qualifications at all, but some of the Manufacturing sub-sectors have more jobs in Elementary occupations, and more workers with no qualifications, than others. These are in particular:

- Wearing Apparel;
- Food Products;
- Paper and Paper Products;

and, to a degree, also

- Rubber and Plastic Products and Other Non-metallic Products; and
- Textiles.

It is worth repeating that many of the lower level jobs in these sectors require practical skills, for which there are sometimes limited qualifications – even vocational qualifications – available. Manual dexterity and a certain level of hand-eye co-ordination are often fundamental for such activity.

Employability skills:

Even for the above sectors, which have some jobs that do not require too much by way of qualifications, employability skills are inevitably needed.

Intermediate skills:

As indicated in the above analysis, there are certain issues around the nature of the intermediate skills required in Manufacturing. Clearly intermediate technical skills will continue to be needed within Manufacturing companies.

If intermediate skills are understood to cover activities viewed as lying within the scope of both Skilled Trades and Associate Professional and Technical occupations, then recent trends suggest that future demand is likely to lie at the higher intermediate levels. Unless there is a significant change in trends (which the Working Futures projections suggest is unlikely – see Section 7) then numbers of skilled trades jobs will continue their steady decline. And while some growth is expected in Associate Professional roles in the coming years (UKCES, 2011b), the share of Associate Professional employment in Manufacturing has been well below the all economy average, and falling steadily.

The sub-sectors where there are good proportions of Intermediate skills are:

- Furniture (High fractions of Skilled Trades and L3 qualifications)
- Repair and Installation of Machinery & Equipment (High fractions of Skilled Trades and L3 qualifications)
- Basic Metals and Fabricated Metal Products
- Printing and reproduction of Recorded Media
- Electrical Equipment
- Machinery and Other Equipment
- Motor Vehicles, and Other Transport Equipment (lower fractions of Associate Professionals, high fractions of Skilled Trades).

Higher Skills:

As manufactured products become more sophisticated, demand for higher level technical skills and for greater sophistication of senior management is expected to grow. As described, the Manufacturing sub-sectors with the greatest demand for Higher level skills are:

- Basic Pharmaceutical Products
- Coke and Refined Petroleum Products
- Chemicals and chemical products (lower fraction of L5 qualifications)
- Computer, Electronic and Optical Products (lower fraction of L5 qualifications)
- Scientific Research & Development

Specific skill-sets within Manufacturing sub-sectors:

Food and Drink Manufacturing:

- a number of specialist skills at Skill Trades and Craft levels and below, including dairy (cheese-making) skills, meat processing skills (butchery and boning) – particularly in Wales, filleters and smokehouse operators in the Scottish fishing industry, Bakery and flour confectionery skills, knife- and fishmongery skills;
- at higher (Professional and Associate professional) levels, skill needs are for food science- and food technology- skills.

Textiles and Wearing Apparel; Leather and Related Goods:

- a range of traditional craft skills involved in working with fabrics and leather are important (e.g. pattern cutting, grading, knitwear linking, hand-tailoring, sewing and weaving, dyeing, and screen-printing);
- need for technicians to manage interface between creative design and production;
- fabric technology and Textile skills;
- specialist quality assurance skills;
- design and customisation skills;
- designers with commercial and technical skills;
- IT and foreign language skills;
- supply-chain management skills;

- more STEM skills in support of New Product Development and Introduction.

Wood and Paper products; Other nNn-Metallic Products, and Furniture:

- emphasis on skilled trade level capabilities – e.g. in glass, printing, and ceramics industry segments;
- continuing demand for sales and customer service staff in the Paper industry;
- process operative and elementary level skill-sets within the Wood industry;
- higher level technical process skills in the Coatings industry (Technicians); and
- in addition to industry-specific skills, continuing demand for customer-handling skills, and other generic skill-sets (e.g. team working, IT skills, communication skills).

Science-based Industries (Chemicals, Pharmaceuticals, Nuclear, Petroleum, Polymers):

- Industry-specific roles at Operative, Skilled Trades and Associate Professional and Technical levels (e.g. chemical process operations, laboratory technicians and support staff, Nuclear plant technical support roles; petroleum production process operatives, and Polymer process technicians);
- Generic skills (IT user skills, team-working skills, problem-solving skills);
- Need for good Professional Scientists and Engineers will continue; and
- Continuing demand for good research skills.

Engineering Manufacture (Metals and Metal Products, Electronic-, Electrical-, Mechanical-, Automotive-, Aerospace-, and Marine- equipment, plus Installation & maintenance and Scientific R&D)

- a range of specialist skills at Skilled Trades and Operatives levels (e.g. Computer Numerical Control (CNC) programming and operating skills, and, more generally, Machine Operating skills);
- welding, Fabricating and Assembling skills;
- design Engineering skills;
- composites working skills;
- vehicle body working skills;
- sheet metal working skills;

- electrical Maintenance skills;
- laboratory technician skills; and
- research and other innovation skills.

Other sectors:

- need for task-related skills in the Caravan-manufacturing industry (workshop technician skills, Gas-Safe registrants, general joinery, plumbing and electrical skills);
- wood- and metal- working skills (for musical instrument manufacture); and
- precision metal-working expertise (for jewellery design and manufacture).

Quantitative indicators of relevance to sectoral skills assessment

Table 4.5 shows the share of each sector's workforce that have achieved a highest qualification at Levels 1, 2, 3, or 4 and above:

Table 4.5: Qualification profile of workforces with sectors, UK (2010)

	No qual-ifications	Level 1	Level 2	Level 3	Level 4 +	Total	Unweighted base
	%	%	%	%	%	'000s	'000s
Agriculture, forestry and fishing	18	21	22	15	24	406	2.978
Energy production and utilities	6	16	22	22	33	473	3.244
Manufacturing	**9**	**19**	**21**	**22**	**29**	**2,969**	**20.404**
Construction, building services engineering and planning	7	16	23	28	27	2,697	17.927
Wholesale and retail trade	11	22	26	22	19	4,140	27.582
Transportation and storage	11	26	29	19	16	1,447	9.732
Hospitality, tourism and sport	10	20	27	22	20	2,046	13.183
Information and communication technologies	2	10	15	18	55	761	4.874
Creative media and entertainment	3	10	14	14	59	987	6.193
Financial, insurance & other professional services	2	12	18	17	52	2,001	12.805
Real estate and facilities management	14	23	22	17	23	978	6.565
Government services	2	12	19	20	46	2,209	15.100
Education	3	9	12	13	63	3,088	21.544
Health	3	10	14	12	61	2,087	14.749
Care	5	12	23	24	36	1,729	12.006
All economy	**7**	**16**	**21**	**20**	**37**	**28,854**	**194.437**

Source: Labour Force Survey 2010 (ONS)

As compared with the UK workforce as a whole, the same proportion of the Manufacturing workforce holds a Level 2 qualification, but there is a greater proportion with no qualifications (9 per cent compared with. 7 per cent in the economy as a whole), and also more with no more than a L1 qualification (19 per cent compared with. 16 per cent). At the higher levels, there is a greater share of the Manufacturing workforce with their highest qualification at L3 (22 per cent compared with 20 per cent), but a lower proportion who have managed to

achieve a L4 qualification (29 per cent compared 37 per cent).

In terms of the qualification achievement level of the Manufacturing sector workforce compared with those of the other fourteen industry sectors, the ranked position is shown in Table 4.6.

Table 4.6: : Qualification level rankings, UK

Level of Highest qualification	ranking of Mfg. w/force within the 15 main sectors
No quals	6th
1	6th
2	9th
3	5th
4+	10th

Source: LFS 2010 (ONS)

Table 4.7 shows the variation in the qualification level achievement for the Manufacturing workforce across the four home nations, and Table 4.8 presents this for the economy as a whole.

Table 4.7: Qualification levels within Manufacturing by sector (2010)

	UK	England	Scotland	Wales	Northern Ireland
	%	%	%	%	%
Level 4 +	29	29	32	24	27
Level 3	22	21	28	22	24
Level 2	21	22	17	21	21
Level 1 and below	28	28	23	32	28
Total	100	100	100	100	100
Weighted base (000s)	2,969	2,541	199	138	91
Unweighted base (000s)	20.404	17.236	1.432	0.905	0.831

Source: Labour Force Survey 2010 (ONS)

Table 4.8: Qualification levels *All economy* by nation (2010)

	UK	England	Scotland	Wales	Northern Ireland
	%	%	%	%	%
Level 4 +	37	37	40	37	35
Level 3	20	20	22	19	19
Level 2	21	21	18	22	20
Level 1 and below	23	23	20	22	25
Total	100	100	100	100	100
Weighted base (000s)	1,729	1,409	183	97	40
Unweighted base (000s)	194.437	161.490	17.022	8.693	7.232

Source: Labour Force Survey 2010 (ONS)

As can be seen, the Scottish workforce shows higher level qualification achievement than workforces in the other home nations and the UK average, both within Manufacturing and beyond.

Before any conclusions are drawn about qualification distribution for possible policy responses, it is essential to remember that qualifications relate more directly to occupations than to sectors.

In addition it is worth considering: a) whether the higher level qualifications (probably university degrees in most cases) held are necessarily in relevant subjects (recent research for BIS has, in particular, confirmed the considerable 'leakage' from science, Technology, Engineering and Mathematics (STEM) degree subjects (BIS, 2011)); [24] and b) whether, in each case, the type of manufacturing involved necessarily needs (or is short of) the knowledge involved in these academic qualifications.

Table 4.9: Qualification levels *All economy*, UK (2002-2010)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%
Level 4 +	28	29	30	31	32	33	33	35	37
Level 3	20	20	20	20	19	19	20	19	20
Level 2	22	22	21	20	22	22	21	21	21
Level 1 and below	30	29	29	29	27	27	26	24	23
Total	100	100	100	100	100	100	100	100	100
Weighted base (000s)	27,905	28,165	28,455	28,741	28,986	29,163	29,380	28,810	28,854
Unweighted base (000s)	247.232	237.919	172.402	210.643	222.190	221.039	216.986	203.217	194.437

Source: Labour Force Survey 2010 (ONS)

[24] That is, cases where graduates from a particular course do not go on to work in the 'obvious' profession or relevant sector

As can be seen (Table 4.9), for the British workforce as a whole, there has been a clear rise in the level of the highest qualification from 2002 to 2010, with the proportion of those with only a L1 qualification or below falling from 30 per cent to 23 per cent over the eight years, while those with a qualification at level 4 or more rising from 28 per cent to 37 per cent. There appears to have been relatively little 'net' change at Levels 2 and 3.

Table 4.10: Qualification levels within Manufacturing, UK (2002-2010)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%
Level 4 +	22	24	25	25	26	28	28	27	29
Level 3	22	22	21	21	22	20	22	22	22
Level 2	22	21	21	20	22	21	21	22	21
Level 1 and below	34	33	33	33	31	31	29	29	28
Total	100	100	100	100	100	100	100	100	100
Weighted base (000s)	4,153	3,869	3,686	3,615	3,562	3,575	3,368	2,915	2,969
Unweighted base (000s)	36.918	32.837	22.346	26.714	27.601	27.224	25.103	20.989	20.404

Source: Labour Force Survey 2010 (ONS)

As can be seen from Table 4.10, the overall levels of qualification achieved by those within the UK Manufacturing workforce has also slowly but steadily risen over recent years, with the proportion with only a L1 qualification or below falling from 34 per cent to 28 per cent, while the proportion with L4 qualifications or higher has edged up from 22 per cent in 2002 to 29 per cent in 2010.

4.2 Value of skills

As indicated above, qualifications achieved are, in themselves, generally of very limited direct value to the performance of an organisation. Skills must be both directly relevant to the tasks the individual is asked to perform, and be deployed effectively. The real contribution of an individual's capabilities will depend on how well his/her strengths can be guided and harnessed, and the degree of commitment to each task. This section examines various elements of Leadership, Management and Work Organisation that determine the effective deployment of each business's Human Resources.

4.2.1 High Performance working

High Performance Working (HPW) has been a topic of considerable interest, both within the skills policy and relevant academic worlds, for some years. The scope of the term is comparatively broad, with the assumption that a number of different approaches can contribute to the achievement, through particularly effective deployment of relevant skills, of consistent, impressive performance of an organisation. The Department for Trade and Industry (DTI, CIPD, 2006) summarise the paradigm in the following way:

> High Performance Work Practices are a set of complementary work practices covering three broad categories: high employee involvement practices, human resource practices, and reward and commitment practices. These broad areas are sometimes referred to as 'bundles' of practices and cover 35 work practices in this research.

More recently a review at the UK Commission (UKCES, 2010b) describes High Performance Working as follows:

> HPW encompasses the bringing together and implementation of a number of practices in a holistic way to effectively manage an organisation. As such it must provide an important means to stimulate businesses to: review their business strategies; move up the value chain (i.e. by delivering higher value goods and services); raise their demand for high skills; reorganise their work; and by so doing improve skills utilisation in the workplace and, hence, firm performance.

The breadth and variety of the techniques limits the amount of quantitative assessment possible on HPW activity, the indicators in this section are recognised to play a role.

Effective leadership and management are a necessary condition for effective use of HPW practices. Table 4.11 provides information on the qualification levels of managers and professionals by sector and home nation, showing the percentage without Level 4 or higher qualifications.

Table 4.11: Managers and professionals without Level 4 or higher qualifications (% of all managers and professionals)

	UK	England	Scotland	Wales	Northern Ireland
	%	%	%	%	%
Agriculture, forestry and fishing	45	43	*	*	*
Energy production and utilities	49	51	41	*	*
Manufacturing	**51**	**51**	**51**	**59**	**35**
Construction	50	51	41	40	*
Wholesale and retail trade	64	64	67	60	50
Transportation and storage	61	59	67	*	*
Hospitality, tourism and sport	66	66	61	70	*
Information and communication technologies	40	40	37	*	*
Creative media and entertainment	38	38	*	*	*
Financial, insurance & other professional services	36	36	38	35	*
Real estate and facilities management	58	59	63	*	*
Government services	31	32	36	29	*
Education	10	11	8	*	*
Health	15	15	*	*	*
Care	30	30	33	*	*
All economy	39	39	37	36	27

Source: Labour Force Survey 2010 (ONS)

** Sample size too small for reliable estimate*

As can be seen, for Manufacturing as a whole, more than half of its managers and professionals do not hold qualifications at Level 4 and above – putting it 5th highest in the UK by this (negative) indicator compared with other sectors: the share of such senior people without these qualifications is notably higher, for Manufacturing, in Wales, and lower in Northern Ireland. It is important in this context to recognise that this indicator provides no information about the type of qualification involved and its relevance to HPW – it is likely that a number of the Level 4 qualifications held by senior people within Manufacturing would relate to the technical aspects of their business, rather than the human resource aspects that would be involved in the kind of leadership necessary for high performance working.

Table 4.12: Managers and professionals without Level 4 or higher qualifications 2002-2010 (All economy, UK)

		2002	2003	2004	2005	2006	2007	2008	2009	2010
Managers or professionals without L4 or higher qualifications	000s	3,239	3,336	2,554	3,023	3,460	3,471	3,496	3,371	3,283
	%	45	45	33	38	43	42	42	40	39
Weighted base (number of managers and professionals)	*000s*	*7,214*	*7,481*	*7,726*	*7,866*	*8,123*	*8,201*	*8,356*	*8,406*	*8,483*

Source: Labour Force Survey 2010 (ONS)

Table 4.13: Managers and professionals in Manufacturing without Level 4 or higher qualifications 2002-2010 (UK)

		2002	2003	2004	2005	2006	2007	2008	2009	2010
Managers or professionals without L4 or higher qualifications	000s	582	540	401	473	547	531	513	472	469
	%	55	54	41	47	53	51	51	53	51
Weighted base (number of managers and professionals)	*000s*	*1,050*	*1,001*	*986*	*1,008*	*1,026*	*1,041*	*1,001*	*890*	*917*

Source: Labour Force Survey 2010 (ONS)

As can be seen from Tables 4.12 and 4.13, the percentage of managers and professionals without L4 of higher qualifications has been reducing for the economy as a whole, while this has not so clearly been the case for Manufacturing.

Skills Utilisation and HPW

Skills Utilisation is worthy of particular consideration in relation to the HPW paradigm, particular in Scotland where its encouragement and deployment has been on the Skills Policy agenda for a number of years. A literature review on Skills Utilisation was carried out for the Scottish Government by CFE in 2008 (Scottish Government, 2008). Although it did not find evidence of a common definition, the review proposed, in the light of other work, the following specification:

> *'*Skills utilisation is about ensuring the most effective application of skills in the workplace to maximise performance through the interplay of a number of key agents (e.g. employers, employees, learning providers and the state) and the use of a range of HR, management and working practices. Effective skills utilisation seeks to match the use of skills to business demands/needs.'

The review highlighted evidence on the topic of 'HPW as a means to achieving (better) skills utilisation', and found a number of reports relating to the Manufacturing sector.

> 'The evidence in this area is mainly limited to manufacturing and large businesses. There is limited information available regarding practical workplace examples of processes with the outcome of skills utilisation across a range of other sectors and business sizes.'
>
> 'Much of the evidence in the US refers to the introduction of HPW in large private sector manufacturing firms.'
>
> 'There is a clear focus on the uptake of HPW in the manufacturing sector. However, it is unclear whether this is true in reality or a reflection of the fact that the majority of the influential studies have been conducted in manufacturing (e.g. Appelbaum et al., 200025; MacDuffie, 1995) or using large-scale national or

[25] See Scottish Government (2008) for details of the references cited within it

> cross-industry surveys of relatively large workplaces (e.g. Delaney and Huselid 1996; Huselid 1995; Ramsay et al. 2000).'
>
> 'Ichniowski, 1990 (focused on manufacturing) and Cutcher-Gershenfeled, 1991 (focused on manufacturing) demonstrated that the implementation of systems based on motivation, problem solving, worker autonomy, job design and training are associated with higher productivity.'
>
> 'Evidence on the overall take up of HPW is limited however; it appears that it is higher in large, manufacturing organisations. Strong leadership and management and employee trust are two key factors needed for successful implementation of skills utilisation within a workplace.'
>
> 'Combs et al. (2006) conducted a meta-analysis to estimate, among other things, the optimum size of an organisation to fully achieve positive outcomes of HPWPs on organisational performance. They found that the optimum size in the Manufacturing sector was twice as large as among Service sector employers.'
>
> 'Sung and Ashton (2006) suggested that the fact that many of the HPW practices were developed in manufacturing explains why they appear to be more effective in achieving a greater range of outcomes in that sector. The authors note that the sector in which the firm operates influences the effectiveness of the HPW practices to achieve improved business performance.'

The interest in Scotland arose in part because of concern that much of the knowledge and skills gained by those who had benefitted from the well-respected Scottish Education system seemed not to be being used for the benefit of Scottish enterprises, and the economy as a whole. Part of the concern arose from what appeared to be significant under-use in industry of the higher level skills of new graduate recruits, and Skills Utilisation helped raise awareness of under-employment generally (see Section 5.3).

While there has been less focus on this agenda in England, Wales and Northern Ireland, awareness and interest in it continues to grow. Examples of the perspectives from some Manufacturing sub-sectors are as follows:

- The technical and highly safety regulated nature of the science-based industries results in a shift towards the high end of the skills spectrum, most notably in Pharmaceuticals and Nuclear Fuel Processing;
- In the Food and Drink Manufacturing industries, training on 'intermediate skills' is associated with more benefits and positive performance indicators than any other level of qualifications. In an Improve SSC review of 'Business Benefits of Training' drawing on a series of case studies of industry employers (Improve, 2008), evidence was presented that workplaces with higher percentages of their workforces having intermediate level qualifications are significantly associated with greater performance in such areas as productivity, growth capacity, profitability and innovation.

It is worth noting that, in summary, the literature review found that:

> Overall, take up of HPW by UK employers has been limited. Ignorance, inertia, inadequacy and impediment are given as the main reasons for a lack of implementation. Evidence shows that sector, size and country of origin influence whether an organisation implements High Performance Working practices, with more evidence of HPW having been adopted in larger organisations; the manufacturing sector; and in the UK in foreign owned organisations.

Other indicators of HPW practices

While, by its very nature, many aspects of HPW are much less measurable in a straightforward way, the 2011 UK Commission's Employer Skills Survey[26] probed four other elements of employer practice of relevance:

- identifying and harnessing outstanding contributions
- amount of variety in each team member's work
- amount of discretion team members can exercise
- access to flexible learning in their working environment.

Response data for these indicators, across Manufacturing and the other major sectors, are shown in Tables 4.14 to 4.17.

Table 4.14: Whether establishment has formal processes in place to identify 'high potential' or talented individuals, by sector (2011) (UK)

	Formal process for identifying 'high potential' individuals									
	Yes, formally documented		Yes, informally		No		Don't know		Unweighted base	Weighted base
	number	%	number	%	number	%	number	%		
Agriculture, forestry and fishing	5,652	5	30,105	27	72,671	64	4,348	4	820	112,776
Energy production and utilities	2,191	17	4,077	31	6,385	49	486	4	866	13,138
Manufacturing	**15,955**	**12**	**41,908**	**31**	**72,179**	**54**	**3,456**	**3**	**4,001**	**133,498**
Construction	21,136	7	89,742	29	185,426	61	8,056	3	4,570	304,360
Wholesale and retail trade	79,322	17	144,464	31	229,455	49	18,075	4	8,093	471,317
Transportation and storage	12,217	10	30,841	26	73,328	61	4,419	4	2,400	120,805
Accommodation, food and tourism activities	32,190	15	69,719	32	109,728	50	7,234	3	5,819	218,871
Information and communication	5,976	8	23,608	32	42,403	58	1,136	2	1,261	73,123
Creative media and entertainment	11,873	8	48,322	33	83,861	57	3,495	2	1,959	147,551
Financial, insurance & other professional services	31,220	18	56,823	33	80,911	47	3,669	2	2,680	172,623
Real estate and facilities management	20,259	13	48,382	30	83,504	52	9,000	6	1,745	161,145
Government	11,426	21	16,967	31	25,307	46	1,600	3	1,379	55,300
Education	18,653	32	20,236	34	18,789	32	1,231	2	2,780	58,909
Health	10,508	20	15,684	30	24,879	47	1,427	3	1,739	52,498
Care	25,788	28	26,675	29	32,817	36	6,485	7	2,455	91,765
All economy	320,952	14	702,866	31	1,198,876	52	77,227	3	44,691	2,299,921

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments in Module 1 and Scotland.

[26] The latest biennial Employer Skills Survey, for the first time in 2011 carried out in a coordinated way across the four home nations.

Table 4.15: Extent to which employees have variety in their work, by sector (2011) (UK)

	Extent to which employees have variety in their work											
	To a large extent		To some extent		Not much		Not at all		Don't know		Unweighted base	Weighted base
	number	%	number	%	number	%	number	%	number	%		
Agriculture, forestry and fishing	76,675	68	24,469	22	7,742	7	2,816	2	1,074	1	820	112,776
Energy production and utilities	5,929	45	4,909	37	1,795	14	406	3	100	1	866	13,138
Manufacturing	**67,095**	**50**	**48,484**	**36**	**12,899**	**10**	**3,756**	**3**	**1,262**	**1**	**4,001**	**133,498**
Construction	179,144	59	88,851	29	24,047	8	9,313	3	3,003	1	4,570	304,360
Wholesale and retail trade	238,562	51	168,884	36	48,318	10	11,692	2	3,861	1	8,093	471,317
Transportation and storage	53,146	44	35,613	29	17,947	15	13,259	11	840	1	2,400	120,805
Accommodation, food and tourism activities	86,140	39	83,543	38	37,117	17	9,289	4	2,782	1	5,819	218,871
Information and communication	46,346	63	21,687	30	3,293	5	417	1	1,381	2	1,261	73,123
Creative media and entertainment	99,587	67	37,290	25	7,267	5	2,237	2	1,170	1	1,959	147,551
Financial, insurance & other professional services	94,803	55	60,363	35	12,493	7	3,148	2	1,816	1	2,680	172,623
Real estate and facilities management	92,156	57	51,012	32	15,579	10	1,561	1	837	1	1,745	161,145
Government	33,925	61	17,273	31	2,855	5	391	1	856	2	1,379	55,300
Education	38,306	65	17,346	29	2,187	4	619	1	452	1	2,780	58,909
Health	26,622	51	19,718	38	5,203	10	694	1	260	**	1,739	52,498
Care	54,001	59	31,224	34	4,410	5	972	1	1,159	1	2,455	91,765
All economy	1,256,316	55	745,134	32	212,192	9	64,300	3	21,979	1	44,691	2,299,921

*Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments in Module 1 and Scotland. **Denotes a figure greater than 0% but less than 0.5%.*

Table 4.16: Extent to which employees have discretion over their work, by sector (2011) (UK)

	Extent to which employees have discretion over how they do their work											
	To a large extent		To some extent		Not much		Not at all		Don't know		Unweighted base	Weighted base
	number	%	number	%	number	%	number	%	number	%		
Agriculture, forestry and fishing	61,757	55	39,087	35	6,625	6	2,485	2	2,821	3	820	112,776
Energy production and utilities	5,809	44	4,957	38	1,467	11	557	4	348	3	866	13,138
Manufacturing	**63,859**	**48**	**49,442**	**37**	**11,926**	**9**	**5,326**	**4**	**2,945**	**2**	**4,001**	**133,498**
Construction	167,066	55	103,337	34	18,624	6	10,627	3	4,706	2	4,570	304,360
Wholesale and retail trade	222,298	47	182,574	39	44,174	9	13,608	3	8,663	2	8,093	471,317
Transportation and storage	60,073	50	38,390	32	12,736	11	8,160	7	1,446	1	2,400	120,805
Accommodation, food and tourism activities	88,190	40	87,712	40	28,331	13	9,926	5	4,712	2	5,819	218,871
Information and communication	48,851	67	20,130	28	3,082	4	614	1	446	1	1,261	73,123
Creative media and entertainment	94,306	64	39,623	27	5,912	4	3,212	2	4,498	3	1,959	147,551
Financial, insurance & other professional services	88,150	51	62,426	36	15,688	9	5,292	3	1,068	1	2,680	172,623
Real estate and facilities management	95,298	59	48,171	30	11,255	7	4,656	3	1,765	1	1,745	161,145
Government	32,235	58	17,718	32	3,674	7	810	1	863	2	1,379	55,300
Education	27,530	47	26,592	45	3,231	5	660	1	897	2	2,780	58,909
Health	22,195	42	21,678	41	6,472	12	1,544	3	608	1	1,739	52,498
Care	48,843	53	36,123	39	3,779	4	1,532	2	1,488	2	2,455	91,765
All economy	1,188,767	52	814,655	35	185,638	8	71,823	3	39,037	2	44,691	2,299,921

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments in Module 1 and Scotland.

Table 4.17: Extent to which employees at establishment have access to flexible working, by sector (2011) (UK)

	Employees have access to flexible working											
	To a large extent		To some extent		Not much		Not at all		Don't know		Unweighted base	Weighted base
	number	%	number	%	number	%	number	%	number	%		
Agriculture, forestry and fishing	48,869	43	41,468	37	12,485	11	8,004	7	1,950	2	820	112,776
Energy production and utilities	4,781	36	4,419	34	2,431	19	1,450	11	58	**	866	13,138
Manufacturing	**52,687**	**39**	**44,362**	**33**	**17,955**	**13**	**16,667**	**12**	**1,827**	**1**	**4,001**	**133,498**
Construction	139,674	46	101,224	33	33,585	11	26,266	9	3,610	1	4,570	304,360
Wholesale and retail trade	176,251	37	168,909	36	64,843	14	56,324	12	4,991	1	8,093	471,317
Transportation and storage	44,233	37	38,327	32	16,329	14	20,683	17	1,233	1	2,400	120,805
Accommodation, food and tourism activities	99,272	45	77,239	35	22,537	10	17,703	8	2,120	1	5,819	218,871
Information and communication	42,992	59	20,273	28	5,342	7	4,226	6	289	**	1,261	73,123
Creative media and entertainment	83,200	56	44,734	30	10,011	7	7,602	5	2,004	1	1,959	147,551
Financial, insurance & other professional services	89,019	52	55,484	32	15,828	9	11,747	7	546	**	2,680	172,623
Real estate and facilities management	77,691	48	52,389	33	16,393	10	13,861	9	811	1	1,745	161,145
Government	34,229	62	15,040	27	3,343	6	1,865	3	823	1	1,379	55,300
Education	14,445	25	21,754	37	12,772	22	9,545	16	393	1	2,780	58,909
Health	14,407	27	23,130	44	9,761	19	5,025	10	174	**	1,739	52,498
Care	38,920	42	35,210	38	9,701	11	6,858	7	1,075	1	2,455	91,765
All economy	1,012,366	44	783,411	34	264,071	11	216,701	9	23,372	1	44,691	2,299,921

*Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments in Module 1 and Scotland. **Denotes a figure greater than 0% but less than 0.5%.*

Perhaps surprisingly (given the findings of the literature review), in terms of performance against these indicators, Manufacturing employers appear in all four cases to show activity a little below the average for the economy as a whole.

In spite of this, there is awareness within most Manufacturing sub-sectors of High Performance Working and its possible benefits.

- within the Science-based industries, HPW is felt to be particularly important for businesses exploiting emerging and safety-critical technologies, notably Pharmaceuticals and Nuclear Fuel Processing
- thinking about HPW is relatively new in the Food and Drink Manufacturing industry, and the level of adoption is evidently related to most of the identified training benefits and performance indicators. Where HPW has been adopted, many of the promoted benefits have been enjoyed, but there appears to have been little progress in 'improved innovation', 'ensuring effective teamwork' and customer retention'.

Overall, taken together with the below-average levels (and limited progress) of higher qualifications of those in Managerial and Professional occupations within Manufacturing, the below average 'performance against the HPW indicators' is a little surprising, given the apparent more general reported evidence about take-up of HPW within the sector. There are two basic differences between the activity reported in the literature review and the findings from responses in the UK ESS:

- the evidence on take-up within the published literature in recent years is not based precisely (or just) on the indicators examined within the 2011 survey

- the survey responses evidently cover more than just large companies, and the activity reported in the literature emphasised that take-up by 2008 was largely limited to large companies.

Another factor may be relevant to this question. Recent years have seen growing deployment of fairly sophisticated cost-effectiveness, efficiency and QA processes within Manufacturing, in many cases drawn from successful Japanese production techniques (e.g. Lean Manufacturing, '5S', Value Stream Analysis, 'Kaizen' – continuous improvement - and 'Six Sigma'). While potentially beneficial to the efficiency of the core business processes, these do not generally include some of the broader HPW approaches, which might suggest that there remain benefits to be achieved for overall performance improvement by drawing on these broader – sometimes more human-focused - aspects of the HPW paradigm.

Some years have now elapsed since the literature review: an update would be useful.

HPW is evidently not a straightforward concept, and it appears that more widespread and robust evidence is needed on both the comparative role of the different practices, and the degree and patterns of take-up. However, to the extent that High Performance Working practices can provide business benefits, the UK ESS results would suggest that there may well be opportunities for Manufacturing companies to derive them.

4.2.2 Provision of Training

While qualification levels in practice emphasise the knowledge levels within the workforce, more important for skills-raising in relation to workplace competence is the training received by those in employment. While it must be noted that such training may not in all cases be directly relevant to workplace tasks, it will in general be very much more relevant to the skills needed for performance on the job. The quarterly Labour Force Survey gathers information from respondents about the training they have received both within the last month, and within the last three months (four weeks and 13 weeks). Tables 4.18 and 4.19 show the percentages of employees within each of the 15 main sectors who have received such training over recent years.

Table 4.18: % of employees receiving training in last 4 weeks, 2002-2010 (UK, by sector)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%
Agriculture, forestry and fishing	7	7	6	6	6	6	6	6	6
Energy production and utilities	15	14	13	13	13	13	12	11	12
Manufacturing	**10**	**9**	**9**	**10**	**9**	**9**	**9**	**9**	**9**
Construction, building services engineering and planning	10	9	10	9	9	9	9	9	8
Wholesale and retail trade	11	10	10	10	10	10	9	8	8
Transportation and storage	10	10	9	9	8	8	8	7	7
Hospitality, tourism and sport	13	12	12	11	11	10	10	10	11
Information and communication technologies	13	12	12	11	11	10	10	10	10
Creative media and entertainment	13	12	12	12	11	11	10	9	8
Financial, insurance & other professional services	18	17	17	16	15	15	15	14	15
Real estate and facilities management	14	13	14	12	13	12	12	7	8
Government services	20	20	20	20	19	18	19	19	17
Education	22	21	21	21	20	20	20	20	18
Health	24	25	25	25	24	23	22	24	24
Care	24	25	25	25	24	23	22	21	20
All economy	15	14	14	14	14	13	13	13	13
Weighted base (000s)	4,095	3,987	4,074	4,061	3,949	3,863	3,834	3,685	3,642
Unweighted base (000s)	*35.781*	*33.324*	*32.626*	*31.674*	*29.781*	*28.888*	*27.829*	*25.468*	*24.012*

Source: Labour Force Survey 2010, ONS

Table 4.19: % of employees receiving training in last 13 weeks, 2001-2010 (UK, by sector)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
	%	%	%	%	%	%	%	%	%
Agriculture, forestry and fishing	15	13	14	13	13	12	13	13	13
Energy production and utilities	33	31	30	28	28	28	26	25	27
Manufacturing	**21**	**20**	**19**	**20**	**19**	**20**	**19**	**18**	**18**
Construction, building services engineering and planning	19	19	20	19	19	19	19	19	18
Wholesale and retail trade	20	20	20	20	18	18	18	16	16
Transportation and storage	21	21	20	19	19	18	18	17	18
Hospitality, tourism and sport	24	22	22	21	21	20	19	19	19
Information and communication technologies	27	25	24	23	23	22	21	21	20
Creative media and entertainment	24	24	23	23	23	21	21	18	17
Financial, insurance & other professional services	35	33	32	33	30	30	29	29	29
Real estate and facilities management	27	26	27	26	26	25	24	15	16
Government services	40	41	40	39	38	37	36	37	35
Education	44	42	42	42	40	39	40	39	38
Health	45	46	46	47	46	44	44	47	46
Care	45	46	46	47	46	44	44	41	40
All economy	28	28	28	28	27	26	26	26	26
Weighted base (000s)	7,952	7,873	7,917	8,037	7,883	7,681	7,669	7,382	7,359
Unweighted base (000s)	*69.767*	*65.973*	*63.658*	*63.118*	*59.87*	*57.81*	*56.008*	*51.497*	*48.93*

Source: Labour Force Survey 2010, ONS

Tables 4.18 and 4.19 show a small but clear reduction, between 2002 and 2010, in the proportion of the UK workforce that have received training, as measured both after four weeks and after 13 weeks. This fall is reflected, albeit more gently, for Manufacturing. There is little direct evidence of the reason behind this, although a general rise of business (in the private sector commercial competitive) pressure, reducing time available for less productive work, would presumably have played a role.

Tables 4.20 and 4.21 show the 2010 estimates for training received across the four nations. Sample size limitations for the devolved administrations, in particular Northern Ireland, reduce availability of statistically reliable estimates. Training levels within Wales appear to be higher than elsewhere for Manufacturing, and – to a lesser extent – more generally.

Table 4.20: % of employees receiving training in last 4 weeks, 2010 (all nations, by sector)

	UK	England	Scotland	Wales	Northern Ireland
	%	%	%	%	%
Agriculture, forestry and fishing	6	7	*	*	*
Energy production and utilities	12	12	13	*	*
Manufacturing	**9**	**9**	**9**	**11**	**8**
Construction, building services engineering and planning	8	8	9	10	*
Wholesale and retail trade	8	8	9	9	6
Transportation and storage	7	7	8	*	*
Hospitality, tourism and sport	11	11	12	15	*
Information and communication technologies	10	10	*	*	*
Creative media and entertainment	8	8	*	*	*
Financial, insurance & other professional services	15	15	17	19	*
Real estate and facilities management	8	8	11	*	*
Government services	17	17	18	16	8
Education	18	19	17	19	*
Health	24	25	21	22	11
Care	20	20	19	26	*
All economy	13	13	13	14	7
Weighted base (000s)	3,642	3,085	317	188	52
Unweighted base (000s)	*24.012*	*20.155*	*2.164*	*1.215*	*0.478*

Source: Labour Force Survey 2010, ONS

**Sample size too small for reliable estimate*

Table 4.21: % of employees receiving training in last 13 weeks, 2010 (all nations, by sector)

	UK	England	Scotland	Wales	Northern Ireland
	%	%	%	%	%
Agriculture, forestry and fishing	13	15	12	*	*
Energy production and utilities	27	27	30	*	*
Manufacturing	**18**	**18**	**18**	**20**	**18**
Construction, building services engineering and planning	18	18	21	18	12
Wholesale and retail trade	16	17	17	15	13
Transportation and storage	18	18	19	16	*
Hospitality, tourism and sport	19	19	20	21	*
Information and communication technologies	20	20	22	*	*
Creative media and entertainment	17	17	18	20	*
Financial, insurance & other professional services	29	29	28	32	17
Real estate and facilities management	16	16	23	18	*
Government services	35	35	35	34	24
Education	38	39	34	38	26
Health	46	47	42	44	32
Care	40	40	40	46	27
All economy	25	25	27	24	18
Weighted base (000s)	7,181	6,065	668	312	137
Unweighted base (000s)	*48.93*	*40.947*	*4.41*	*2.282*	*1.291*

Source: Labour Force Survey 2010, ONS

**Sample size too small for reliable estimate*

In addition to evidence from the Labour Force Survey, quantitative data on training provided by employers is available from the 2011 UK Commission's Employer Skills Survey (Davies et al, 2012).

Table 4.22: Employees receiving training by sector and nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry and fishing	198,736	43	152,352	43	†25,724	†47	8,993	29	11,667	51
Energy production and utilities	167,507	50	120,687	49	32,976	55	11,072	66	2,772	38
Manufacturing	**1,146,654**	**45**	**934,516**	**44**	**93,562**	**48**	**74,719**	**54**	**43,857**	**52**
Construction	1,072,552	48	884,923	48	116,140	47	39,666	44	31,826	46
Wholesale and retail trade	2,340,353	50	1,960,109	49	201,879	55	109,603	55	68,761	48
Transportation and storage	538,494	41	448,580	39	49,954	44	22,489	58	17,468	63
Accommodation, food and tourism activities	1,221,736	53	1,017,791	53	124,328	55	48,807	49	30,809	50
Information and communication	233,240	38	205,944	37	†15,377	†51	5,255	28	6,663	65
Creative media and entertainment	524,081	48	451,335	47	†30,017	†43	24,215	69	18,513	69
Financial, insurance & other professional services	1,109,888	54	949,712	52	101,444	73	32,505	60	26,224	69
Real estate and facilities management	560,354	47	492,799	47	†36,284	†49	19,985	60	11,286	50
Government	1,004,866	56	835,514	58	82,550	47	49,901	53	36,901	59
Education	1,598,280	63	1,354,826	63	116,696	62	84,527	72	42,231	58
Health	1,300,684	65	1,032,851	64	187,638	81	58,505	49	21,690	52
Care	969,487	64	780,108	64	89,130	63	52,831	84	47,414	64
All economy	14,476,138	53	12,050,111	52	1,337,833	56	661,045	56	427,137	54
Weighted base	27,547,123		23,198,475		2,381,601		1,182,314		784,732	
Unweighted base	2,816,693		2,345,213		201,868		178,922		90,690	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All employment.
† Treat figures with caution due to small base size of 50-99 establishments in Scotland

As shown in Table 4.22, in terms of employers' reports in the 2011 survey of the numbers of employees who receive training they have provided, Manufacturing numbers are lower than the overall average, with Scotland, Northern Ireland, and – particularly – Wales 'outperforming' English employers on this indicator.

Table 4.23: Employees receiving training by occupational group

	Manufacturing		All economy	
	Number	%	Number	%
Managers, Directors and senior officials occupations	169,678	39	2,413,145	45
Professional occupations	76,470	48	1,904,780	61
Associate professional and technical occupations	64,288	46	1,022,510	56
Administrative and secretarial occupations	91,566	38	1,607,984	45
Skilled trades occupations	184,320	50	1,041,373	55
Personal service occupations	*	*	1,606,254	70
Sales and customer service occupations	72,728	48	1,937,670	55
Process, plant and machine operatives	309,428	48	902,782	47
Elementary occupations	173,308	43	1,938,793	48
Other	3,852	n/a	100,845	n/a
All occupations	1,146,653		14,476,137	
Weighted base	1,146,653		14,476,137	
Unweighted base	138,751		1,517,802	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All employees receiving training
Note: % figures refer to % of those working in x occupation who have received training
**suppressed due to employer base size <25.*

In terms of the distribution of training provided across the main occupational groups, numbers receiving training in Manufacturing represented (Table 4.23) a smaller share of the workforce than for the economy as a whole, with the one (modest) exception of those working as Process, plant and machine operatives. Within Manufacturing, the broad occupational group that received the greatest proportion of training was those working in Skilled trades occupations. In terms of (absolute) numbers receiving training, operatives received the most, followed by Skilled Trades, Elementary Occupations, and Managers.

Comparisons of training received by employees across the European Union

International comparisons of many skills-related indicators are challenging, because of differences in classifications and survey methodology. Table 4.24 shows 2005 data on Continuing Vocational Training (CVT- analogous to Lifelong Learning) for a number of sectors defined in relation to the European NACE classification ("Nomenclature des Activités Économiques dans la Communauté Européenne"). NACE categories are very close to those of SIC 2007, though the scope of the 15 major sectors examined in this assessment are not identical.

Table 4.24: Hours in Continuous Vocational Training courses per employee

Hours in CVT courses during 2005 per employee (all enterprises), by NACE group												
	All NACE activities covered by CVTS (Continuing Vocational Training)	Mining and quarrying	Manufact-uring	Electricity, gas and water supply	Construct-ion	Wholesale and retail*	Hotels and restaurants	Transport and travel	Post and telecommu nications	Financial intermed-iation	Real estate, renting and business activities	Other community, social and personal service activities
GEOGRAPHICAL UNIT	2005	2005	2005	2005	2005	2005	2005	2005	2005	2005	2005	2005
European Union (27 countries)	9	9	9	15	6	6	4	9	13	20	10	9
European Union (25 countries)	9	10	9	16	6	7	4	9	13	21	10	9
Belgium	12	13	14	12	4	9	4	12	32	19	15	8
Bulgaria	4	13	3	4	3	5	3	7	5	9	6	5
Czech Republic	14	13	13	24	13	10	4	13	19	46	16	10
Denmark	10	8	10	26	8	6	12	6	9	11	18	20
Germany (including former GDR)	9	14	10	14	4	5	4	5	11	19	10	8
Estonia	7	7	4	11	4	6	5	6	11	40	12	7
Ireland	12	:	14	:	:	11	:	:	:	14	16	6
Greece	3	7	3	6	1	3	1	5	5	12	5	2
Spain	9	7	8	16	5	11	3	12	17	19	7	5
France	13	9	13	14	8	9	8	17	16	27	12	12
Italy	7	18	5	19	3	6	2	9	15	27	8	4
Cyprus	7	:	4	:	:	5	:	:	:	14	13	4
Latvia	4	2	3	9	3	3	1	4	4	11	5	2
Lithuania	5	7	4	16	4	3	3	5	8	19	7	3
Luxembourg	16	:	22	:	:	9	:	:	:	22	18	19
Hungary	6	4	4	23	3	4	2	8	17	13	5	3
Malta	11	:	18	:	:	6	:	:	:	14	14	3
Netherlands	12	31	13	13	14	8	10	13	9	20	15	9
Austria	9	8	8	20	5	8	2	10	6	32	6	7
Poland	6	7	5	10	3	5	2	7	16	20	5	2
Portugal	7	5	6	17	3	9	6	10	10	16	8	6
Romania	5	4	5	13	4	3	7	4	6	14	8	3
Slovenia	14	8	15	29	4	9	7	18	16	27	17	18
Slovakia	12	11	11	38	6	13	1	11	15	37	6	6
Finland	10	7	10	40	8	7	6	6	10	17	16	6
Sweden	15	3	22	23	8	10	5	9	10	10	18	17
United Kingdom	7	5	5	4	8	4	4	4	5	12	10	11
Norway	9	6	13	19	6	8	2	13	2	25	7	10

Source: Eurostat, 2011 (from CVTS3, 2006)

: Data missing

** Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods*

*** Land transport; transport via pipelines; water transport; air transport; supporting and auxiliary transport activities; activities of travel agencies*

As can be seen, by this measure, the amount of CVT reported for the UK was not as high as in many other (competitor) countries, and for Manufacturing CVT Hours per employee is little more than half the EU average.[27]

[27] Due to certain specific characteristics of the UK data for the *Third European CVT Survey* (2006), there are sample sizes issues when making comparisons between UK estimates and those from other Member States.

Planning of training

The UK Commission's Employer Skills Survey questioned respondents about their training intentions, asking whether they had training plans and/or training budgets.

Table 4.25: Employers with a training plan by sector and nation, 2011

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry and fishing	28,388	26	20,580	26	†4,477	†34	1,243	12	2,087	29
Energy production and utilities	6,140	49	4,860	49	655	51	424	51	201	38
Manufacturing	**38,568**	**30**	**31,191**	**28**	**4,415**	**47**	**1,940**	**36**	**1,022**	**27**
Construction	84,115	27	67,305	26	9,885	46	3,996	30	2,930	27
Wholesale and retail trade	178,673	38	150,280	38	15,096	43	8,396	40	4,900	35
Transportation and storage	34,005	28	28,993	27	2,929	37	1,362	32	721	32
Accommodation, food and tourism activities	91,460	42	74,110	41	11,037	50	3,997	35	2,316	40
Information and communication	16,895	23	15,419	23	†550	†15	632	32	294	27
Creative media and entertainment	32,800	23	28,824	23	†1,975	†18	1,064	23	937	46
Financial, insurance & other professional services	77,091	45	68,380	45	4,263	51	2,779	49	1,668	49
Real estate and facilities management	66,124	40	59,648	40	†4,566	†38	1,158	38	752	41
Government	30,270	55	24,097	54	3,715	67	1,455	54	1,003	49
Education	42,196	65	34,120	64	3,472	78	2,414	76	2,189	67
Health	33,941	65	28,543	64	2,653	82	1,791	64	954	64
Care	60,643	69	50,342	70	4,822	57	3,311	76	2,168	67
All economy	863,494	38	721,499	37	79,173	45	37,719	38	25,099	37
Weighted base	2,299,921		1,960,298		175,115		98,952		65,558	
Unweighted base	87,572		75,053		2,503		6,012		4,004	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments

† Treat figures with caution due to small base size of 50-99 establishments in Scotland

Manufacturing employers reporting having a training plan (Table 4.25) represent below average numbers, as compared with other sectors, although Scottish manufacturers are more likely than average to have a training plan[28].

[28] Skills policy in Scotland has, for some years, focussed increasingly strongly on the *Skills Utilisation* agenda, and this may be having impact

Table 4.26: Employers with a training budget by sector and nation, 2011

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry and fishing	23,169	21	16,302	21	†3,969	†30	647	6	2,250	32
Energy production and utilities	4,538	36	3,604	36	434	34	353	43	147	27
Manufacturing	**27,468**	**21**	**23,265**	**21**	**2,161**	**23**	**1,323**	**25**	**720**	**19**
Construction	59,489	19	49,098	19	6,428	30	2,230	17	1,733	16
Wholesale and retail trade	113,516	24	97,068	24	9,142	26	4,534	22	2,773	20
Transportation and storage	23,228	19	19,317	18	2,846	36	549	13	516	23
Accommodation, food and tourism activities	61,752	28	50,474	28	7,274	33	2,519	22	1,484	26
Information and communication	17,700	24	14,936	23	†1,918	†54	560	29	285	26
Creative media and entertainment	32,018	22	28,351	22	†1,756	†16	961	21	950	46
Financial, insurance & other professional services	60,256	35	55,617	36	1,607	19	1,924	34	1,108	33
Real estate and facilities management	53,538	32	46,838	31	†4,955	†41	1,077	36	668	36
Government	30,711	56	25,025	56	2,957	53	1,554	58	1,175	58
Education	43,136	67	35,825	67	2,950	66	2,382	75	1,979	60
Health	22,570	43	19,100	43	1,952	60	943	34	574	39
Care	51,869	59	43,591	61	3,377	40	2,884	66	2,017	62
All economy	657,040	29	554,765	28	57,270	33	25,624	26	19,380	30
Weighted base	*2,299,921*		*1,960,298*		*175,115*		*98,952*		*65,558*	
Unweighted base	*87,572*		*75,053*		*2,503*		*6,012*		*4,004*	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments.
† Treat figures with caution due to small base size of 50-99 establishments in Scotland

As with training plans, fewer Manufacturers than employers in other sectors have training budgets (Table 4.26) – though more Scottish manufacturers report these in place.

4.2.3 Investment in Training

UK employers continue to make massive investments in training their workforces: estimates from the 2009 National Employers Skills Survey (UKCES, 2010c) show an investment across the economy of nearly £40bn, with Manufacturing employers committing to over £2.8bn of expenditure[29].

Table 4.27 shows from 2011 UK ESS responses, for each broad sector, the numbers (and fractions) of UK employers who provide training to their staff.

[29] These figures do not include such investment in Scotland, Wales or Northern Ireland

Table 4.27: Employers providing training by sector and nation, 2011

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry and fishing	58,869	53	42,577	54	†7,737	†58	3,536	34	5,019	71
Energy production and utilities	8,743	69	6,858	69	1,040	81	554	67	291	54
Manufacturing	**73,972**	**57**	**61,935**	**55**	**6,629**	**71**	**3,464**	**64**	**1,944**	**51**
Construction	163,641	53	137,473	53	13,506	63	7,193	55	5,469	51
Wholesale and retail trade	261,948	56	218,681	55	23,692	67	11,347	54	8,228	58
Transportation and storage	55,004	45	46,106	43	5,633	70	2,103	50	1,161	52
Accommodation, food and tourism activities	134,314	61	108,618	60	15,665	71	6,570	58	3,461	59
Information and communication	39,090	54	34,418	52	†2,974	†83	1,215	62	483	44
Creative media and entertainment	74,069	52	63,945	51	†5,976	†54	2,690	57	1,457	71
Financial, insurance & other professional services	114,074	67	101,640	66	5,354	64	4,605	80	2,474	73
Real estate and facilities management	95,068	57	85,826	57	†6,652	†55	1,340	44	1,249	67
Government	41,608	76	32,980	74	4,715	85	2,343	87	1,571	77
Education	55,629	86	45,309	85	4,348	97	2,941	92	3,031	92
Health	44,797	86	38,133	85	3,208	99	2,216	79	1,239	84
Care	73,669	84	60,516	84	6,798	81	3,562	81	2,793	86
All economy	1,361,250	59	1,141,560	58	119,847	68	58,171	59	41,668	64
Weighted base	2,299,921		1,960,298		175,115		98,952		65,558	
Unweighted base	87,572		75,053		2,503		6,012		4,004	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012). Base: All establishments.
† Treat figures with caution due to small base size of 50-99 establishments in Scotland

As can be seen, the percentage of Manufacturing employers who provide training lies just below the average for the economy as a whole: the percentage of sector employees who train their staff is greater in Scotland and, to a lesser extent Wales, while rather fewer Manufacturing employers in Northern Ireland provide such training. The types of training provided are shown below, in Table 4.28.

Table 4.28: Type of training funded or arranged for employees

	Manufacturing		All economy	
	Number	%	Number	%
Job specific training	60,147	81	1,149,860	84
Health and safety/first aid training	53,889	73	970,183	71
Induction training	38,766	52	702,846	52
Training in new technology	32,957	45	641,023	47
Management training	20,100	27	457,763	34
Supervisory training	20,997	28	437,577	32
Personal Development Training	2,142	3	45,451	3
Other	116	**	4,101	**
None of these	445	1	8,809	1
Don't know	159	**	2,412	**
Weighted base	73,972		1,361,249	
Unweighted base	5,394		66,916	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments providing training.
***Denotes a figure greater than 0% but less than 0.5%.*
NB: Column percentages sume to more than 100 since multiple responses were allowed.

The fraction of employers in Manufacturing providing training in the different areas appear broadly similar to those provided in other sectors, although, with the exception of Health & Safety/First Aid Training (understandable in principle given the potentially more physically risky working environments), a slightly lower proportion of Manufacturing employers provide training in most of these areas than employers as a whole.

European Comparisons

Table 4.29 shows the percentage of employers providing training by sector and geography. By this measure, UK employers appear to perform comparatively well, with 88 per cent of UK Manufacturing employers providing training of some kind, as compared with 75 per cent in France and 71 per cent in Germany (the data are for 2005). These data are not particularly consistent with UK data30: in particular the percentages for all sectors seem high in comparison with those based on UK ESS 11 response data.

[30] As mentioned, due to certain specific characteristics of the UK data for the Third European CVT Survey (2006), there are sample sizes issues when making comparisons between UK estimates and those from other Member States.

Table 4.29: Employers providing training (%) by sector and European nation (2005)

Table 4.29: Employers providing training (%) by sector and European nation (2005)

	Mining and quarrying	Manufact-uring	Electricity, gas and water supply	Construct-ion	Wholesale and retail*	Hotels and restaurants	Transport and travel**	Post and telecommu nications	Financial intermed-iation	Real estate, renting and business activities	Other community, social and personal service activities
European Union (27 countries)	54	54	79	53	60	49	57	63	88	75	70
European Union (25 countries)	55	55	80	53	62	50	58	65	89	76	71
Belgium	72	68	95	46	64	43	62	77	96	76	57
Bulgaria	51	28	67	34	24	22	24	33	67	39	27
Czech Republic	86	73	90	78	69	49	70	80	80	73	85
Denmark	64	79	100	84	93	58	68	71	99	91	100
Germany (including former GDR)	69	71	92	56	70	53	58	60	99	81	78
Estonia	72	68	80	61	64	61	70	66	85	76	61
Ireland	:	70	:	:	62	:	:	:	94	80	60
Greece	25	19	31	17	25	10	16	32	63	36	23
Spain	44	48	59	42	52	32	44	48	79	54	47
France	76	75	99	59	74	66	75	61	92	82	79
Italy	27	28	69	37	32	14	35	43	73	47	36
Cyprus	:	51	:	:	45	:	:	:	85	63	54
Latvia	35	32	58	39	38	20	35	59	63	44	35
Lithuania	62	44	79	55	44	27	40	50	85	56	55
Luxembourg	:	70	:	:	71	:	:	:	92	92	91
Hungary	40	48	83	44	50	30	42	70	88	58	52
Malta	:	44	:	:	42	:	:	:	82	58	49
Netherlands	84	75	100	81	71	57	67	62	89	82	76
Austria	79	82	99	84	85	70	64	90	99	87	82
Poland	49	32	61	29	32	18	36	50	73	45	56
Portugal	42	37	89	38	49	38	55	89	88	68	48
Romania	41	39	66	38	40	34	44	39	51	53	42
Slovenia	88	74	86	58	75	50	69	73	79	78	91
Slovakia	73	61	91	59	60	30	69	78	90	65	67
Finland	44	69	90	68	77	66	72	86	91	98	79
Sweden	75	76	100	74	79	59	78	77	97	90	70
United Kingdom	93	88	89	86	87	89	82	89	96	98	92
Norway	85	85	91	88	91	62	74	98	95	98	73

Source: Eurostat, 2011

: Data missing

** Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods*

*** Land transport; transport via pipelines; water transport; air transport; supporting and auxiliary transport activities; activities of travel agencies*

To the extent that the UK data from CVT3 can be relied upon, these estimates, when taken together with those from Table 4.24, suggest that, while comparatively high numbers of UK Manufacturing employers provide training for their employees, the amount of training (CVT) provided for each employee might be rather limited. Unfortunately there is no obvious way to explore this hypothesis.

4.2.4 Barriers to Training

Given the importance of job-related training in raising skill levels and so contributions to organisational performance, it is important to understand why more is not carried out. Table 4.30 shows the breakdown of reasons why Manufacturing employers do not train, or do not train more.

Table 4.30: Barriers to training within Manufacturing, by nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
All our staff are fully proficient / no need for training	38,109	68	34,028	69	*	*	1,057	56	1,275	69
No money available for training	6,378	11	5,296	11	*	*	249	13	213	12
Training is not considered to be a priority for the establishment	4,935	9	4,492	9	*	*	341	18	101	5
No training available in relevant subject area	3,690	7	3,362	7	*	*	112	6	109	6
Managers have lacked the time to organise training	1,202	2	866	2	*	*	279	15	57	3
Learn by experience/Learn as you go	1,339	2	1,226	2	*	*	21	1	83	4
External courses are too expensive	796	1	697	1	*	*	13	1	33	2
Small firm/training not needed due to size of establishment	751	1	683	1	*	*	22	1	46	2
Employees are too busy to undertake training and development	795	1	676	1	*	*	42	2	78	4
Employees are too busy to give training	550	1	507	1	*	*	19	1	14	1
Business not operating long enough/New business (inc. takeover transition)	382	1	382	1	*	*	0	0	0	0
Trained staff will be poached by other employers	152	**	131	**	*	*	0	0	20	1
I Don't know what provision is available locally	185	**	178	**	*	*	6	**	0	0
The start dates or times of the courses are inconvenient	498	1	491	1	*	*	6	**	0	0
The courses interested in are not available locally	509	1	492	1	*	*	6	**	11	1
No new staff (only train new staff)	212	**	212	**	*	*	0	0	0	0
The quality of the courses or providers locally is not satisfactory	134	**	129	**	*	*	5	**	0	0
Difficult to get information about the courses available locally	54	**	47	**	*	*	6	**	0	0
Other	1,720	3	1,524	3	*	*	25	1	8	*
No particular reason	1,502	3	1,435	3	*	*	19	1	47	3
Don't know	283	1	207	**	*	*	29	2	38	2
Weighted base	55,685		49,229		*		1,900		1,845	
Unweighted base	2,323		2,061		*		111		133	

*Source: UK Commission's Employer Skills Survey (Davies et al, 2012). Base: All establishments that do not provide training. *Data suppressed due to small base. **Denotes a figures of greater than 0% but less than 0.5%. NB: Column percentages sume to more than 100 since multiple responses were allowed.*

The main reasons cited by employers, in responses to the UK ESS2011, for not providing training, are well known:

- lack of need (staff competence adequate);
- lack of money;
- not high enough priority; and
- lack of availability of training needed.

These reasons are also the 'top of the list' for UK employers generally, though for the economy as a whole, slightly smaller percentages of responding employers than in Manufacturing consider there is no need, lack of money or lack of availability. Although there is insufficient robust data on this indicator from Scottish Manufacturers, those in Wales and Northern Ireland broadly follow the pattern in England, though a greater of Welsh employers cite lack of money and training not being a high enough priority.

4.2.5 Remuneration

The most direct valuation of workers' skills within a sector or occupation is provided by average remuneration levels. The Annual Survey of Hours and Earnings (ASHE) provides, on an annual basis, a wide range of accurate data on working time and remuneration.

Table 4.31: Average hourly wage by sector (£) (UK)

	2008	2009	2010
	£	£	£
Agriculture, forestry and fishing	10.42	11.18	10.38
Energy production and utilities	15.93	16.41	16.62
Manufacturing	**13.86**	**14.28**	**14.37**
Construction, building services engineering and planning	14.66	15.29	15.39
Wholesale and retail trade	11.00	11.27	11.36
Transportation and storage	12.44	13.16	13.21
Hospitality, tourism and sport	9.14	9.35	9.52
Information and communication technologies	20.05	20.26	20.40
Creative media and entertainment	17.14	17.29	17.50
Financial, insurance & other professional services	21.06	21.45	21.99
Real estate and facilities management	11.36	11.64	11.71
Government services	14.40	14.87	15.62
Education	14.67	15.39	15.71
Health	14.97	15.79	16.45
Care	10.21	10.30	10.49
All economy	13.94	14.39	14.60

Source: Annual Survey of Hours and Earnings, 2010 (ONS)

Table 4.31 shows that, over all occupations, wages for those working in Manufacturing are close to the average across the economy as a whole, though increases over recent years appear to have been a little lower.

As with most other indicators, there is considerable variation of average wage rates between the different sub-sectors that make up Manufacturing as a whole.

Table 4.32: Average hourly wage (all occupations) by sub-sector, UK, 2010 (£) (ranked)

SIC	Manufacturing Sub-Sector	Wage
19	Manufacture of coke and refined petroleum products	28.2
72	Scientific research and development	21.5
12	Manufacture of tobacco products	21.4
21	Manufacture of basic pharmaceutical products	18.4
30	Manufacture of other transport equipment	17.8
26	Manufacture of computer, electronic and optical products	16.2
33	Repair and installation of machinery and equipment	16.0
11	Manufacture of beverages	15.7
20	Manufacture of chemicals and chemical products	15.5
24	Manufacture of basic metals	15.5
29	Manufacture of motor vehicles	15.5
28	Manufacture of machinery and equipment nec	14.3
17	Manufacture of paper and paper products	13.7
32	Other manufacture	13.7
27	Manufacture of electrical equipment	13.2
23	Manufacture of other non-metallic products	13.1
18	Printing and reproduction of recorded media	13.0
25	Manufacture of fabricated metal products	12.6
22	Manufacture of rubber and plastic products	12.3
10	Manufacture of food products	11.8
15	Manufacture of leather and related good	11.7
31	Manufacture of furniture	11.5
16	Manufacture of wood and products	11.1
13	Manufacture of textiles	10.9
14	Manufacture of wearing apparel	10.4

Source: Annual Survey of Hours and Earnings, 2010 (ONS)

As shown within Table 4.32, within Manufacturing, the Annual hourly wage ranges across the 25 sub-sectors from 28 per cent below the Manufacturing £14.37 mean to 96 per cent above it. The sub-sectors benefitting from comparatively high mean wages were, in ranked order:

- Coke and Refined Petroleum
- Scientific Research & Development
- Tobacco Product
- Basic Pharmaceutical Product
- Other Transport Equipment (including Aerospace and Marine Engineering)
- Sub-sectors with comparatively low mean wages, were, again in descending order:
- Furniture

- Wood and Wooden Products
- Textiles
- Wearing apparel.

4.3 Skills and sectoral performance

The contribution of an organisation's staff to its performance is generally a major element of the success, or otherwise, of the operation. The skills of each member of the team are important to their contribution to the company's performance, but the nature of this contribution (the staff member's 'marginal product' in economic terms) depends on a number of elements, only part of which could be viewed as the technical knowledge understanding and expertise of primary focus in most skills assessments – probably more precisely the staff member's *competence* in their specific role. Other elements are:

precise role requirement;

personal commitment; and

non-technical skills.

The precise role requirement depends on various things, generally in particular on the company's product/market strategy and work organisation.

Since Manufacturing businesses depend centrally on expertise in the technology of the product and of its production, technical competence is probably more strongly demanded in this sector than some others (hence the strong focus on STEM expertise). Product market strategies and work organisation have major influences within enterprises on the mapping of the derived demand for skills.

A review of the product market strategy and skills link was provided by Mason in 2011 (UKCES, 2011a), which summarised the essence as follows:

> The relationship between the product market strategies adopted by employers and the skills they require is important because of indications of a strong interrelationship, in that:
>
> - the level of skills available to employers may have a bearing on the markets in which enterprises can operate and this is likely to impact on their productivity, performance and their future business aspirations;
> - product market strategies may influence the skill levels used in the workplace.

This report provides evidence that establishments pursuing high value-added product market strategies are more likely to have higher workforce skill levels than their counterparts with medium or lower value added product market strategies. In addition, these establishments are more likely to be actively looking to update the skill levels of their staff and less likely to have skill gaps, perhaps as a result of their pre-emptive action to address problems before they arise. The relationships identified are interdependent.

Mason's multivariate analysis includes estimates for a number of industries within the private sector, including seven Manufacturing sub-sectors. The extent of mismatch found between sector-specific product strategy (PS) positioning and cross-sector skill levels, analysed by sector (for private sector establishments with five or more employees, from population weighted NESS 09 data) are of particular interest. These results, which provide an indication of lower correlation between the indexes developed for product strategy and skills levels suggest that the correlation is generally greater for Manufacturing than for other sectors (see Table 4.33).

Table 4.33: Extent of mismatch of Product Strategy positioning and cross-sector skills levels

Manufacturing sector analysed	Product strategy Upper Quartile, Skills below median	Product strategy Third Quartile, Skills below median	Product strategy below median, Skills Upper quartile	Product strategy below median, Skills Third quartile
	Percentage of establishments in Sector			
Food, drink and tobacco	12	14	7	10
Printing, publishing, recorded media	7	9	11	17
Chemicals, rubber and plastics	10	14	7	14
Fabricated metal products	12	11	4	14
Electronic and electronic engineering	5	6	14	14
Mechanical Engineering, Vehicles and other engineering	9	10	5	14
Other manufacturing industries	12	14	6	13
Average over all sectors	**10**	**11**	**13**	**13**

Source: UKCES (2011a)

Where the 'mismatch percentage' is lower than the all-sector average, this shows a stronger than average correlation between product strategy (specification) level and skills level – i.e. evidence that these two factors are inter-dependent.

As can be seen, with limited exceptions, the Manufacturing sectors shown have fewer than average mismatches, supporting the link between skill levels and product specification levels.

The Product Strategy index used for the analysis is based on NESS09 response data relating to the Company's products:

- having limited price dependence;
- being of premium quality (specification); and the company being committed to
- innovation leadership.

These three elements are, of course, of central importance to a Manufacturing company's market positioning strategy, and each is influential in the identification of the skill requirements perceived necessary to achieve the desired positioning.

A significant additional relationship between labour costs and business realities can also be observed in the realities of graduate first destinations. While Manufacturing employers continue to seek STEM skills within market entrants, so do employers from other sectors (concerns have been expressed in recent years about 'more engineering graduates going into financial services than into manufacturing'). The 'market' for such talent transcends different sectoral financial realities, so that, while it is generally plausible to assume that those seeking the best talent should – in the absence of enough good applicants - raise their salary offers, employers in sectors with lower profit margins are less able to raise their remuneration offers to the most talented graduates than employers where pressure on margins is less.

5 Extent of skills mismatch

Summary

This Section provides a wide range of quantitative evidence relating to the state of the labour markets relevant to Manufacturing: while the prevailing economic conditions mean skill shortages are generally considerably lower than in a period of strong growth, and mis-match is not currently too serious, there remain one or two areas of concern.

Overall the analysis reveals that employers in Manufacturing are less likely to report that they have vacancies currently, but where they do so they are more likely to result in hard-to-fill and skill-shortage vacancies than in the economy generally.

Where skill shortage vacancies exist these are more likely to relate to technical and job specific skill requirements than in the economy generally. The data also reveals that the incidence of skill gaps in the sector is relatively high.

In general, where employers face skill-shortage vacancies or skill gaps employer recognise that these are having a negative impact on their businesses – such as lost business and delays in meeting customer demands. The response of employers when faced with skill deficiencies is to engage in more training. Yet, as indicated in the previous chapter, the volume of training undertaken in the sector is slightly lower than that recorded in the economy as a whole.

Labour retention is regarded as no more of a problem than in the economy generally. In other words, employers are able to retain the skills extant in their workforce. This may account for the relatively low level of recruitment of young people in the sector compared with the economy overall. In a sector with a relatively old workforce, the relatively low incidence of recruitment of young people may be storing up problems for the future.

Fewer Manufacturing employers than those from other sectors report concerns that their workforce is ‘over-skilled’ or ‘over-qualified’ (although still nearly a half do so).

There is little evidence of direct impact of skill mismatches on wage levels, although reported skill shortages in some engineering occupations have led to the inclusion of certain very specific roles on the official Home Office shortage list.

5.1 Extent and nature of vacancies

An indicator of the state of labour markets is the scale of vacancies reported by employers. This provides an indication of their current demand for skills and provides the basis for exploring the extent to which that demand is met or results in hard-to-fill and skill-shortage related vacancies.

5.1.1 Level of Vacancies

The Employer Skills Surveys ask questions about three kinds of vacancies: All vacancies, Hard-to-Fill (HTF) Vacancies (a subset), and Skill Shortage vacancies (SSVs - a subset of HTF Vacancies). Some vacancies will be hard-to-fill, not because there is any significant lack of supply of these skills, but because those with such skills are not applying – for various possible reasons (perceived unattractiveness of the offer, whether in remuneration terms or to do with the location of the employment, etc.).

Table 5.1: Manufacturing Employers reporting (any) vacancies by occupational group

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Managers	956	1	862	1	45	**	21	**	28	1
Professionals	2,132	2	1,821	2	178	2	65	1	68	2
Associate professionals	3,624	3	3,231	3	237	3	109	2	47	1
Administrative/clerical staff	2,791	2	2,359	2	273	3	80	1	78	2
Skilled trades occupations	5,622	4	4,722	4	267	3	523	10	110	3
Caring, leisure and other services staff	64	**	53	**	0	0	10	*	0	0
Sales and customer services staff	1,621	1	1,387	1	94	1	125	2	13	**
Machine operatives	3,710	3	3,140	3	363	4	119	2	88	2
Elementary staff	1,421	1	1,264	1	66	1	74	1	17	**
Unclassified staff	298	**	212	**	51	1	22	**	13	**
Weighted base	130,709		112,176		9,355		5,376		3,802	
Unweighted base	7,776		6,774		182		470		350	

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All establishments in sector.
***Denotes a figures of greater than 0% but less than 0.5%.*

The percentages of employers with any vacancies in Table 5.1 are comparatively low, although in the case of Associate Professionals, Skilled Trades and Machine Operatives higher than the averages for the economy as a whole. These rather low figures reflect the current comparatively stagnant state of the economy generally.

Incidence and Type of vacancies

Table 5.2 shows the estimated numbers of a) Vacancies, b) HTF, and c) SSV by sector within the United Kingdom.

Table 5.2: Profile of vacancies in the sector

	Volume			%				
	Vacancies	HTF vacancies	SSV (prompted and unprompted)	Vacancies as a % employment	HTF vacancies as a % all vacancies	SSV as a % vacancies	*Weighted base*	*Unweighted base*
Agriculture, Forestry & Fishing	14,641	5,785	4,238	3	40	29	466,870	19,506
Energy Production & Utilities	9,343	1,590	1,236	3	17	13	333,050	47,228
Manufacturing	40,252	11,834	9,711	2	29	24	2,541,188	291,593
Construction, Building Services Engineering	47,241	19,103	12,394	2	40	26	2,235,270	150,111
Wholesale & Retail Trade	95,390	17,441	12,619	2	18	13	4,674,684	514,820
Transportation and Storage	25,734	4,739	3,182	2	18	12	1,320,126	114,658
Hospitality, Tourism and Sport	73,886	18,245	11,179	3	25	15	2,313,487	258,524
Information and Communication	29,361	5,449	4,937	5	19	17	614,641	53,681
Creative Media & Entertainment	37,885	6,824	5,502	3	18	15	1,086,978	87,953
Financial, Insurance & other Professional	58,847	11,732	10,623	3	20	18	2,052,039	112,945
Real Estate & Facilities Management	31,155	5,773	4,252	3	19	14	1,183,601	91,204
Government Services	35,917	9,330	5,938	2	26	17	1,780,058	223,796
Education	34,684	4,984	3,729	1	14	11	2,538,545	387,221
Health	27,811	5,281	3,330	1	19	12	2,004,436	219,765
Care	37,494	5,924	3,335	2	16	9	1,504,729	157,681
Not Within Scope	36,266	9,533	7,248	4	26	20	897,422	86,007
Total	635,907	143,564	103,453	2	23	16	27,547,123	2,816,693

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Bases vary:
Vacancies as a % of employment based on all employment.
Hard-to-fill vacancies as a % of vacancies based on all vacancies.
SSVs as a % of vacancies based on all vacancies.

As compared with the economy as a whole, vacancies as a percentage of employment was lower in Manufacturing than in the economy as a whole, but HTFs and SSVs constituted higher proportions of all vacancies than the average across the economy. So where Manufacturing has vacancies these are more difficult to fill than in the economy as whole.

Table 5.3 shows the breakdown of the three types of vacancies experienced, by sector, across the home nations.

Table 5.3: Profile of vacancies by sector and nation

	Vacancies as a % employment				HTF vacancies as a % vacancies				SSV as a % vacancies			
	England	Scotland	Wales	NI	England	Scotland	Wales	NI	England	Scotland	Wales	NI
Agriculture, forestry & fishing	3	†4	2	0	36	†45	87	0	28	†22	85	0
Energy production & utilities	2	7	4	1	11	22	32	49	9	17	22	25
Manufacturing	2	1	2	2	28	39	30	33	23	36	27	29
Construction, Building Services Engineering and Planning	2	2	2	1	42	29	41	27	26	24	34	16
Wholesale & retail trade	2	2	2	2	18	17	23	32	13	10	12	18
Transportation and Storage	2	2	3	1	17	6	48	60	12	3	29	11
Hospitality, Tourism and Sport	3	3	4	2	23	25	56	29	13	17	41	23
Information and Communication Technologies	5	†5	3	3	18	†35	19	13	16	†28	17	13
Creative media & entertainment	3	†2	5	11	20	†1	18	7	16	†0	16	4
Financial, Insurance & other Professional Services	3	2	2	11	19	7	12	44	17	6	12	44
Real estate & facilities management	3	†1	2	1	18	†29	17	0	14	†22	12	0
Government services	2	1	2	2	25	10	46	43	17	5	4	36
Education	1	2	1	1	16	6	6	16	12	2	5	11
Health	2	1	1	1	19	19	17	27	12	9	13	27
Care	3	1	3	3	16	19	20	13	9	16	13	3
Total	2	2	2	2	22	20	36	44	16	14	22	22
Weighted base	*23,198,476*	*2,381,601*	*1,182,314*	*784,732*	*545,064*	*45,749*	*25,542*	*19,552*	*545,064*	*45,749*	*25,542*	*19,552*
Unweighted base	*2,345,213*	*201,868*	*178,922*	*90,690*	*43,960*	*3,186*	*2,999*	*1,759*	*43,960*	*3,186*	*2,999*	*1,759*

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Bases vary:
Vacancies as a % of employment based on all employment.
Hard-to-fill vacancies as a % of vacancies based on all vacancies.
SSVs as a % of vacancies based on all vacancies.
† Treat figures with caution due to small establishment base size of 50-99 in Scotland.

As can be seen, in Wales, Northern Ireland, and (particularly) Scotland, Manufacturing HTF vacancies represent higher share of all vacancies than in England, as do SSVs.

Although information about sectors on different types of vacancies is interesting, it does shed much light on which kinds of skills are difficult to recruit.

Table 5.4 shows the numbers of HTF and SSVs by occupation within Manufacturing. As can be seen, for Manufacturing, the greatest numbers of vacancies, and SSVs, are to be found in Skilled Trades. While vacancy levels are also high for Associate Professionals and Machine Operatives, there is less of a problem in filling these vacancies.

Table 5.4: Profile of vacancies by occupational group within Manufacturing

	Volume								
	Vacancies	HTF vacancies	SSV	HTF vacancies as a % vacancies	SSV as a % vacancies	*Weighted base (number of vacancies)*	*Unweighted base (number of vacancies)*	*Weighted base (establishments reporting vacancies)*	*Unweighted base (establishments reporting vacancies)*
Managers	1,214	376	321	31	26	1,214	126	956	95
Professionals	4,870	1,614	1,508	33	31	4,870	569	2,132	241
Associate professionals	7,117	1,940	1,645	27	23	7,117	796	3,624	376
Administrative/clerical staff	3,345	961	402	29	12	3,345	298	2,791	214
Skilled trades occupations	9,602	4,222	3,795	44	40	9,602	938	5,622	437
Caring, leisure and other services staff	*	*	*	*	*	*	*	*	*
Sales and customer services staff	2,342	619	529	26	23	2,342	193	1,621	115
Machine operatives	7,939	1,663	1,145	21	14	7,939	843	3,710	302
Elementary staff	2,485	315	265	13	11	2,485	254	1,421	130
Unclassified staff	786	119	101	15	13	786	89	298	34
Total	39,774	11,834	9,711	30	24	39,774	4,111	22,237	1,948

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All vacancies
Data suppressed due to small size of unweighted establishment base.

Table 5.5 shows that Manufacturing accounts for 6 per cent of all vacancies in the UK (compared with 10 per cent of all employment) , though with higher percentages of HTF Skill SSVs. Overall, these estimates are comparatively low, and reflect the general state of UK labour markets, reflection the sluggish economic conditions.

Table 5.5: Employers with vacancies, hard-to-fill vacancies and skills shortage vacancies, by sector

	Vacancies		HTF vacancies		SSV			
	Number	%	Number	%	Number	%	*Weighted base*	*Unweighted base*
Agriculture, Forestry & Fishing	8,285	3	4,141	5	2,660	4	110,220	1,547
Energy Production & Utilities	1,783	1	635	1	532	1	12,610	1,614
Manufacturing	**17,423**	**6**	**7,684**	**8**	**6,040**	**9**	**130,709**	**7,776**
Construction, Building Services Engineering and Planning	22,972	8	11,596	13	9,607	14	306,403	8,961
Wholesale & Retail Trade	50,681	18	13,499	15	9,778	14	470,200	16,150
Transportation and Storage	13,036	5	4,127	5	2,662	4	122,058	4,735
Hospitality, Tourism and Sport	32,674	12	11,656	13	7,435	11	220,055	11,318
Information and Communication Technologies	9,146	3	3,596	4	3,386	5	72,281	2,510
Creative Media & Entertainment	16,182	6	5,506	6	4,746	7	143,772	3,762
Financial, Insurance & other Professional Services	21,794	8	5,310	6	4,556	7	170,887	5,343
Real Estate & Facilities Management	17,403	6	4,651	5	3,956	6	166,486	3,424
Government Services	8,185	3	1,877	2	1,204	2	54,687	2,605
Education	14,466	5	3,220	4	2,386	4	64,540	5,439
Health	9,577	3	2,820	3	1,842	3	52,370	3,398
Care	15,589	6	3,956	4	2,054	3	87,899	4,763
Not in scope	15,583	6	6,497	7	5,121	8	114,744	4,227
Total	274,779	100	90,771	100	67,965	100	2,299,921	87,572

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments.

5.1.2 Nature of Vacancies

As compared with the economy as a whole, Manufacturing employers report (Table 5.6) greater incidence of a low numbers of applicant with the required skills (53 per cent compared with. 40 per cent for whole economy), and lower incidence of low number of applicants with the required attitude/motivation (13 per cent compared with 18 per cent for all sectors), and poor terms and conditions (10 per cent compared with 13 per cent). Otherwise the numbers reported are generally similar (sample sizes result in all Scottish and Northern Ireland data being suppressed).

Table 5.6: Causes of hard-to-fill vacancies within Manufacturing, by nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Low number of applicants with the required skills	4,065	53	3,244	51	*	*	323	73	*	*
Lack of work experience the company demands	1,604	21	1,275	20	*	*	46	10	*	*
Not enough people interested in doing this type of job	1,470	19	1,195	19	*	*	49	11	*	*
Low number of applicants with the required attitude, mo	990	13	877	14	*	*	72	16	*	*
Poor terms and conditions (e.g. pay) offered for post	778	10	646	10	*	*	95	21	*	*
Low number of applicants generally	857	11	766	12	*	*	23	5	*	*
Lack of qualifications the company demands	806	10	564	9	*	*	126	28	*	*
Job entails shift work/unsociable hours	166	2	137	2	*	*	22	5	*	*
Remote location/poor public transport	403	5	333	5	*	*	21	5	*	*
Too much competition from other employers	491	6	473	7	*	*	5	1	*	*
Poor career progression / lack of prospects	165	2	165	3	*	*	0	0	*	*
Not full-time/permanent work	28	**	28	**	*	*	0	0	*	*
Low number of suitable applicants inc. Age of applicants	79	1	74	1	*	*	0	0	*	*
Poor recruitment channels/mechanisms (inc. lack/cost o	112	1	112	2	*	*	0	0	*	*
Seasonal work	13	**	13	**	*	*	0	0	*	*
Benefits trap	20	**	20	**	*	*	0	0	*	*
Lack of funding for the position	48	1	48	1	*	*	0	0	*	*
Difficulty with work permits/immigration issues for non-	7	**	7	**	*	*	0	0	*	*
Other	145	2	105	2	*	*	35	8	*	*
No particular reason	5	**	5	**	*	*	0	0	*	*
Don't know	181	2	175	3	*	*	6	1	*	*
Weighted base	7,684		6,404		*		445		*	
Unweighted base	583		505		*		31		*	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments with hard-to-fill vacancies
**Data suppressed as unweighted base < 25 (<50 Scotland)*
*** Denotes a figures of greater than 0% but less than 0.5%*
NB: Column percentages sum to more than 100 since multiple responses were allowed.

The consequences of HTFl vacancies on the organisation and its business vary: Table 5.7 shows how Manufacturing employers felt such vacancies were adversely affecting their business.

Table 5.7: Impact of having hard-to-fill vacancies in Manufacturing, by nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Increase workload for other staff	6,317	82	5,292	83	*	*	*	*	*	*
Have difficulties meeting customer services objectives	3,820	50	3,046	48	*	*	*	*	*	*
Lose business or orders to competitors	2,912	38	2,349	37	*	*	*	*	*	*
Delay developing new products or services	3,764	49	3,217	50	*	*	*	*	*	*
Experience increased operating costs	3,045	40	2,546	40	*	*	*	*	*	*
Have difficulties meeting quality standards	2,097	27	1,705	27	*	*	*	*	*	*
Have difficulties introducing new working practices	2,528	33	2,053	32	*	*	*	*	*	*
Outsource work	2,754	36	2,052	32	*	*	*	*	*	*
Withdraw from offering certain products or services alto	1,598	21	1,306	20	*	*	*	*	*	*
Have difficulties introducing technological change	1,811	24	1,201	19	*	*	*	*	*	*
None	444	6	419	7	*	*	*	*	*	*
Don't know	24	**	24	**	*	*	*	*	*	*
Weighted base	7,684		6,404		*		*		*	
Unweighted base	583		505		*		*		*	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments with hard-to-fill vacancies
**Data suppressed as unweighted base < 25 (<50 Scotland)*
*** Denotes a figures of greater than 0% but less than 0.5%*
NB: Column percentages sum to more than 100 since multiple responses were allowed.

In terms of comparisons with the situation across the economy as a whole, greater proportions of UK Manufacturing employers report difficulties meeting customer services objectives as a result of HTFVs as compared with employers generally (50 per cent compared with 45 per cent in the economy as a whole), delays in developing new products or services (49 per cent compared with 41 per cent), outsourcing work (36 per cent compared with 26 per cent). Conversely comparatively fewer UK Manufacturing employers report loss of business or orders to competitors (38 per cent compared with 42 per cent for the economy as a whole), have difficulty meeting quality standards (27 per cent compared with 34 per cent for all employers), and withdrawing from offering certain products/services altogether (21 per cent compared with 26 per cent generally).

Action in response to HTFVs

Where vacancies cannot be filled, employers have to respond by taking steps to deal with the problem. Table 5.8 shows how Manufacturing employers described their responses, across the four nations.

Table 5.8: Measures taken by employers to overcome hard-to-fill vacancies in Manufacturing, by nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Increasing advertising / recruitment spend	2,345	31	1,902	30	*	*	131	29	*	*
Using NEW recruitment methods or channels	2,172	28	1,922	30	*	*	50	11	*	*
Redefining existing jobs	1,073	14	883	14	*	*	141	32	*	*
Increasing the training given to your existing workforce	729	9	639	10	*	*	12	3	*	*
Increasing / expanding trainee programmes	904	12	775	12	*	*	61	14	*	*
Being prepared to offer training to less well qualified rec	509	7	456	7	*	*	19	4	*	*
Bringing in contractors to do the work, or contracting it o	351	5	314	5	*	*	17	4	*	*
Increasing salaries	244	3	229	4	*	*	8	2	*	*
Recruiting workers who are non-UK nationals	182	2	154	2	*	*	14	3	*	*
Making the job more attractive e.g. recruitment incentiv	79	1	70	1	*	*	0	0	*	*
Other	174	2	152	2	*	*	22	5	*	*
Nothing	1,353	18	1,129	18	*	*	52	12	*	*
Don't know	237	3	237	4	*	*	0	0	*	*
Weighted base	7,684		6,404		*		445		*	
Unweighted base	583		505		*		31		*	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments with hard-to-fill vacancies
**Data suppressed as unweighted base < 25 (<50 Scotland)*
NB: Column percentages sum to more than 100 since multiple responses were allowed

In comparison with the response data for the whole economy, responses from Manufacturing employers show less effort than employers as a whole to increase advertising/recruitment spend (31 per cent of respondents compared with 39 per cent in the economy overall), but greater activity in increasing training given to the existing workforce (9 per cent compared with 7 per cent), increasing/expanding trainee programmes (12 per cent compared with 6 per cent), and being prepared to offer training to less well qualified recruits (seven per cent compared with 5 per cent). Variations in use of these measures between Manufacturers in England, Scotland and Wales appear limited.

5.1.3 Staff Retention

While turnover of staff is always a reality for employers to some degree, the retention of good employees is a major element of maintaining an adequate skills base. Labour market 'churn' is dependent on supply and demand conditions, with increases in movements when skills demand is comparatively strong, and reductions when supply exceeds demand, as in time of low, or no, economic growth. Table 5.9 shows the distribution of retention problems reported by respondents to the UK ESS 11.

Table 5.9: Employers with retention problems by sector and nation

	UK (excl. Scotland)		England		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
Agriculture, Forestry & Fishing	4,954	5	4,236	5	360	3	358	5
Energy Production & Utilities	555	5	484	5	62	8	9	2
Manufacturing	6,493	5	5,883	5	433	8	177	5
Construction, Building Services Engineering and Planning	10,569	4	9,710	4	722	5	138	1
Wholesale & Retail Trade	18,192	4	16,682	4	891	4	619	4
Transportation and Storage	5,676	5	5,240	5	321	8	115	5
Hospitality, Tourism and Sport	18,345	9	16,670	9	1,126	10	548	9
Information and Communication Technologies	3,084	4	2,948	4	57	3	79	7
Creative Media & Entertainment	5,303	4	4,891	4	306	7	106	5
Financial, Insurance & other Professional Services	6,271	4	5,876	4	339	6	55	2
Real Estate & Facilities Management	5,826	4	5,649	4	139	5	38	2
Government Services	2,496	5	2,200	5	208	8	88	4
Education	2,925	5	2,493	5	267	8	165	5
Health	3,297	7	2,961	7	249	9	87	6
Care	5,134	6	4,615	6	327	7	191	6
Not within scope	6,810	6	6,476	6	247	6	87	3
Whole Economy	105,929	5	97,014	5	6,054	6	2,860	4
Weighted base	2,124,807		1,960,298		98,952		65,558	
Unweighted base	85,069		75,053		6,012		4,004	

Source: UK Commission's Employer Skills Survey 2011 (Davies et al, 2012).
Base: All establishments in England, NI, Wales (question not asked in Scotland)

The scale of reported staff retention problems in Manufacturing is comparatively small, reflecting a generally subdued labour market, and does not appear to be significantly different from those in the economy as a whole, except in Wales and Northern Ireland, where response fractions are a little higher. The main reasons cited by Manufacturing employers for retention problems are shown in Table 5.10.

Table 5.10: Reasons for retention problems in Manufacturing

	UK (excl. Scotland)		England		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
Not enough people interested in doing this type of work	4,087	63	3,634	62	351	81	*	*
Long/unsocial hours	1,148	18	877	15	219	51	*	*
Wages offered are lower than those offered by other firms	1,728	27	1,623	28	59	14	*	*
Staff don't want long term commitment	1,394	21	1,311	22	62	14	*	*
Lack of career progression	2,002	31	1,826	31	118	27	*	*
Too much competition from other employers	1,976	30	1,861	32	54	12	*	*
Impact of the benefits trap	1,494	23	1,262	21	199	46	*	*
Unattractive conditions of employment	1,236	19	1,073	18	120	28	*	*
Geographic location of the firm	1,430	22	1,125	19	248	57	*	*
Difficult to find experienced/skilled staff	1,284	20	1,054	18	196	45	*	*
Nature of work is too difficult/mentally and physically tiring	107	2	57	1	36	8	*	*
Other	380	6	376	6	4	1	*	*
None	7	**	7	**	0	0	*	*
Don't know	0	0	0	0	0	0	*	*
Weighted base	6,493		5,883		433		*	
Unweighted base	482		429		34		*	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012).
Base: All establishments in England, NI, Wales that find it difficult to retain staff (question not asked in Scotland).
**Data suppressed as unweighted base < 25.*
***Denotes a figures of greater than 0% but less than 0.5%.*
NB: Column percentages sum to more than 100 since multiple responses were allowed

In comparison with employers as a whole, Manufacturing employers reported, as causes for retention problems, greater impact of:

- Not enough people interested in the type of work (63 per cent compared with 51 per cent for the economy as a whole), and
- Lack of career progression (31 per cent compared with 30 per cent).

But reported less impact of:

- Long/Unsocial hours (18 per cent compared with 33 per cent for employers as a whole);
- Lower wages (27 per cent compared with 33 per cent);
- Staff don't want long term commitment (11 per cent compared with 32 per cent);
- Impact of the benefits trap (23 per cent compared with 27 per cent); and
- Unattractive employment conditions (19 per cent compared with 25 per cent).

Reasons cited by Welsh Manufacturing employers stressed, more than did English employers:

- not enough people interested in the type of work
- long/unsocial hours
- impacts of the benefits trap
- unattractive conditions of employment
- geographic location of the firm
- difficult to find experienced/skilled staff.

Employers' response: measures to overcome retention problems

Table 5.11: Measures taken by employers to overcome retention problems in Manufacturing

	UK (excl. Scotland)		England		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
Introduced further training/development opportunities	1,718	26	1,501	26	143	33	*	*
Offered higher pay or more incentives than normal	1,347	21	1,252	21	33	8	*	*
Altered/improved recruitment methods	1,081	17	867	15	207	48	*	*
Introduced flexible working hours	396	6	392	7	4	1	*	*
Changed the job specification by giving some of the tasks to other	285	4	262	4	6	1	*	*
Introduced job enrichment	504	8	489	8	0	0	*	*
Improved career progression	473	7	460	8	6	1	*	*
Changed working environment generally	180	3	150	3	30	7	*	*
Changed the job specification by automating some of the tasks	162	2	162	3	0	0	*	*
Provided assistance with travel	258	4	258	4	0	0	*	*
Used agency staff /sub contractors	176	3	170	3	0	0	*	*
Provided assistance with childcare	99	2	99	2	0	0	*	*
Other	586	9	564	10	22	5	*	*
Not taken any measures to overcome retention difficulties	1,385	21	1,295	22	51	12	*	*
Don't know	177	3	177	3	0	0	*	*
Weighted base	6,493		5,883		433		*	
Unweighted base	482		429		34		*	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012).
Base: All establishments in England, NI, Wales that find it difficult to retain staff (question not asked in Scotland).
**Data suppressed as unweighted base < 25.*
NB: Column percentages sum to more than 100 since multiple responses were allowed.

The responses from Manufacturing employers (Table 5.11) seem largely similar (in terms of the proportion of respondents confirming the use of each measure) to those for employers as a whole, with two exceptions: Manufacturing employers appear to be only half as interested in introducing flexible working hours (6 per cent compared with 12 per cent in the economy as whole) or changing the job specification (four per cent compared with 9 per cent) as other employers. Manufacturers in Wales seem significantly more interested in introducing further training/development (33 per cent compared with 26 per cent) and trying altered/improved recruitment methods (48 per cent compared with 17 per cent) than their English counterparts, though considerably less inclined to consider responding with higher pay or more incentives (8 per cent compared with 21 per cent).

As with HTF vacancies, retention difficulties pose problems for a business. Table 5.12 shows the incidence of the different types of problem, across the UK and England, Wales and Northern Ireland[31].

Table 5.12: Impact of retention difficulties in Manufacturing

	UK (excl. Scotland)		England		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%
Loss of business to competitors	3,068	47	2,736	47	278	64	*	*
Restrictions to business development activities	3,252	50	2,881	49	306	71	*	*
Increased running costs (for example use of excess overtime, subcontracting or use of temporary staff etc)	3,383	52	3,100	53	158	36	*	*
More strain on management of existing staff in covering the shortage	5,324	82	4,741	81	417	96	*	*
An increase in recruitment costs due to more advertising or use of a recruitment agency	2,869	44	2,684	46	112	26	*	*
Difficulties with quality	3,055	47	2,792	47	195	45	*	*
Difficulties with customer service	2,312	36	2,095	36	167	39	*	*
Loss of efficiency or increased wastage	3,197	49	3,009	51	128	30	*	*
Difficulties with accommodating technological change	1,885	29	1,720	29	141	32	*	*
Difficulties with introducing new working practices	2,260	35	2,080	35	135	31	*	*
Something else	317	5	189	3	121	28	*	*
Not affected the business	225	3	225	4	0	0	*	*
Don't know	47	1	47	1	0	0	*	*
Weighted base	6,493		5,883		433		*	
Unweighted base	482		429		34		*	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012).
Base: All establishments in England, NI, Wales that find it difficult to retain staff (question not asked in Scotland).
**Data suppressed as unweighted base < 25.*
NB: Column percentages sum to more than 100 since multiple responses were allowed.

[31] No data available for Scotland

Manufacturing employers reported concerns with a range of negative impacts of staff retention problems, as did employers from all sectors. The main differences of emphasis between the concerns reported by Manufacturers and those of all other employers were as follows:

A greater proportion of Manufacturing employers reported concerns with:

- loss of business to competitors (47 per cent of Manufacturing respondents compared with 38 per cent in the economy as whole)
- limitations to business development (50 per cent compared with 43 per cent overall)
- increased running costs (52 per cent compared with 47 per cent overall)
- more strain on management (82 per cent compared with 79 per cent)
- difficulties introducing new working practices (35 per cent compared with 29 per cent)
- difficulties accommodating technological change (29 per cent compared with 20 per cent overall).

A lower proportion of Manufacturing employers reported concerns with:

- difficulties with Quality (47 per cent compared with 50 per cent overall).

5.1.4 Recruitment – channels and taking on young people

Recruitment is a key element within skills management. Skills gaps within an organisation can be addressed either by investment in current staff by raising their skill levels in the required areas, or by 'buying in' skills that are lacking. Very often employers will view the latter as the most cost-effective solution, although the time and cost trade-offs between the two are not always clear if assessed in more detail. In addition, recruitment activity is needed where business activity is increasing. Employers use a range of recruitment approaches, and there is some evidence (Keep and James, 2010): that some recruitment and selection is not always as cost-effective as desired.

When a company needs additional human resource with a particular set of skills, and decides to bring in one or more additional people, it has, in principle a choice between three options:

- 'post a vacancy' specifying the skill requirements,
- commission an employment intermediary to find someone with a skill-set as close as possible to the requirements, and

- train up an existing staff member whose existing skills may not be too far off, and recruit someone to take over the role previous carried out by the existing employee.

Each of these three options involves uncertainty, and possible risk to the performance of the functions required by the employer. More specifically, each option involves the commitment of money and a delay before the new arrangements are in place and functioning effectively. Generally, in competitive environments, employers tend to believe they need the new resource up and running very quickly, and feel that 'buying in' new staff – often paying for the help of an intermediary - is likely to achieve the quickest solution. It is possible that these assumptions (while understandable) may not always deliver the most cost-effective outcome in the long run.

The UK Commission's Employer Skills Survey asked employers about their recruitment of young people. Table 5.13 shows responses by broad sector and nation.

Table 5.13: Employers recruiting one or more young persons over the last three years by sector and nation

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Agriculture, forestry & fishing	21,769	20	14,815	19	†2,725	†20	1,183	11	3,046	43
Energy production & utilities	2,660	21	2,080	21	322	25	197	24	61	11
Manufacturing	**31,047**	**24**	**26,304**	**23**	**2,442**	**26**	**1,437**	**27**	**863**	**23**
Construction, building services engineering and planning	66,741	22	55,108	21	6,498	30	2,973	23	2,161	20
Wholesale & retail trade	120,702	26	101,878	25	9,862	28	5,297	25	3,665	26
Transportation and storage	18,432	15	16,069	15	1,496	19	476	11	391	17
Hospitality, tourism and sport	70,608	32	59,071	33	6,164	28	3,583	32	1,789	31
Information and communication technologies	14,960	21	13,659	21	†794	†22	241	12	266	24
Creative media & entertainment	31,843	22	28,704	23	†1,573	†14	1,082	23	484	24
Financial, insurance & other professional services	37,955	22	34,274	22	1,679	20	1,230	21	773	23
Real estate & facilities management	23,229	14	21,827	15	†699	†6	475	16	229	12
Government services	10,268	19	8,375	19	1,084	20	378	14	431	21
Education	28,641	44	24,132	45	1,812	41	1,450	45	1,247	38
Health	13,817	26	11,547	26	938	29	822	29	510	34
Care	26,557	30	22,175	31	1,955	23	1,481	34	947	29
All economy	552,385	24	467,925	24	43,211	25	23,664	24	17,584	27
Weighted base	*2,124,807*		*1,960,298*		*175,115*		*98,952*		*65,558*	
Unweighted base	*85,069*		*75,053*		*2,503*		*6,012*		*4,004*	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012). Base: all establishments. NB: Scottish employers were asked a slightly different question; results cannot be compared directly to UK, England, Wales, or Northern Ireland figures. Scottish employers have not been included in the UK base. † Treat figures with caution due to small base size of 50-99 establishments in Scotland

As can be seen, Manufacturing employers have been recruiting young people broadly in line with the average for the economy as a whole. However, given the comparatively low proportion of the Manufacturing workforce that is in the youngest age-bands, and the reduction of this over recent years (see 3.3.2), it is arguable that recruitment rates for young people might need to rise. Where recruits are for technical roles, the longer learning

'pipelines' involved in the acquisition of detailed technical skills might be one cause of this situation. In some sub-sectors that have made considerable use of migrant labour, it appears that this supply is reducing because of reduced growth in the UK (as compared with opportunities in their countries of origin). This might provide opportunities for employers to recruit more labour market entrants who are currently unemployed.

5.2 Extent and nature of skills issues

Skills Policy views skill issues in terms of two main indicators – skill s*hortages* and s*kill gaps*. Skill shortages represent skill deficiencies which arise in the 'external' labour market, while skill gaps arise within the 'internal' labour market of organisations. Skill shortages are evident when HTF vacancies arise through lack of supply of appropriate labour; skill gaps occur when employees are not 'fully proficient' in their job, not having the skills required to undertake effectively the full range of duties expected (UKCES, 2010a).

5.2.1 Extent of Skills shortages and gaps

Table 5.14: Skills lacking in Skills Shortage Vacancies within Manufacturing

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Basic computer literacy / using IT	1,441	15	953	12	*	*	250	44	82	21
Advanced IT or software skills	2,113	22	1,615	21	*	*	175	31	160	42
Oral communication skills	2,399	25	1,847	24	*	*	246	43	107	28
Written communication skills	2,703	28	1,686	22	*	*	210	37	261	68
Customer handling skills	2,886	30	1,833	24	*	*	289	51	262	68
Team working skills	2,472	25	1,556	20	*	*	378	66	186	49
Written Welsh language skills	73	1	0	0	*	*	73	13	0	0
Oral Welsh language skills	73	1	0	0	*	*	73	13	0	0
Foreign language skills	1,031	11	916	12	*	*	0	0	17	4
Problem solving skills	2,925	30	2,182	28	*	*	258	45	199	52
Planning and Organisation skills	3,193	33	2,413	31	*	*	327	57	275	72
Strategic Management skills	2,486	26	2,001	26	*	*	112	20	246	64
Numeracy skills	2,103	22	1,570	20	*	*	285	50	116	30
Literacy skills	2,400	25	1,837	24	*	*	256	45	125	33
Office admin skills	1,468	15	1,071	14	*	*	94	16	112	29
Technical or practical skills	5,736	59	4,607	59	*	*	363	64	151	40
Job specific skills	6,992	72	5,521	71	*	*	410	72	332	87
Experience/lack of product knowledge	313	3	309	4	*	*	3	1	0	0
Personal attributes e.g. motivation, work ethos etc.	345	4	336	4	*	*	0	0	0	0
Other	68	1	68	1	*	*	0	0	0	0
No particular skills difficulties	272	3	272	3	*	*	0	0	0	0
Don't know	596	6	538	7	*	*	58	10	0	0
Weighted base	*9,711*		*7,790*		*		*570*		*383*	
Unweighted base	*939*		*776*		*		*45*		*68*	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012).
Base: All skill shortage vacancies
**Data suppressed as unweighted base < 25 (<50 Scotland)*
*** Denotes a figures of greater than 0% but less than 0.5%*

Table 5.15: Skills lacking in Skills Shortage Vacancies – Whole economy

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Basic computer literacy / using IT	16,832	16	13,842	16	514	8	2,001	35	476	11
Advanced IT or software skills	21,988	21	18,190	21	1,160	18	1,976	35	661	15
Oral communication skills	39,113	38	33,997	39	1,910	30	1,993	35	1,213	28
Written communication skills	33,859	33	28,515	33	2,659	41	1,381	24	1,305	30
Customer handling skills	41,349	40	33,863	39	3,056	47	2,977	53	1,453	33
Team working skills	33,728	33	27,092	31	1,877	29	3,315	59	1,444	33
Written Welsh language skills	1,574	2	0	0	0	0	1,574	28	0	0
Oral Welsh language skills	1,680	2	0	0	0	0	1,680	30	0	0
Foreign language skills	16,773	16	14,601	17	1,451	22	385	7	336	8
Problem solving skills	37,882	37	32,338	37	2,453	38	2,209	39	882	20
Planning and Organisation skills	42,431	41	35,377	41	2,867	44	2,372	42	1,815	41
Strategic Management skills	29,853	29	24,828	29	2,122	33	1,564	28	1,340	31
Numeracy skills	26,775	26	23,194	27	1,866	29	1,149	20	567	13
Literacy skills	30,151	29	25,002	29	1,674	26	2,490	44	985	22
Office admin skills	17,559	17	15,320	18	967	15	797	14	475	11
Technical or practical skills	47,992	46	40,313	46	3,711	57	2,571	46	1,397	32
Job specific skills	68,385	66	56,716	65	5,064	78	4,401	78	2,204	50
Experience/lack of product knowledge	1,668	2	1,523	2	135	2	9	0	0	0
Personal attributes (e.g. motivation, work ethos,	2,743	3	2,385	3	314	5	17	0	26	1
Other	911	1	835	1	0	0	13	0	62	1
No particular skills difficulties	7,129	7	5,588	6	148	2	135	2	1,258	29
Don't know	3,777	4	3,459	4	102	2	124	2	93	2
Weighted base	103,453		86,950		6,463		5,650		4,390	
Unweighted base	7,197		5,959		367		482		389	

Source: UK Commission's Employer Skills Survey, 2011 (Davies et al, 2012).
Base: All skill shortage vacancies.

Skills lacking in relation to SSVs within Manufacturing are particularly around Job specific and Technical/Practical Skills (Table 5.14). While these are also the most prevalent skills lacking across the economy (Table 5.15), the higher employer percentages confirm that they are even more important within Manufacturing. In addition the next three highest skill-sets in demand generally (Planning and Organisation skills, Customer Handling skills, and Problem Solving skills) are also of importance to Manufacturing employers – though with lower response rates than the All Economy average. Employer responses from Scotland and Wales indicate even greater concern with Job specific and Technical/Practical Skills, though in Northern Ireland the concern is less with Technical/Practical skills than Job Specific skills.

Skills Gaps

As indicated, skill gaps occur when employees are not 'fully proficient' in their job, not having the skills required to undertake effectively the full range of duties expected. Tackling skill gaps are unequivocally the responsibility of individual employers, but awareness of the main gaps are important to policy to the extent that public sector training providers could contribute to the relevant up-skilling. Tables 5-16, 5-17 and 5.18 provide information on the different dimensions of skill gaps.

Table 5.16: Employers and employees with skills gaps by sector

	Employers with skills gaps				Employees with skills gaps			
	Number	%	*Weighted base*	*Unweighted base*	Number	%	*Weighted base*	*Unweighted base*
Agriculture, Forestry & Fishing	10,665	10	110,220	1,547	20,149	4	466,870	19,506
Energy Production & Utilities	2,000	16	12,610	1,614	17,250	5	333,050	47,228
Manufacturing	21,520	16	130,709	7,776	148,007	6	2,541,188	291,593
Construction, Building Services Engineering and Planning	31,925	10	306,403	8,961	99,184	4	2,235,270	150,111
Wholesale & Retail Trade	72,233	15	470,200	16,150	300,344	6	4,674,684	514,820
Transportation and Storage	11,540	9	122,058	4,735	55,391	4	1,320,126	114,658
Hospitality, Tourism and Sport	43,000	20	220,055	11,318	193,549	8	2,313,487	258,524
Information and Communication Technologies	6,647	9	72,281	2,510	34,775	6	614,641	53,681
Creative Media & Entertainment	9,155	6	143,772	3,762	41,091	4	1,086,978	87,953
Financial, Insurance & other Professional Services	20,954	12	170,887	5,343	92,599	5	2,052,039	112,945
Real Estate & Facilities Management	13,185	8	166,486	3,424	64,302	5	1,183,601	91,204
Government Services	7,980	15	54,687	2,605	94,735	5	1,780,058	223,796
Education	12,304	19	64,540	5,439	94,884	4	2,538,545	387,221
Health	9,776	19	52,370	3,398	101,986	5	2,004,436	219,765
Care	14,886	17	87,899	4,763	78,458	5	1,504,729	157,681
Whole economy	300,941	13	2,299,921	87,572	1,489,540	5	27,547,123	2,816,693

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All establishments, all employment.

Table 5.17: Employers and employees with skills gaps within sector, by nation - Manufacturing

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Employers with skills gaps	21,520	16	17,836	16	2,255	24	887	16	542	14
Employees with skills gaps	148,007	6	123,349	6	12,098	6	8,475	6	4,085	5
Employer weighted base	130,709		112,176		9,355		5,376		3,802	
Employer unweighted base	7,776		6,774		182		470		350	
Employment weighted base	2,541,188		2,121,263		196,137		138,902		84,885	
Employment unweighted base	291,593		229,018		22,977		25,366		14,232	

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All establishments, all employment.

Table 5.18: Skills gaps by occupational group – Manufacturing

	Total employment	Number with skills gaps	% with skills gaps
Managers	438,975	14,796	3
Professionals	158,438	5,949	4
Associate professionals	140,485	7,934	6
Administrative/clerical staff	237,990	9,612	4
Skilled trades occupations	365,911	19,511	5
Caring, leisure and other services staff	*	*	*
Sales and customer services staff	153,076	8,797	6
Machine operatives	638,317	49,606	8
Elementary staff	403,706	31,079	8
Weighted base	2,541,188	148,007	6
Unweighted base	291,593	17,987	

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All employees.
** suppressed due to unweighted establishment base of <25.*

Manufacturing employers report higher levels of skill gaps among employers and numbers of employees than for the economy as a whole. The levels are similar around the UK, although higher proportions of Scottish employers report these problems. Percentages levels of skills Gaps across the SOC Major Groups are comparatively low.

Table 5.19: Consequences of skills gaps in Manufacturing

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Increase workload for other staff	9,959	76	8,457	76	*	*	511	84	282	71
Increase operating costs	8,014	61	6,808	62	*	*	343	56	230	58
Have difficulties meeting quality standards	5,030	38	4,334	39	*	*	213	35	116	29
Have difficulties introducing new working practices	4,514	34	3,852	35	*	*	157	26	143	36
Lose business or orders to competitors	4,296	33	3,658	33	*	*	285	47	109	27
Delay developing new products or services	3,566	27	3,056	28	*	*	257	42	124	31
Outsource work	2,688	20	2,252	20	*	*	178	29	79	20
No particular problems / None of the above	1,081	8	783	7	*	*	35	6	24	6
Don't know	29	**	29	**	*	*	0	0	0	0%
Weighted base	13,116		11,064		*		610		399	
Unweighted base	1,187		1,019		*		78		42	

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All skill gaps
**Data suppressed as unweighted base < 25 (<50 Scotland)*
*** Denotes a figures of greater than 0% but less than 0.5%*
NB: Column percentages sum to more than 100 since multiple responses were allowed.

The consequences of skills gaps cited for Manufacturing (Table 5.19) follow those for the economy as a whole reasonably closely: the ranking of the eight main consequences is the same, and the percentages of employers citing them are broadly comparable (within a few percentage points of each other), although the percentage of respondents from the Manufacturing sector citing increased operating costs as a result of skills gaps (61 per cent) is distinctly greater than for the economy as a whole (45 per cent).

Table 5.20: Steps employers have taken to overcome skills gaps (whole economy)

	UK		England		Scotland		Wales		Northern Irelan	
	Number	%	Number	%	Number	%	Number	%	Number	%
Increase training activity / spend or increase/expand trainee	185,527	82	155,451	82	3,822	79	18,002	83	8,253	86
More supervision of staff	139,442	62	116,865	62	3,186	66	13,381	62	6,009	62
More staff appraisals / performance reviews	123,245	55	103,336	55	2,939	61	12,001	55	4,968	51
Implementation of mentoring / buddying scheme	113,645	50	94,041	50	2,350	49	12,376	57	4,878	51
Reallocating work	76,053	34	62,381	33	1,952	41	7,876	36	3,844	40
Changing working practices	69,850	31	59,408	31	1,499	31	6,406	29	2,537	26
Increase recruitment activity / spend	33,319	15	28,747	15	762	16	2,386	11	1,424	15
Recruiting workers who are non-UK nationals	21,589	10	18,782	10	572	12	1,373	6	862	9
Other	3,156	1	2,742	1	125	3	221	1	69	1
Nothing	3,541	2	2,736	1	36	1	617	3	152	2
Don't know	348	**	322	0	0	0	0	0	25	0
Weighted base	*225,379*		*189,191*		*21,730*		*9,650*		*4,807*	
Unweighted base	*16,506*		*14,313*		*655*		*1,074*		*464*	

*Source: UK Commission's Employer Skills Survey (Davies et al, 2012). Base: All employers with skill gaps who have taken steps to improve the proficiency or skills of these staff, or have plans to do so. **Denotes a figure of greater than 0% but less than 0.5%.*

Table 5.21: Steps employers within Manufacturing have taken to overcome skills gaps

	UK		England		Scotland		Wales		Northern Ireland	
	Number	%	Number	%	Number	%	Number	%	Number	%
Increase training activity / spend or increase/expand trainee	12,242	80	10,385	80	238	82	1,143	79	477	76
More supervision of staff	8,100	53	7,167	55	127	44	507	35	299	48
More staff appraisals / performance reviews	6,854	45	6,202	48	85	29	283	20	284	45
Implementation of mentoring / buddying scheme	6,461	42	5,563	43	141	48	527	37	230	37
Reallocating work	4,369	29	3,845	30	109	38	130	9	284	45
Changing working practices	4,755	31	4,078	31	41	14	479	33	158	25
Increase recruitment activity / spend	2,530	17	2,210	17	57	20	177	12	86	14
Recruiting workers who are non-UK nationals	1,677	11	1,430	11	52	18	98	7	97	15
Other	286	2	278	2	0	0	0	0	8	1
Nothing	214	1	194	1	0	0	15	1	5	1
Don't know	23	**	23	0	0	0	0	0	0	0
Weighted base	*15,319*		*12,960*		*1,440*		*628*		290	
Unweighted base	*1,410*		*1,237*		*58*		*82*		33	

*Source: UK Commission's Employer Skills Survey (Davies et al, 2012). Base: All employers with skill gaps who have taken steps to improve the proficiency or skills of these staff, or have plans to do so. **Denotes a figure of greater than 0% but less than 0.5%.*

As compared with employers across the whole economy (Table 5.20), Manufacturing employers in the UK undertake the same range of responses to perceived skills gaps as others. In general, however, a smaller proportion of Manufacturing employers (Table 5.21) are involved in most of these responses than the average across all sectors, with the small exception that a slightly greater percentage of Manufacturing employers increase recruitment activity (17 per cent compared with 15 per cent in the whole economy) and recruit workers from beyond the UK (11 per cent compared with 10 per cent). Responses made by significantly fewer employers in Manufacturing than elsewhere include More supervision of staff (only 53 per cent of employers taking measures in Manufacturing compared with 62 per cent overall), More staff appraisals/performance reviews (45 per cent in Manufacturing compared with 55 per cent overall), and Implementation of mentoring / buddying scheme (42 per cent compared with 50 per cent).

Table 5.22: Employers who formally assess performance of employees who have received training, by sector

	Formally assesses performance of employees receiving training							
	Yes		No		Don't know		Unweighted base	Weighted base
	number	%	number	%	number	%		
Agriculture, forestry and fishing	28,724	49	29,389	50	756	1	1,116	58,869
Energy production and utilities	5,689	65	2,920	33	133	2	1,220	8,743
Manufacturing	**44,101**	**60**	**28,412**	**38**	**1,459**	**2**	**5,394**	**73,972**
Construction	87,580	54	73,252	45	2,808	2	6,250	163,641
Wholesale and retail trade	187,796	72	70,368	27	3,783	1	11,690	261,948
Transportation and storage	35,176	64	18,967	34	861	2	3,098	55,004
Accommodation, food and tourism activities	93,084	69	39,315	29	1,916	1	8,532	134,314
Information and communication	19,950	51	18,718	48	422	1	1,848	39,090
Creative media and entertainment	40,438	55	32,357	44	1,274	2	2,738	74,069
Financial, insurance & other professional services	75,092	66	37,647	33	1,335	1	4,364	114,074
Real estate and facilities management	66,488	70	26,541	28	2,039	2	2,620	95,068
Government	27,365	66	13,717	33	527	1	2,263	41,608
Education	43,282	78	11,788	21	559	1	5,129	55,629
Health	32,689	73	11,264	25	844	2	3,125	44,797
Care	56,495	77	16,232	22	942	1	4,411	73,669
All economy	890,621	65	449,685	33	20,943	2	66,916	1,361,249

Source: UK Commission's Employer Skills Survey (Davies et al, 2012).
Base: All establishments providing training.

As can be seen from Table 5.22, fewer employers within Manufacturing (60 per cent) formally assess performance after training than for the economy as a whole (65 per cent).

5.3 Extent of under-employment

While few people exercise all their skills in the execution of their work, some work makes use of comparative small part of the person's capabilities. There is growing concern around this area, which has manifested itself within the growing Skills Utilisation agenda. As with quantitative skills measures generally, the only indicator that can currently tell us about this situation is the usual proxy for skills – qualifications. The caveats about using this proxy are particularly important to bear in mind in this context, but the growing evidence around early graduate employment (that graduates are substantially over-qualified for many jobs they start their careers with) has understandably triggered the desire for clarification of the scale of under-employment. Table 5.23 shows the analysis from responses to UK ESS 11 on this question.

Table 5.23: Extent to which workforce is 'over qualified' and 'over skilled' by sector

	Employers with employees who are over qualified and over skilled				Employees who are over qualified and over skilled			
	Number	%	*Weighted base*	*Unweighted base*	Number	%	*Weighted base*	*Unweighted base*
Agriculture, Forestry & Fishing	42,111	38	110,220	1,547	88,613	19	466,870	19,506
Energy Production & Utilities	5,458	43	12,610	1,614	43,319	13	333,050	47,228
Manufacturing	**56,009**	**43**	**130,709**	**7,776**	**252,633**	**10**	**2,541,188**	**291,593**
Construction, Building Services Engineering and Planning	129,922	42	306,403	8,961	369,923	17	2,235,270	150,111
Wholesale & Retail Trade	241,146	51	470,200	16,150	846,216	18	4,674,684	514,820
Transportation and Storage	61,038	50	122,058	4,735	202,809	15	1,320,126	114,658
Hospitality, Tourism and Sport	131,526	60	220,055	11,318	566,562	24	2,313,487	258,524
Information and Communication Technologies	33,764	47	72,281	2,510	93,637	15	614,641	53,681
Creative Media & Entertainment	66,845	46	143,772	3,762	205,573	19	1,086,978	87,953
Financial, Insurance & other Professional Services	76,826	45	170,887	5,343	312,906	15	2,052,039	112,945
Real Estate & Facilities Management	81,744	49	166,486	3,424	217,791	18	1,183,601	91,204
Government Services	29,384	54	54,687	2,605	256,006	14	1,780,058	223,796
Education	34,623	54	64,540	5,439	341,455	13	2,538,545	387,221
Health	23,566	45	52,370	3,398	225,183	11	2,004,436	219,765
Care	47,114	54	87,899	4,763	258,385	17	1,504,729	157,681
Whole economy	1,118,691	49	2,299,921	87,572	4,456,192	16	27,547,123	2,816,693
Weighted base	2,299,921				27,547,123			
Unweighted base	87,572				2,816,693			

Source: UK Commission's Employer Skills Survey (Davies et al, 2012). .
Bases vary. "Employers" columns based on all establishments. "Employees" columns based on all employment.

As can be seen, some 43 per cent of responding Manufacturing employers felt that some staff were 'overqualified' and 'over-skilled', compared with a 49 per cent average figure for the economy as a whole. In terms of the *number of employees* who are felt to be 'overqualified' and 'over-skilled', estimates for Manufacturing are also below the whole economy average. While the fact that Manufacturing scores below average on these indicators could be viewed as encouraging, the evidence that getting on for *half of all respondents* acknowledged such 'under-employment' still suggests there may be opportunities within firms for making use of certain available untapped talent.

Evidence on under-employment by sector and nation is shown in Table 5.24 (overleaf).

Table 5.24: Extent to which workforce is 'over qualified' and 'over skilled' by sector and nation

	UK				England				Scotland				Wales				Northern Ireland			
	Number	%	*Weighted base*	*Un-weighted base*	Number	%	*Weighted base*	*Un-weighted base*	Number	%	*Weighted base*	*Un-weighted base*	Number	%	*Weighted base*	*Un-weighted base*	Number	%	*Weighted base*	*Un-weighted base*
Agriculture, Forestry & Fishing	88,613	19	466,870	19,506	65,776	18	358,073	16,212	14,421	26	55,022	2,001	6,304	20	31,065	968	2,112	9	22,711	325
Energy Production & Utilities	43,319	13	333,050	47,228	24,398	10	248,701	39,310	16,430	27	60,199	4,710	1,492	9	16,821	2,400	1,000	14	7,329	808
Manufacturing	**252,633**	**10**	**2,541,188**	**291,593**	**207,252**	**10**	**2,121,263**	**229,018**	**23,989**	**12**	**196,137**	**22,977**	**10,438**	**8**	**138,902**	**25,366**	**10,953**	**13**	**84,885**	**14,232**
Construction, Building Services	369,923	17	2,235,270	150,111	322,354	18	1,826,590	119,856	26,150	11	249,158	14,453	11,605	13	91,003	10,713	9,813	14	68,519	5,089
Wholesale & Retail Trade	846,216	18	4,674,684	514,820	706,922	18	3,967,497	431,237	84,085	23	365,530	33,910	29,870	15	198,972	31,169	25,339	18	142,684	18,504
Transportation and Storage	202,809	15	1,320,126	114,658	174,327	15	1,138,957	93,995	19,364	17	114,772	11,541	5,532	14	38,478	5,832	3,586	13	27,920	3,290
Hospitality, Tourism and Sport	566,562	24	2,313,487	258,524	469,544	24	1,928,392	219,773	61,407	27	224,512	15,106	21,939	22	98,666	15,566	13,672	22	61,917	8,079
Information and Communication	93,637	15	614,641	53,681	82,478	15	555,147	46,987	6,789	22	30,382	2,446	2,486	13	18,801	2,960	1,883	18	10,311	1,288
Creative Media & Entertainment	205,573	19	1,086,978	87,953	180,207	19	955,788	75,150	16,895	24	69,122	4,548	5,726	16	35,216	4,872	2,744	10	26,852	3,383
Financial, Insurance & other	312,906	15	2,052,039	112,945	273,503	15	1,821,184	97,600	25,942	19	138,311	4,900	5,851	11	54,573	6,972	7,611	20	37,971	3,473
Real Estate & Facilities Management	217,791	18	1,183,601	91,204	190,600	18	1,053,782	80,451	16,587	23	73,496	3,406	8,312	25	33,534	4,408	2,292	10	22,788	2,939
Government Services	256,006	14	1,780,058	223,796	209,697	14	1,448,381	172,874	25,177	14	174,100	28,174	11,208	12	94,827	14,458	9,923	16	62,750	8,290
Education	341,455	13	2,538,545	387,221	283,067	13	2,159,448	325,375	26,749	14	189,346	32,366	21,757	19	116,992	20,262	9,882	14	72,759	9,218
Health	225,183	11	2,004,436	219,765	203,155	13	1,609,864	184,519	11,177	5	232,319	11,422	7,399	6	120,538	20,282	3,452	8	41,715	3,542
Care	258,385	17	1,504,729	157,681	219,433	18	1,226,842	137,952	20,636	15	140,877	5,750	9,128	15	62,824	8,143	9,188	12	74,186	5,836
Whole economy	4,456,192	16	27,547,123	2,816,693	3,612,713	16	23,198,476	2,345,213	395,798	17	2,381,601	201,868	165,139	14	1,182,314	178,922	117,410	15	784,732	90,690
Weighted base	27,547,123				23,198,476				2,381,601				1,182,314				784,732			
Unweighted base	2,816,693				2,345,213				201,868				178,922				90,690			

Source: UK Commission's Employer Skills Survey (Davies et al, 2012). .
Base: All employment.

In terms of the estimated numbers of manufacturing staff around the United Kingdom who are deemed by their employers to be 'over-qualified' or 'over skilled', manufacturing employers in Wales 'suffer' from this problem the least, but manufacturing companies in Scotland and Northern Ireland reported a greater fraction of their staff being in this situation.

5.3.1 Wages

In principle, excess of demand for labour over supply would result in increases in the price of labour. In reality few labour markets operate so straightforwardly as to produce the classic dynamic responses of some product markets, and while employers sometimes find 'going rates' rising for rather specific roles, there is little robust evidence to support such reports.

The most thorough, rigorous attempt that has been made to examine such behaviour has been carried out by the Migration Advisory Committee (MAC) in the context of assessing the occupational shortages within the UK labour market in relation to the implementation of inward Migration policy (see, for example, their most recent analysis MAC (2011)).

Changes in (average) occupational salary levels year on year (from ASHE data) represent one of twelve indicators used in the MAC's methodology in order to assess degree of skill shortage against an essentially arbitrary threshold. While one or two occupational groupings of importance to Manufacturing are to be found on the recommended shortage list, there is little evidence of wage rises representing direct evidence on their own of skill shortages (hence the MAC's decision to use twelve indicators and complement top-down quantitative evidence from bottom-up employer evidence, which is in all cases now for specific 'Job Titles' - occupational categories much finer than the 4-digit SOC categories for which the quantitative evidence is available).

5.3.2 Migration

Recruitment from overseas is one, rather natural, response to serious recruitment problems in the resident labour market. Many large manufacturing companies, with a presence in different countries, treat their talent base as a global one – and often move people around their global operations to gain experience or to handle particular needs. UK migration policy handles this situation through the Intra-Company Transfer admission route. As is well known, concern about excessive levels of inward migration to the UK at a time of significant unemployment has resulted in continuing pressure to reduce in-flows, and to a steady raising of thresholds for the Points Based admission system. This only applies to a comparatively small part of inward migration flows – recruitment beyond the European Economic Area (EEA). The free movement within the EEA allows considerable recruitment

from within it: some employers in Manufacturing recruit from universities in other EU Member States (and found good candidates). This will presumably continue unless and until the employers find better candidates from UK universities.

The position with migrant labour stock within the different Manufacturing sub-sectors was presented in some detail in Section 3.3.4.

The most direct impact of mismatches on employer behaviour (arising when supply from within the European Union is concluded to be insufficient) can be seen from the 'Shortage Occupations' of relevance to Manufacturing on the MAC's most recent recommendations (MAC, 2011) for the official shortage list (as approved by HMG and issued in November 2011) are as follows.

- mechanical engineer in the aerospace sector
- manufacturing engineer (process planning) in the aerospace sector
- technical services representative in the aerospace sector
- metallurgical / mineral processing engineer
- the following jobs in the aerospace sector:
  - aerothermal engineer
  - stress engineer
  - chief of engineering
- licensed and military certifying engineer / inspector technician.

As indicated above, these occupational categories (viewed by the MAC as 'job titles') are at a level of occupational granularity below 4-digit SOC, and arise primarily from 'bottom up' evidence presented to the Migration Advisory Committee by industry bodies. Since they 'sit within' SOC unit group categories, the objective evidence from the 'top down' indicators evaluated by the Committee only applies to a limited extent, and in some cases (MAC, 2011) the relevant top down evidence did not appear to support the bottom up representations.

5.4 Extent to which skills deficiencies are hampering growth

Skills deficiencies within a Manufacturing company will always have some effect. The cause of greatest concern is often where inadequate resources prevent business growth that would otherwise have been possible. This can often arise from recruitment difficulties during a period of strong pick-up in the economy, but can be caused in other ways.

Table 5.7 shows that HTFl vacancies in Manufacturing are reported to have caused loss of business or orders to competitors in 38 per cent of UK ESS 11 respondents, and delay developing new products or services in 49 per cent of respondents.

Skill gaps also impact on these problems (Table 5.19), with 33 per cent of Manufacturing employers reporting loss of business or orders to competitors, and 27 per cent suffering delay developing new products or services.

And Retention difficulties also impact growth, with 47 per cent of respondents (not including Scotland) reporting resulting Loss of business to competitors, and 50 per cent reporting Restrictions to business development activities (Table 5.12).

6 Drivers of change and their skills implications

Summary

This Section examines the key drivers of change for UK Manufacturing, presenting:

- examples of how each driver influences activity within different sub-sectors;
- the principles of influence of each of the selected drivers on Manufacturing and the implications for skills;
- summaries of the drivers identified by the different Sector Skills Councils for their own branches of Manufacturing, and their relative importance;
- the resulting prioritisation of drivers for Manufacturing; and
- the factors which could affect possible variation in driver priorities within the different UK nations.

The demand for skill in Manufacturing is one derived from a number of factors which have, and will continue to, shape the sector. The principal drivers are:

- demographic change
- environmental change
- economics and globalisation
- technological change
- values and Identities
- consumer demand
- regulation and governance

The obvious impact of demographic change is upon labour supply and demand given the age structure of the sector's workforce, but it also relates to the range of products will be in a demand as a consequence of an ageing population (e.g. the demand this will generate for pharmaceutical and medical technology products).

Environmental change relates not only to how manufacturers, especially those with large carbon footprints, will need to adapt their production processes to reduce their carbon emissions, but also the opportunity to develop technologies which will support the environmental agenda.

Economics and globalisation relates to how manufacturers develop production processes which optimise supply chain relationships which are likely to stretch around the world.

Technological change is something which the manufacturing sector is a constantly progressing in both processes and products. It is important that sector stays at the forefront of technological change through investments in innovation and R&D.

Values and identifies mainly refers to developing a strong brand which, in aggregate, enhances the value attached to buying a good which is designed and / or manufactured in the UK.

Meeting consumer demand essentially means having in place the processes which will allow manufacturers to anticipate and respond to changing consumer tastes. This relates to both the design and production processes.

Finally, employers need to be compliant with the wide range of regulation which governs their sector of activity.

The skill demand these will give rise to will be multifaceted relating to having the skills to establish product market strategies capable of withstanding increased competition and changing consumer tastes. These might be considered the strategic skills required to withstand ongoing change. But there are also a range of tactical skills which are needed to support product market strategy related to innovation and design for manufacture, having the appropriate production systems in place, and employees with the skills to operate those production systems. The exact configuration of skills, as the chapter explains, is very much dependent upon the particular sub-sector in which an employer operates.

In order to meaningfully assess how demand and supply of skills will respond to changes in the world over the coming years, the most useful approach is through the consideration of a set of major change drivers, and the assessment of the kinds of change that each would be expected to influence in relation to skills. This section considers these 'macro-level' developments, and distils the main impacts that are to be expected in relation to the skills required in UK Manufacturing.

Two realities must be taken into account in this exercise.

- The difference between macro-level and micro-level perspectives. For individual businesses to respond effectively to trends arising from these macro-level drivers, those involved (the senior management teams of the companies) must think in very broad terms and assess the potential implications of macro changes on their businesses. In doing so, they will inevitably be influenced by the change drivers within their own market environments. These will generally be shorter term – and less broad - considerations, but skill policy makers must recognise that such drivers form a major part of the perceptions of business managers about the future, and must be taken into account in any assessment of activity at the industry level.
- Demand for skills is a derived demand. Skills are needed to perform tasks and activities, and the organisation of work in businesses within the same industry can vary considerably. It is therefore necessary to consider the functions involved, before the skills required to perform them are specified in too much detail.

An overview of the change drivers used in this report (proposed by Davies et al., 2001) is shown in the diagram.

Source: National Strategic Skills Audit 2010, UKCES

The drivers shown all contribute, to a greater or lesser extent, to the skills position within all 'branches' of UK manufacturing. Table 6.1 (overleaf) shows examples of the kind of impact in different Manufacturing 'sub-sectors'.

Such drivers are powerful macro-forces, and their impacts are complex. In some cases, a movement in one driver can result in movement in another, and so the drivers are not always independent. For example, environmental concerns can result in the introduction of new regulation aimed at tacking the problem. Thus environmental change can result, in response both to scientific monitoring of environmental variables by policy advisers and through problems voters report to their democratic representatives, and indeed to media coverage, in the introduction of new legislation. The behaviour of enterprises will generally respond to regulatory pressure, but can also respond to changes in consumer preferences or strong popular attitudes. Thus skill needs of individual businesses can arise, in response to a single environmental consideration, through more than one of these drivers.

Table 6.1: Manufacturing Instances of the seven Change drivers

Driver	Examples from Manufacturing
Demographic Change	Retirement and ageing of the qualified/skilled workforce brings the need to tackle skills issues arising from an ageing workforce (Engineering Manufacture and within Fashion and Textiles manufacturing, as many skills are tacit).
Environmental Change	As climate change and our burgeoning global population place more and more demand on food supply**,** it has become clear that global food systems are far from sustainable. Ensuring food security is vital, and consumers must change the way they eat; reducing the quantities of meat and dairy consumed, and having a "...sustainable diet". This shift in behaviour requires the public to have a clear awareness and understanding of environmental issues and limits. (Food & Drink Industries). Policy responses to continuing concerns about carbon emissions include subsidies to low-carbon products (e.g. electric cars, micro-generation feed-in tariffs, etc.) (Engineering Manufacture). Sustainable production and reducing costs of production are increasingly important within Fashion and Textiles Manufacturing.
Economics & Globalisation	Rapid increase in Contract Pharmaceutical Manufacturing Outsourcing companies (CMOs) in the UK and other western countries. Biotechnology companies concentrate on the highest-value activity of discovery, and generally outsource drug development and manufacturing to CMOs to improve the economics of production, and to leverage outside expertise. This provides some competitive advantage but still leaves manufacturers in competition with facilities in low-cost, low-tax regions. Tough economic conditions which mean that companies are under increasing pressure to reduce costs, improve performance and find new markets, locally, nationally, and internationally (Process and Manufacturing industries). The opening up of the global labour market, better logistics and lower transport costs have seen a vast amount of fashion and textiles manufacturing 'off-shored' to lower cost countries and have led to changing product strategies for manufacturers, e.g. traditional textile manufacturers moving into technical textile production that is high value and innovative –requiring more STEM skills. Rising overseas transport and production costs (secondary effects of globalisation)
Technological Change	Need for introduction of new technologies or equipment (Engineering Manufacture, Process and Manufacturing, Technical Textile production). In Advanced Engineering Manufacturing, the impact of the emerging technologies of Plastic Electronics, Composites, and Nanotechnology in particular is expected to be massive over the next ten years.
Values and Identities	Maximising the benefits and impact of 'British style' within the fashion and textiles sector requires specialist skills, for example an understanding of how to design and manufacture products that meet consumer demands, plus an ability to effectively market and sell these products, both domestically and to traditional and emerging overseas markets in a way that builds upon the UK brand. The Ceramics and Furniture industries both exploit the "made in the UK" branding domestically and overseas to denote quality.

Driver	Examples from Manufacturing
Consumer Demand	More sophisticated customer demands and relationships, including new business models involving more complex supply chains and greater numbers of customer-facing activities (Process and Extraction industries). Growing demand for low carbon products and machines will continue to accelerate the low carbon economy. Evolving fashions and the requirement to design, source and produce goods that meet constantly changing consumer demand in a short time frame (fast-fashion) is an important element of the fashion and textiles manufacturing process. Growing interest in UK-made products.
Regulation and Governance	Hot topics for regulators are obesity and healthy food; food safety and traceability (stimulated by BSE, e Coli, listeriosis, salmonella, etc); along with nutrition labelling, food prices and security and sustainability (Food and Drink industries). The stringent requirements of COMAH, COSHH and REACH are significant for the chemicals sector, with compliance forming a major part of the new skills requirement. Health & Safety legislation is a big driver generally, and will increase with the proposed changes in inspection routines for “more dangerous” industries.

Source: SSC information

6.1 Drivers of change

Each driver plays out for UK Manufacturing, and its skills, in the following main ways:

Regulation and multi-level governance

- Export success is sensitive to adequate stability levels, and differential product specification legislation, in each national market (e.g. different safety and environmental regulation thresholds). To handle this, UK Manufacturers need: a) adequate monitoring of regulatory position in relation to its products in each export market; and b) adequate ability to gain conformance certification and perhaps make (generally) small design adjustments to products for each requirement[32] This means a need for adequate expertise in these areas – either within the export marketing team or through bought-in consultants.
- Possible constraints on skills supply through labour market regulation – e.g. regulation of occupational activity or professional practice. Given the comparatively un-regulated labour market in the UK, regulation plays less part in skills supply than funding structures in affecting flows into and out of education, training and employment.
- Regulation of (inward) migration plays a small role (only for non-European – EEA - migrant workers) in affecting the UK's labour/skills supply – the current policy direction will continue to reduce supply from this source.
- The greatest direct impact on skills requirement of regulation in the UK is for the skills to monitor and manage compliance with existing and changing legal requirements. The main element of this in Manufacturing is the need, for all producers, for adequate expertise in product safety requirements (for example, managing biological safety conformance in the food and drink sectors; ensuring that transport equipment conforms to all necessary safety standards (e.g. Civil Aviation Authority checks for Aircraft equipment and airworthiness).
- Regulation in British markets is not limited to measures from the UK Government: the requirements of European Directives (and other EU level legislation) must also be taken into account: two obvious examples would be the Working-time Directive, and the REACH (Registration, Evaluation, Authorisation & restriction of Chemicals) regulations on use of Chemical substances. Additional expert resource is needed for these, involving both recruitment and additional training.

[32] In addition, in extreme cases, larger exporters might want, and be in a position, to initiate lobbying of export market regulatory authorities, where there might be a chance to achieve regulation adjustments.

- Government Policy, in relation to promotional interventions and funding, for example promotional- and innovation support- activity in support of Manufacturing, in the cause of re-balancing the economy, and skills policy responses like the recent strengthened commitment to Apprenticeships. These would both, in principle, result in increases in the supply of relevant skills, but also in some cases of increased activity (e.g. establishment of the 'Catapult' (Technology and Innovation) Centres for which additional higher level STEM skills are needed).

Demographic and population change

- The ageing workforce in manufacturing will continue to have a major (negative) impact on future skills supply, though the resultant significant replacement demand levels are in principle helpful in providing future employment opportunities in a context of generally negative expansion demand. Steady disappearance over the coming years of the considerable expertise of workers approaching retirement, built up from years of experience, will prove a significant loss within the Manufacturing workforce. Replacing this valuable resource with younger people will involve both planning for, and managing, skills succession; investment in training; and stronger efforts to make working in Manufacturing as attractive as possible to the best young talent.
- The UK's ageing population, many of whom are comparatively well off, will continue to provide an important consumption market, and some adjusting of product design and specification for older consumers' needs will be necessary. Responding cost-effectively to changing demand patterns like this once again emphasises the need for continuous market monitoring (adequate marketing skills), innovation skills and flexibility and nimbleness of production;
- Such changes in working populations in most other developed countries will have corresponding impact on export demand – something that will need to be built into exporting strategies.

Environmental change

- Growing concerns about carbon emissions will cause responses both in terms of product design and new product opportunities, arising from both regulation and shifting consumer preferences. Changes will also continue to be affected by policy action – in particular market stimulation action for (e.g.) subsidy to low-carbon products (e.g. electric cars, micro-generation feed-in tariffs and other green policy interventions), and this will stimulate new markets and demands for new skill-sets. Examples of skills implications would be the growth in demand for engineering skills associated with the low carbon

economy (e.g. augmenting electrician skills to include capabilities to install Photo Voltaic solar panels – see SSC Low Carbon cluster report, 2009).

- Prices of fossil energy and other natural resources in falling supply will increase input costs and cause changes of behaviour and consumer demand. Manufacturing companies will need technical expertise to extract the most benefit from these changes. The skill implications include: a need for expertise in producing lower consumption equipment generally, and in working with different and new materials (in particular composites); technical innovation skills that will enable new approaches and solutions to the engineering challenges involved (generally high level engineering skills), as well, in general, as more marketing skills to respond to falling demand given economic slow-down).
- Changes in societies with major environmental upheavals will, both directly and through policy responses, affect export demand for UK manufactured products. There are opportunities for UK manufacturing to be ahead of the curve in such developments. Again, as well as fast and effective responses to changing demand, this will require expertise in monitoring and responding to changes in market conditions in each export market, arising from policy developments in those countries: this will require additional skills resource in export marketing.

Economics and globalisation

- The economic climate has a central, major impact on business confidence, and on demand generally. The current economic climate, both within the UK and within economies to which UK manufacturers export (in particular at present those of the EuroZone), is currently unusually adverse, and, in spite of occasional encouraging reports (e.g. EEF, March 2012)[33] overall prospects do not look encouraging. Since business confidence has a very strong influence on recruitment activity, this situation suggests that, for the UK labour market as a whole, supply will exceed demand in the coming months at least, and levels of skill shortage will be comparatively low (as evident from the UK ESS 11 findings). As always aggregate labour market states can mask imbalances in the supply and demand within particular occupations, and it is important for policy to be thinking ahead to the next market rise, in particular for skill areas with longer "learning pipelines" for labour market entrants.

[33] "Wavering confidence (in Engineering and Manufacturing companies) at the end of last year has proven to be temporary as activity turns out stronger than expected at the start of this year, whilst short-term confidence has recovered to levels reported in early to mid-2011"

- The response to rising competition should include continued commitment to raising both productivity and innovation: the skills implications being for business leadership-, Business-Improvement Techniques-, innovative design, NPDI-, and relevant STEM-skills.
- Globalisation will provide both threats and opportunities. Opportunities to export to economies beyond those suffering from lack of growth will be crucial, suggesting a particular need for skills in marketing to (for example) the "BRICS" countries. The main skills implications will be increasing demand for international marketing skills.
- Falling logistics prices will continue to have a direct effect on trade generally, and international trade in particular. The main impact on skills demand would be through reduction in the effects of movement of goods from production sites to the consumption markets. This could affect the cost balance between home- and overseas- production, and possibly result in re-establishment of some plants within the UK, with the corresponding skills requirements.
- Continuing opportunities for *e-business*, in particular for micro-businesses and market entrants (requiring continuing availability of good IT-user and e-business skills).
- Currency fluctuations have a direct, and often decisive, impact on import and export activity. Such movements are essentially outside the control of the individual enterprise, but early warning of adjustments can be very helpful, in enabling more time for a commercial response of some kind. This implies access to market movement information and to the skills of understanding such movements.
- Reducing labour cost differentials: the inevitable adjustments to massive growth and rising standards of living in countries with comparatively very low initial labour costs have already started, and will continue. The resulting fall in differentials will in due course bring small but important growth in the comparative competitiveness of UK production companies within the global market-place. While this effect will be small initially, it is likely to grow, and will have important skills consequences. In some cases this could result in the balance of trade-offs in the choice between United Kingdom and overseas production to shift. As indicated above, if a re-establishment of production in Britain were found desirable, skills issues would be inevitable where the infrastructure – possibly both for machinery and skills - has been lost following the previous closure of UK production.

- Increasing competitive pressures can lead, in some cases, to commercial behaviour with varying degrees of integrity. The growing sophistication of many products results in an increase in the value of the Intellectual Property (IP) associated with them, and so to 'industrial espionage' and/or the introduction of imitation products, which can have significant effects on a market. The skills implication would be for growth in the need for security-associated skills, and where imitations appear, in the need for legal skills, and, where exports are concerned, for legal expertise in other legal jurisdictions.
- Rising overheads and increasing pressure on retail margins. These two effects of reduced spending power and inflation can pose substantial threats to a business's financial viability in the short term, and are often the main causes of business failure in adverse economic conditions. The skills implications focus on particular on business leadership – a combination of determination to get through difficult conditions, and the necessary leadership skills, as well as the experience to handle the particularly difficult judgements along the way. Experience and confidence, rather than training, is often most significant for such situations. As with many other dimensions of business, really good understanding of customers and their behaviour is also crucial.
- Where market prospects look bleak, this prospect can trigger more radical responses that involve shifts of target market, introduction of new products, and even new business directions. Such major shifts are always ambitious, and require considerable courage and creativity, as well as the ability to manage innovation, often under conditions of great urgency. Such radical commercial shifts bring with them a range of new skill needs, like any start-up business.

Technological change

- A major influence in manufacturing innovation, both in terms of design of products, and of production, business, and marketing processes. The management of such change requires considerable leadership skills, as well as the skills to manage, and support, the specific technical innovation.
- At the least, skills are needed for monitoring, assessing for various possible applications, introducing and managing new technologies within the business (innovation identification and management), plus product knowledge skills for pre- and post sales guidance and support.
- Where relevant and appropriate, investment in skills for exploring new approaches to existing business activity, and perhaps direct R&D activity (innovation design).

Changing values and identities

- Social and attitudinal change will continue in the UK, and will continue to influence both consumer preferences and labour markets. The balance of power in labour markets is first and foremost influenced by the state of supply and demand. In general, in times of economic stagnation, employers are in a comparatively strong position, but when growth picks up, the bargaining strength of the individual strengthens, and there is almost always competition for the very best talent.
- New ways of working have been emerging, in particular in enterprises with innovative approaches to the working relationship, often including HPW companies. Successful employers have been increasingly willing to adapt to the attitudes and desires of the most outstanding talent to the working environment.
- Skills in Manufacturing Leadership and Management to respond to these changes will be important.
- Growing awareness of the attractiveness and quality of UK products.

Changing consumer demand

- Levels of consumer demand continue to be a major influence on business growth, in particular for manufacturing, where consumer products are involved. These levels and patterns are affected by affluence (will trading-up within the population reduce without growth?), and changing attitudes (e.g. to environmental issues) and fashions.
- Marketing and customer-facing roles require good understanding of market trends, and marketing strategy requires expertise in positioning products.
- Although price levels will be crucial, and pressure on margins will continue, opportunities for manufacturing semi-individualised and individualised products will not disappear.
- Need for innovative and creative design approaches to respond to growing sophistication of consumers in both domestic and export markets.

The above analyses illustrate the *direct* influences on skills demand and supply, it is important to be aware of the additional influences on skills demand from company responses to the changing environment. These can occur through the intermediate stage of adjustment of product market strategy in response to the changes, since the derived skills demand comes from the work organisation needed to achieve the adjusted strategy.

An obvious example would be a shift in the product specification: for example where product demand in response to reducing consumer spending might polarise into: a) greater volumes

at the lowest price end of the market; plus b) greater opportunities at the higher price end of the market where demand might not be affected – high quality niche markets… An enterprise could choose to shift either upwards or downwards in such a situation, and the skill requirements in the two cases could be significantly different.

A second example of changing work organisation in response to market developments would involve a company response involving strategic alliances. An example would be enhanced collaboration within the Fashion and Textiles sectors between designers and production units. Where, as a result of moving production off-shore, the two functions are no longer physically close, mutual understanding can be reduced, and this can result in both misunderstanding on individual projects (resulting in delays and increased costs), but also the loss of opportunities for New Product Development and Introduction (NPDI) that might otherwise have occurred. Skills implications here would include improved communication and joint-working skills, and, more broadly, strengthened supply-chain management skills.

A more thorough scenario analysis of future developments in the different Manufacturing sub-sectors would be able to explore the specifics of such *secondary* or *indirect* response effects.

6.2 Scale of drivers

In order to clarify the comparative scale of the different drivers for Manufacturing, and to assess their relative importance, it is necessary to examine the perspectives of the different Sector Skills Councils in assessing the significance of different drivers for the various groups of sub-sectors they cover.

This can be derived by examining the driver analysis contained within the most recent individual SSC Sector Skills Assessments (Cogent (2011), Creative & Cultural Skills (2010), Improve (2010), ProSkills UK (2010), Semta (2010), SkillsActive (2010), and SkillSet (2011)). These analyses provide additional evidence of the heterogeneity of the different sub-sectors within Manufacturing, even showing how, in some cases, drivers that do not relate clearly to any of the seven change drivers selected for this report can be significant for particular industries. The cross mapping is shown in Table 6.2.

Table 6.2: Sub-group Driver focus, in relation to the Drivers selected for this study

Sub-sector grouping: ⇩Selected Driver⇩ (SSC)	**Food Products and Beverages** (Improve)	**Textiles, Wearing Apparel, Leather and Related Goods** (SkillSet)	**Refined Petroleum Products, Chemicals, Pharmaceuticals, Rubber & Plastics** (Cogent)	**Wood products, Paper products, Non-metallic products, Furniture** (Proskills)	**Metals, Electronics, Electrical, Mechanical, Automotive, Aerospace, Marine, Maintenance, Scientific R&D** (Semta)	**Other Manufacture** (C & C Skills)	**Sport and Leisure equipment manufacture** (SkillsActive)
Demographic Change		Sector image and an ageing workforce			Socio-demographic aspects	Demographics	Population Trends; Demographic Issues
Environmental Change	Environmental Change	(The impact of legislation and) the sustainability agenda	('**L**egal &) **E**nvironmental'	Environmental issues and Sustainability	Environmental challenges and sustainability requirements		
Economics & Globalisation	Globalisation & Market Power	Economic Environment; Globalisation	'**E**conomic'	The Economy	Increasingly competitive global economic climate	Economic Climate; Globalisation; Finance	Globalisation
Technological Change	Technology and Innovation	Responding to Technological Advances	'**T**echnological'		Rapid advances in science and technology	Technology	Technology
Values and Identities		Product Marketing and the British Style	'**S**ociological' (Social and Ethical)		Values and public acceptance of new technology		
Consumer Demand	Consumer demands	Fast fashion and Responding to consumer demands					Consumer trends (P)
Regulation and Governance	Regulation and Compliance	The impact of legislation (and the sustainability agenda)	'**L**egal (& **E**nvironmental)'; '**P**olitical'		The regulatory environment, standards and IPR	Government Policy	Legislation (P); Government drivers (P)
Additional Drivers identified for the Sub-sectors:		A re-defined Sector; Diversification and the rise of Technical Textiles		Energy (prices)	(*Business* Drivers from employer perceptions of market changes)	(Current Skills levels)	Obesity

Source: SSC 2011 Sector Skills Assessments

Within the conceptual frameworks found effective for the different sub-sectors, a number of assessments have emerged. These are summarised in Annex E for each sub-sector grouping, in the order of the relevant selected driver.

As Annex E demonstrates, most of these factors from the different Manufacturing sub-sectors come within the ambit of the seven drivers of change used for this analysis, but with important differences in relation to which are considered to be most influential for particular sectors. For example:

- *Consumer Demand* and *Values* and Identities are, not surprisingly, particularly important for sub-sectors producing products directly for consumers – e.g. Textiles & Clothing and Food & Drink manufacturing, as well as producers of Jewellery and Sports & Leisure Equipment;
- *Regulation and Governance* issues are of particular significance for industries involving potentially dangerous or polluting materials – e.g. Chemicals, Oil & Gas, Pharmaceuticals, etc.
- *Economics and Globalisation* are fundamental to the market environment of manufacturing in general, with some sectors moving into a second phase of responding to the realities of major labour-cost differences between the UK and some emerging economies. The actual benefits of production off-shoring are in some cases proving less attractive than initially expected, and in some cases cost differentials are narrowing. In many cases, UK producers have moved from mass markets into niche markets with higher specification/quality products. Movement in raw material and energy costs are fundamental to the business model in some sub-sectors (e.g. Energy costs for producing Building Products, Glass and Ceramics).
- *Technological Change* is central to maintaining UK manufacturing companies' continuing success and future global competitiveness. New technologies can have massive influence both on the efficiency and effectiveness of production processes as well as on marketing channels (growth of internet sales, generally). In addition, where products are technically sophisticated (in particular for science-based, advanced engineering, and other 'high-tech' based products), continuing technical innovation is necessary for competing and survival. Even industries where products have not traditionally been viewed as technologically complex (e.g. food and drink, textiles and clothing) are beginning to recognise that effective adoption of new techniques is likely to become more necessary in the future. These trends emphasise the growing needs for higher-level skills, and STEM expertise, in all branches of Manufacturing.
- *Environmental Change* considerations are relevant to all Manufacturing, in two ways: the pressure – through various governance channels – to reduce carbon emissions in all economic activity, and the business opportunities opened up by the accompanying growth of the low-carbon economy arising from sustainability legislation.

- These affect the different manufacturing sub-sectors differently, with – for example – particular challenges for high energy-consuming production sectors and particular opportunities for sectors (e.g. electrical and mechanical engineering) where the leading enterprises are already building new businesses in deploying carbon-emission reduction products.
- Although demographics is not singled out in several of the sub-sector groupings as a major influence on changes in business activity, the statistical evidence relating to the ageing workforce (see Section 3.3.2) confirms that it is a factor that must be taken into account in planning effective HR management in the coming years.
- As can be seen from Table 6.2, several branches of Manufacturing cite drivers that go beyond the main ones selected for this analysis. An example would be the growing levels of obesity within the UK population: this impacts on the Food and Drink industry in terms of political pressures to reduce the fat content of foodstuffs, and on the Sport and Leisure industry in terms of programmes to encourage more physical activity in response.

It is clear that economic factors are overall of greatest importance for all branches of Manufacturing, and that responding effectively to technological change is also of fundamental significance to the future of all these sub-sectors. Compliance with regulation continues to be a challenge in most Manufacturing industries, and, while concerns about demographics have not shown up in many of the analyses, this is probably because (with the exception of the growth of preferences of older people within consumer demand) the 'demographic time bomb' of ageing workforces is not thought of as something that influences business change.

6.3 Differences in drivers across the four nations

Since the seven Change drivers operate at a comparatively macro level, significant variations in their contribution and impact are not to be expected within the four nations that make up the UK.

The main potential differences will presumably arise from one or other of:

- different geographical or climatic conditions (causing differences in demand for certain products)
- different degrees of intensity within different branches of Manufacturing (thus resulting in greater impact of factors of particular importance in different sub-sectors)

- differences arising from different legal or administrative arrangements either in the workplace or concerning product regulation
- differences relating to differing policy emphases or positions between the four government administrations.

Most of these differences, while important in different contexts, are not likely to have significant effects on the scale of impact of the macro Change drivers.

The last element, however, will have real importance in relation to the policy response to the skill needs assessed in this report. In particular skills policy is fully devolved, and this has resulted in small but growing differences in Skills Policy interventions, in particular through the funding preferences for learning provision. This will be considered in the individual nation reports.

7 Future Trends

Summary

The projections of future skill demand reveal the increasing demand for people employed in high level occupation (managers, professionals, and associate professions), and a decline in the number of people employed in skilled trades and operative occupations. This trend stems in large part from the skills the sector will need to obtain if it is to meet the challenges highlighted in the previous chapter.

It needs to be borne in mind that the level of replacement demand will be positive across all of the occupations on which the sector depends, including skill trades and operatives. This results in large measure from the fact that the sector has a relatively aged workforce.

From a more qualitative perspective it is expected that change will take place in the content of jobs. These relate to the strategic management skills which will be needed to steer companies through an increasingly competitive and technologically advanced future. There are a wide range of other management skills which will be required related to, amongst other things, the management of supply chains, human resource management, and the management of innovation.

Reflecting the increasingly rich mix of skills the sector will need in the future, the number of professionals and associate professionals operating across a range of activities will increase. In other words, the sector is likely to employ more specialists in the future.

The fact remains that the sector will be looking to recruit skilled individuals against a backdrop of an overall decline in the number of people employed in the sector.

This Section examines the key expected trends in employment levels that will influence the demand for skills in UK Manufacturing, summarising:

- The expected trends and their skills implications
- The likely change patterns of occupational structure, as identified in the most recent Working Futures analysis
- The main adjustments to skill requirements within the different occupational groupings; plus a more detailed summary of the individual *short-to-medium-*, and *longer- term* growing needs for skill and expertise within the six main occupational groups of particular importance to Manufacturing employers.

Consideration of the main change drivers enables a sounder assessment of the key future trends that are to be expected in relation to skills demand within UK Manufacturing. These are examined in this section.

7.1 Possible or Likely trends and associated skills needs

Probably the most significant trend to be expected in the coming years arises from the UK's current economic position and current expected prospects. The latest reports confirm a worsening picture for UK manufacturing activity, and prospects for recovery of demand for UK manufactured products in the coming months are poor. While estimating dates for economic pick-up is never easy, strong recovery does not look likely within the coming year, or probably several years.

The new projections from 'Working Futures' (see below) of change in employment levels to 2015 and 2020 in the main occupational groupings may not have taken into account the continuing discouraging news concerning EuroZone economies, but it indicates a continuing substantial loss of people in skilled trades and operative work. While this loss is expected for the economy as a whole, these occupational groups are a particularly significant element of Manufacturing. As will be seen, employment reduction in these types of work will be somewhat offset by anticipated growth in employment at higher skill levels.

This forecast rings true from the analysis of SSCs about the different manufacturing sub-sectors – that a steady upward shift is to be expected in the level of skills required in manufacturing, for a number of reasons. Replacement demand at the lower levels will also produce a requirement for craft and operative skills, although of smaller volumes.

Economic challenges bring with them more than just a reduction in demand for skills generally – they bring a growing need for 'fight-back' measures, which in turn may well need to draw on new skill sets. An obvious example would be the need to gear up marketing to countries whose economies are less affected by the current economic difficulties – in particular countries such as Brazil, Russia, India, China and South Africa (BRICS) group. If sales of UK manufactured products to such countries are to be boosted, there will be an urgent need for relevant skills, which would presumably include export marketing skills of various kinds, including bringing in and training up those with either direct experience of such countries, or with relevant language skills.

The two most important ways of responding to inadequate demand are *growing productivity* (to help reduce product price) and *innovation* (to improve the product attractiveness).

More long term, UK manufacturing must seek to use periods with lower activity levels to address skill gaps and begin to identify and deliver learning that will improve the enterprise's ability to deliver world class products at competitive prices once demand begins to pick up. Such learning provision can also accelerate understanding of the impacts and appropriate responses to, the various other market changes that emerge from the other drivers. Some of the new skills can be delivered in an 'adaptive' or 'top-up' way – e.g. augmenting electrician skills to cover the requirements of solar panel installation.

7.2 Likely patterns of occupational change

New estimates from Working Futures 2011 project likely development of employment and percentages of employment in the SOC Major Groups within Manufacturing as follows:

Table 7.1: Workplace job growth by occupation within Manufacturing, UK

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	279	299	310	10.6	11.6	12.6	31
Professional occupations	380	402	414	14.4	15.6	16.8	34
Associate professional and technical	308	319	325	11.7	12.4	13.2	17
Administrative and secretarial	205	196	184	7.8	7.6	7.4	-21
Skilled trades occupations	656	602	546	24.9	23.4	22.1	-109
Caring, leisure and other service	23	26	28	0.9	1.0	1.1	5
Sales and customer service	79	79	77	3.0	3.1	3.1	-3
Process, plant and machine operatives	505	449	391	19.1	17.5	15.8	-114
Elementary occupations	203	200	195	7.7	7.8	7.9	-9
All occupations	2,638	2,572	2,469	100.0	100.0	100.0	-169

Source: Working Futures 2011

The projections (Table 7.1) compare with those for the whole economy (Table 7.2)[34].

Table 7.2: Workplace job growth by occupation within the Whole Economy, UK

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	3,016	3,279	3,560	9.9	10.6	11.1	544
Professional occupations	5,843	6,189	6,712	19.2	20.1	21.0	869
Associate professional and technical	3,926	4,138	4,476	12.9	13.4	14.0	551
Administrative and secretarial	3,698	3,466	3,312	12.1	11.2	10.3	-387
Skilled trades occupations	3,526	3,389	3,295	11.6	11.0	10.3	-230
Caring, leisure and other service	2,719	2,801	3,032	8.9	9.1	9.5	313
Sales and customer service	2,608	2,555	2,610	8.6	8.3	8.2	2
Process, plant and machine operatives	1,950	1,829	1,737	6.4	5.9	5.4	-213
Elementary occupations	3,173	3,209	3,274	10.4	10.4	10.2	101
All occupations	30,458	30,855	32,008	100.0	100.0	100.0	1,550

Source: Working Futures 2011

The latest "Working Futures" projections indicate (Table 7.1) a broad continuation of recent trends within Manufacturing, including:

- continuing net reductions in overall employment levels (with nearly 170,000 fewer jobs expected within Manufacturing as a whole by 2020)
- substantial continuing reductions in the lower level occupations (net losses of some 21,000 within *Administrative and Secretarial* occupations, 109,000 within *Skilled Trade* occupations, and some 114,000 within *Plant Process and Machine Operative* occupations over 20 years)
- steady increases in employment at the higher levels (some 17,000 more Associate Professionals, 34,000 more Professionals, and 31,000 more Senior Managers expected by 2020).

As can be seen from Table 7.2 the major falls in Skilled Trade, and Plant Process and Machine Operative- occupations are projected for the economy as a whole, though the falls in their percentage share is less, since there are proportionately many more within Manufacturing. Conversely the fall in the percentage share of Administrative and Secretarial occupations is correspondingly greater.

The projections for Manufacturing are disaggregated between the home nations as shown below.

[34] Note that *Working Futures* estimates for occupational group employment in 2010 vary from figures shown in Section 3.1.1 because Working Futures estimates draw on more sources than just the Labour Force Survey (see Technical appendix for more details).

Table 7.3: Workplace job growth by occupation within Manufacturing in England

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	247	266	275	11.1	12.2	13.1	28
Professional occupations	332	351	362	14.8	16.1	17.2	30
Associate professional and technical	268	278	284	12.0	12.7	13.5	16
Administrative and secretarial	176	169	159	7.9	7.7	7.6	-17
Skilled trades occupations	554	510	461	24.8	23.4	22.0	-93
Caring, leisure and other service	19	21	23	0.8	1.0	1.1	4
Sales and customer service	68	68	66	3.0	3.1	3.1	-2
Process, plant and machine operatives	407	361	314	18.2	16.5	14.9	-93
Elementary occupations	163	160	156	7.3	7.3	7.4	-8
All occupations	2,234	2,185	2,099	100.0	100.0	100.0	-135

Source: Working Futures 2011

Table 7.4: Workplace job growth by occupation within Manufacturing, Scotland

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	17	17	17	8.7	9.7	10.4	0
Professional occupations	30	31	31	15.8	17.7	19.1	1
Associate professional and technical	22	21	21	11.4	12.2	12.9	-1
Administrative and secretarial	15	14	12	8.1	7.9	7.5	-3
Skilled trades occupations	43	37	33	22.7	21.0	20.4	-10
Caring, leisure and other service	2	2	2	1.0	1.2	1.3	0
Sales and customer service	6	6	6	3.3	3.5	3.5	0
Process, plant and machine operatives	36	29	23	18.9	16.3	14.5	-12
Elementary occupations	19	18	17	10.1	10.3	10.3	-2
All occupations	189	175	162	100.0	100.0	100.0	-27

Source: Working Futures 2011

Table 7.5: Workplace job growth by occupation in Manufacturing, Wales

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	9	10	11	6.8	7.5	8.4	2
Professional occupations	11	11	12	8.1	8.5	9.4	1
Associate professional and technical	10	10	11	7.4	7.7	8.3	1
Administrative and secretarial	7	6	6	5.3	4.9	4.7	-1
Skilled trades occupations	35	33	32	26.2	25.2	25.1	-3
Caring, leisure and other service	1	1	2	1.0	1.1	1.2	0
Sales and customer service	3	2	3	2.0	1.9	2.0	0
Process, plant and machine operatives	45	43	39	33.7	33.1	30.3	-6
Elementary occupations	13	13	14	9.5	10.2	10.6	1
All occupations	133	130	128	100.0	100.0	100.0	-6

Source: Working Futures 2011

Table 7.6: Workplace job growth by occupation within Manufacturing, Northern Ireland

Employment in	2010	2015	2020	2010	2015	2020	2010-2020
	Numbers (000s)			% shares			Net change (000s)
Managers, directors and senior officials	7	7	8	8.1	8.7	9.6	1
Professional occupations	8	9	9	9.6	10.6	11.5	1
Associate professional and technical	8	9	10	10.0	11.0	11.9	1
Administrative and secretarial	6	7	6	7.9	8.2	8.0	0
Skilled trades occupations	24	22	20	29.0	26.9	25.4	-3
Caring, leisure and other service	*	1	1	*	1.3	1.4	*
Sales and customer service	2	2	2	2.8	3.0	3.0	0
Process, plant and machine operatives	18	16	15	21.6	20.0	18.5	-3
Elementary occupations	8	8	8	9.8	10.3	10.6	0
All occupations	82	82	80	100.0	100.0	100.0	-2

Source: Working Futures 2011
* cell sizes of less than 1,000 have been suppressed

As might be expected, the pattern of gains and losses in the different occupational groupings is broadly similar in the four nations. The estimated absolute impact of employment losses of Skilled Trades and Operative occupations in the Manufacturing Workforce in Scotland, Wales and Northern Ireland are comparatively small: in fact in proportion to other SOC Major Groups, Northern Ireland and Wales are expected to see fewer losses than in England. However, with the exception of Scotland, the proportionate gain in employment at the higher skill level occupations is less than in England.

These estimates are of workforce employment levels, and information on replacement demand is required in order to estimate the net new labour demand arising from the expected growth. With a workforce demographic ageing more than the average, replacement demand will prove particularly important in Manufacturing, and is likely to ensure continuing demand even where falls in employment levels are expected.

7.3 Likely changes of skills within occupations

The implications of influence of the change drivers listed above on the skills required within each occupational grouping will vary considerably between Manufacturing sub-sectors, but they can be expected to include:

- the need for continuing enhancement of technical expertise within Associate Professional and Professional roles, in response to the emergence of new technologies and other changes within the marketplace and society

- the need for continuing improvement of leadership and management skills within senior roles to help improve the cost effectiveness of change programmes, in particular for innovation processes like new product development and introduction (NPDI), as well as strengthening the nimbleness of the enterprise
- strengthening of succession planning and management skills for Senior Managers, to improve the cost-effectiveness of responses to the loss of expertise through retirement
- the need for increasing skill sets (within senior roles) to improve assessment of market conditions and opportunities, both with the UK market and key export markets
- continuing need for high-quality regulation compliance skills (within senior roles) to ensure cost-effective responses to the developing regulatory environment (UK and abroad)
- the use of industrial biotechnology in fine chemical and pharmaceutical manufacture is generating a demand for an interdisciplinary skill set that encompasses both the laboratory and production scales
- research and development skills, in tandem with those to ensure regulatory compliance and business process and productivity improvement, are a strong and increasing feature of process manufacturing
- supply Chain management skills will continue to grow in importance, as will competence in business improvement techniques
- craft based and design skills will drive product development in larger companies and respond directly to consumer demand in micro-companies.

The specific priorities, arising from the expected impact of the analysed *change drivers* on Manufacturing markets in the coming years, for up-skilling and increased staff capabilities within each of the key occupational groups within Manufacturing, are summarised in Table 7.6 overleaf.

Table 7.7: Change drivers in Manufacturing

Occupational	Growing skill needs arising from expected developments in Manufacturing market	
	Short to Medium (1-year	Longer (2-5
Managers and Senior	o Regulation compliance o Export, and new channel exploitation, marketing o Change management expertise (for introduction of new processes and o (Product and Process) Innovation planning o investigation into potential benefits of HPW	o HR Succession planning & management skills (to cost-handle loss of experienced staff and their o New technology introduction o Export marketing o Supply Chain management o (assuming effective) Commitment to useful HPW
Professional	o Regulation compliance o Export, and new channel exploitation, marketing o New Product Development and Introduction (NPDI) o Productivity and resource-use improvement and HPW o Technical skills to respond to low carbon economy	o New technology introduction o Export marketing o Relevant STEM o R&D management o Productivity improvement process and HPW
Associate Professional (AP) and	o Regulation compliance understanding and support o Skills to support and enable technical change o Understanding of, and support skills for, o Relevant STEM knowledge and o Business-Improvement Technique (B-IT)	o Regulation compliance o Skills to support and enable technical change o Relevant STEM knowledge and expertise, and R&D support o NPDI o B-IT
Skilled Trades (ST)	o Responsiveness to change o Up-skilling to support, and then carry out, AP o Relevant STEM o Business-Improvement Technique (B-IT) support	o Responsiveness to change o Skills to support and enable technical change o Up-skilling to support, and then carry out, AP o Relevant STEM
Sales and Customer Service	o Responsiveness to change o Skills to support new marketing thrusts, in understanding of e-business and export	o Responsiveness to change o Skills to support new marketing thrusts, in understanding of e-business and export
Process, Plant and Machine	o Responsiveness to change o Up-skilling to support, and then carry out, ST o Some relevant STEM	o Responsiveness to change o Up-skilling to support, and then carry out, ST o Some relevant STEM
All	o Responsiveness to change o Strengthened team-work and understanding of - and commitment to new business directions and o Commercial and cost	o Responsiveness to change o Strengthened team-work and understanding of - and commitment to new business directions and o Commercial and cost

Table 7.6 shows the kinds of skills and expertise that are likely to be needed more in the coming years within each broad occupational group of particular relevance within Manufacturing. As will be clear from the analysis in Section 6, the importance of each element will vary considerably between the different sub-sectors of Manufacturing, but as can be seen, these needs have been stated in sufficiently broad terms that there is likely to be some relevance in most production industries.

It should be noted that much of the expertise required to respond to the likely forthcoming challenges and market developments is required within the leadership of the business – in both senior management and professional roles. The changes that will often be required to what is done, and how it is done, mean that the staff team as a whole must be ready both to adjust and adapt, and to play their part in ensuring the success of the new directions and approaches. Where the changes involve technical understanding therefore, those in both Associate Professional and Skilled Trades roles will – as shown - need to respond actively and support the technical leadership in the introduction of new products and processes. The achievement of such 'hearts and minds' commitment to significant change is, of course, a major part of the leadership challenge within change programmes generally. In addition, some activities that are initially carried out by those in professional roles (e.g. compliance management tasks) can often, in principle, be delegated to less senior staff once they are fully briefed and have acquired expertise, and gained experience, with the relevant technical area. This is shown by the picking up, in the longer term, of certain "Professional" tasks by Associate Professionals and "Associate Professional" tasks by those with Skilled Trades.

In addition to opportunities for 'delegation' of certain activities, it is important for the senior management to consider the career progression of more junior staff: Table 7.6 also shows how, with the expected continued attrition in overall numbers of those with Skilled Trades, and Operative, it is important for enterprises to retain the skills of good contributors by enabling promotion possibilities, by providing learning opportunities to enable more junior staff to perform more and more of the functions normally associated with occupations at higher skill levels.

These skill needs that are expected to grow in the coming years focus primarily on the effects of the macro trends examined in Section 6. They do not include possible responses to the various issues identified in the previous detailed analyses of the current workforce, and these will be considered in Section 8.

It is apparent that the sector will need to meet its future skill needs against a backdrop of a decline in overall employment. Potentially this sends a rather negative signal to the labour market. A challenge for the sector, if it is to avoid future skill shortages, is to persuade people whose skills are in high demand in other sectors – such as STEM related ones – of the merits of pursuing a career in Manufacturing.

8 Priority areas for action

Summary

This Section presents a set of Priority areas for action, drawing on the evidence of the analysis in this report. Looking to the future the priorities for the sector relate to:

- ensuring that employers' product market strategies are sufficiently well developed so that they can anticipate changes in the segment of the market in which they operate. This emphasises the need to develop strategic skills in the sector
- but is not just the skills of the more senior managers which need addressing. There is also a need to ensure that the skills of new recruits and existing employees are also developed, especially since there is evidence that training levels might be relatively low
- training needs to be embedded within the wider set of practices associated with high performance working including work-life balance practices which might contribute to a more diverse workforce as well as a more productive one
- it is possible that as the economy recovers and the demand for manufacturing increases, that skill-shortages will emerge which will potentially constrain any growth. It is important, therefore, that the investment in training the existing workforce alongside the adoption of high performance practices likely to make the sector more attractive to would-be recruits takes place
- there are also a range of specialist skills which the sector will need to acquire over the medium-term, including those related to supply-chain management
- the sector will increasingly compete with other sectors to recruit the people with the skills it needs. The pressing issue, therefore, is to convince people of the relative merits of choosing a career in manufacturing. Many of the UK's leading manufacturers have succeeded in achieving this. It is important the practices associated with achieving this goal are adopted more widely.

UK Manufacturing has a wide range of strengths, but market conditions are challenging. Raising the skill-sets of each company's team to world-class levels will form an inevitable part of companies' responses to the challenge.

Skills policy priorities are set within the developing policy context of each of the four UK nations. Pressures on public expenditure mean that skills policy action must deliver more impact for each unit of resource. A major element of how this can be achieved will be the 'leadership' role that the UK Commission, together with SSCs, can play in encouraging and catalysing employer action. This will involve skills policy preparing, and effectively delivering, compelling arguments for employers to take their skills management even more seriously, and to consider greater investments in skills, where these have been properly assessed, and in accordance with business priorities.

The evidence in this Sector Skills Assessment, from a wide range of indicators, and in comparison with other sectors and with whole economy norms, does not suggest any dramatic difference to the analyses and current action plans of the relevant Sector Skills Councils. But that does not mean there is no need for action.

This report has focused primarily on the assessment of skills demand, and the factors that will affect that demand in the coming years. Without a corresponding thorough assessment of supply, and the resultant gap analysis, no direct conclusions can be drawn about what action might be needed on the supply side, over which policy has more direct influence. Given the general shift towards more market oriented solutions to ensuring that skills supply meets skill demand , within skills policy, away from 'command and control' institutional arrangements towards ways of helping the relevant markets to work better, as well as the realities of the different policy emphases within the four nations, that is both understandable and appropriate.

The emphasis within this section is therefore on messages to the individual employer, rather than recommendations for skills policy.

Given the trends laid out in Section 7, the analysis in this report would, at a broad level, support several of the key messages from the carried out by the UK Commission. In particular (UKCES, 2010a):

> The Audit identifies the fundamental importance of increasing skill levels to future economic growth over the longer term. In particular important skills areas include:
>
> - management and leadership skills, and especially corporate managers across a wide range of sectors;

- professional skills in the computing and software sector, in parts of health and social care, in pharmaceutical and medical technology, in manufacturing (i.e. traditional and advanced), especially for STEM skills, and in teaching and research;
- technician and equivalent skills across many sectors, such as health and social care, utilities, chemicals, life sciences and pharmaceuticals, automotive engineering and broadcasting;
- intermediate vocational skills within sectors such as manufacturing, engineering, processing and construction associated with skilled trades as the current ageing workforce retires and emerging opportunities develop in some sectors and to support future demand at technician level.

There are a number of issues which the sector needs to address over the medium-term. These can be considered with respect to each of the broad subject areas covered in this review: the performance of the sector; the composition and skills of the workforce; skill mismatches; and future challenges and emerging skill needs.

In relation to the performance of the sector there is evidence that productivity levels have risen quite considerably over the recent past. This clearly needs to be maintained. The issue for the future is not so much to ensure that all manufacturing is in relatively high value-added markets - such as, for instance, the aerospace and defence related sub-sectors - but to ensure that employers are equipped the know-how to survive in whatever segment of the market they are operating. This relates to possessing the appropriate production techniques and concomitant forms of work organisation, as well as the ability to adapt in good time to changing market demands (Davis *et al.*, 2001; Davis *et al.*, 2012). How employers respond is dependent upon their current market position and how this is likely to change over the medium-term (*e.g.* if a niche product increasingly becomes a mass consumer good – *c.f.* mobile telephones over the 1990s and 2000s – then employers will either need to adapt their product market strategy to accommodate this change or move out of this particular market). Davis's criticism in his 2001 report was that too many manufacturers react to change rather than anticipate it when, in fact, the trajectory of any given product from being a niche one to one which is increasingly commoditised is a well known one (Davis, *et al*.,2001).

The role of skills in this respect is of central importance in relation to both the strategic management skills required to devise the appropriate product market strategies and the in possessing the tactical skills which will ensure that the product market strategy is realisable.

The evidence in this report points to a number of factors which need addressing with respect to ensuring that the workforce is suitably equipped with the skills it needs. In particular:

- The workforce is not particularly diverse despite a number of campaigns to bring this about. In particular, women are disproportionately under-represented in the manufacturing workforce. This may well relate, at least in part, to working patterns in the sector which are mainly full-time – and which sometimes involve shift-work – and are therefore not amenable to women with children of school-age. But the fact remains that so long as the workforce is not representative of the labour force as a whole, the sector is likely to missing out on the opportunity to recruit many suitably qualified and skilled personnel.
- The sector has a relatively aged workforce such that there are likely to be substantial exits from the workforce over the medium-term as people retire. The recruitment of young people is relatively low compared to other sectors. This raises the possibility that the sector may be inadvertently heading towards future labour and skill shortages unless further consideration is given to future labour and skill needs.
- The adoption of high performance working practices is not particularly pronounced in the sector despite many of the pioneering studies on HPWs being conducted in the manufacturing sector. There is clearly scope to promote these more effectively given their relationship with relatively good organisational performance.
- Levels of workforce development are below the UK average and UK manufacturers provide fewer hours of training than their European counterparts. As has been emphasised throughout this report the sector is one which relies upon innovation, R&D, and the adoption of new technologies in production processes and goods. Workforce development needs to go hand-in-hand with these developments otherwise there is the danger that technological change will bring about sub-optimum results.

Workforce development draws attention to the issue of skill mismatches. The analysis reveals that Manufacturing employer are less likely to post vacancies, but where employers have vacancies these are more likely to result in hard-to-fill and skill-shortage vacancies than in the economy as a whole. At the time of writing the 2010/11 recession has dampened the demand for labour. This suggests that when the economy resumes its long-term growth trend and employment levels begin to pick up, employers will be more likely to post vacancies and these will be, in all likelihood, difficult to fill, resulting in organisational performance being constrained in a number of ways. It is also apparent that the skill gaps are relatively high in the sector – that is, employers feel that their existing workforce are not fully proficient at their existing jobs to meet business needs.

These findings in relation to skill-shortages and skill gaps point to the need for the sector to invest more in the training and development of its workforce. But it is not simply about training, it relates much more the wider set of high performance work practices which emphasise the need to develop a working environment which is attractive to would-be recruits and which will encompass work-life balance practices alongside those which effectively utilise extant skills in the workforce.

Looking to the future, the workforce will increasingly comprise people with relatively high level qualifications and skills. The manufacturing workforce of the future will be increasingly comprised of people who have relatively high levels of educational attainment working in managerial, professional, and associate professional occupations. There are likely to be more specialists working in R&D, finance, supply-chain management, human resources, *etc.* Many of the skills the sector will be looking are in demand by other sectors, especially STEM skills. The sector, against a backdrop of a declining number of employees, needs to be able to demonstrate the relative merits of choosing manufacturing over careers in other sectors if it is to attract the skills it requires. In doing so, it will need to consider recruiting from a wider range of people than it currently does it is to make the optimum use of the skills potentially available to it.

The evidence presented in this report which reflected upon the drivers of change identified the specific types of skill need which are emerging which include, *inter alia*:

i. the management of innovation and exploitation of its results including more expertise in NPDI, and, in some cases, R&D;
ii. demand for STEM skills at all levels of the workforce;
iii. skills related to business-improvement techniques (e.g. effective introduction of techniques like Six Sigma, Lean Manufacturing, Kaizen & “5S”);
iv. regulation compliance skills;
v. export marketing and e-business skills;
vi. change management expertise;
vii. supply-chain management skills.

Table 7.6 in the previous chapter indicates the changing nature of skills on an occupational basis.

As indicated at the outset (Section 1.3), a wealth of additional research resources on skills priorities for the different sub-sectors, and industry 'segments', within UK Manufacturing can be found on the websites of the relevant Sector Skills Councils, as shown in Table 8.1.

Table 8.1: Sources of a wide range of more detailed skills priority information for individual industries

Manufacturing sub-sector	weblink*
Manufacture of food products	http://improveltd.co.uk/england/food-industry-research-and-insight
Manufacture of beverages	
Manufacture of textiles	http://www.creativeskillset.org/research
Manufacture of wearing apparel	
Manufacture of leather and related goods	
Manufacture of coke and refined petroleum products	http://www.cogent-ssc.com/research
Manufacture of chemicals and chemical products	
Manufacture of basic pharmaceutical products	
Manufacture of rubber and plastic products	
Manufacture of wood and wood products	http://www.proskills.co.uk/research
Manufacture of paper and paper products	
Manufacture of other non-metallic products	
Manufacture of furniture	
Manufacture of basic metals	http://semta.org.uk/media/facts-figures
Manufacture of fabricated metal products	
Manufacture of computer, electronic and optical products	
Manufacture of electrical equipment	
Manufacture of machinery and equipment nec	
Manufacture of motor vehicles	
Manufacture of other transport equipment	
Repair and installation of machinery and equipment	
Scientific research and development	
Other manufacture (including production of Jewellery and Musical Instruments)	http://www.creative-blueprint.co.uk
Manufacture of Fitness and Leisure products	http://www.skillsactive.com/what_we_do/research

* as of April, 2012

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Glossary of Abbreviations

ABI	Annual Business Inquiry (now Annual Business Survey)
ASHE	Annual Survey of Hours and Earnings
BAME	Black, Asian or Minority Ethnic
BDO LLP	BDO is the UK member of BDO international accountants
BERR	(former department of) Business, Innovation and Regulatory Reform
BIS	(Department for) Business, Innovation and Skills
BRES	Business Register Employment Survey
BRICS	Brazil, Russia, India, China and South Africa (economic grouping)
BSE	Bovine Spongiform Encephalitis
BTEC	(Business and Technician Education Council)
CCAs	Climate Change Agreements
CCS	Creative & Cultural Skills (SSC), also Carbon Capture and Storage
CIPD	Chartered Institute for Personnel and Development
CIPS	Chartered Institute for Purchasing and Supply
CIS	(European) Community Innovation Survey
CMO	Contract Manufacturing Outsourcing (companies)
COMAH	Control of Major Accident Hazards
COSHH	Control of Substances Hazardous to Health
CPA	Classification of Product by Activity (for ONS Export data)
CPD	Continuing Professional Development
CRC	Carbon Reduction Commitment
CVT	Continuing Vocational Training (European training concept)
DETI	Department of Enterprise, Trade and Investment (NI)
DLHE	(HESA) Destinations of Leavers from Higher Education (survey)
DTI	Department of Trade and Industry
EAMA	Engineering and Machinery Alliance
EEA	European Economic Area

EEF	Engineering Employers Federation
ESRC	Economic and Social Research Council
ESS	Employer Skills Survey
EU	European Union
EU ETS	EU Emission Trading Scheme
FDI	Foreign Direct Investment
FDMP	Food and Drink Manufacturing and Processing
FTE	Full Time Equivalent
GCSE	General Certificate of Secondary Education
GDP	Gross Domestic Product
GNVQ/GSVQ	General/Scottish National Vocational Qualification (former qualification)
GVA	Gross Value Added
HE	Higher Education
HESA	Higher Education Statistics Agency
HMG	Her Majesty's Government
HPW(P)	High Performance Working (Practices)
HR	Human Resources
HRM	Human Resource Management
HTFV	Hard To Fill Vacancies
ICT	Information and Communication Technologies
IDBR	Inter-Departmental Business Register
IER	Institute for Employment Research (University of Warwick)
IES	Institute for Employment Studies (University of Sussex)
ISIC	International Standard Industrial Classification
IT	Information Technology
IPR	Intellectual Property Rights
LFS	Labour Force Survey
LLAKES	(ESRC Centre for) Learning and Life Chances in Knowledge Economies and Societies

LSIS	Learning and Skills Improvement Service
MAC	Migration Advisory Committee
MG	(SOC) Major Group
MoD	Ministry of Defence
NACE	Nomenclature des Activités Économiques dans la Communauté Européenne (EU Economic activity classification)
NESTA	National Endowment for Science, Technology and the Arts
NI	Northern Ireland
NICE	National Institute for Health and Clinical Excellence (NICE).
NIESR	National Institute for Economic and Social Research
NPDI	New Product Development and Introduction
N/SVQ	National/Scottish Vocational Qualifications
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
PMI	(Markit/CIPS) Purchasing Managers' Index
PPRS	Pharmaceutical Price Regulation Scheme
QALI	Quality-Adjusted Labour Input
R&D	Research and Development
REACH	Registration, Evaluation, Authorisation and restriction of *Chemicals*
SIC	Standard Industrial Classification
SKOPE	(ESRC Centre for) Skills, Knowledge and Organisational Performance
SMEs	Small and Medium-sized Enterprises
SOC	Standard Occupational Classification
SQA	Scottish Qualifications Authority
SSA	Sector Skills Assessment
SSC	Sector Skills Council
SSV	Skill Shortage Vacancy
STEM	Science, Technology, Engineering and Mathematics
TSB	Technology Strategy Board

UKCES	UK Commission for Employment and Skills
UK ESS	UK Commission's Employer Skills Survey
VET	Vocational Education and Training
WAG	Welsh Assembly Government

Technical appendix

Methodology

The provision of core data

To ensure consistency and comparability across all 15 SSA reports, data from core labour market information sources was centrally collected, processed and formatted. It was then distributed by the UK Commission to Sector Skills Councils for inclusion within the reports.

Core data was centrally produced from the following sources:

- The Labour Force Survey
- The Annual Survey of Hours and Earnings
- The UK Commission's Employer Skills Survey 2011
- Working Futures 2010-2020
- Regional Accounts (information on Gross Value Added)
- Mid Year Population Estimates
- European Continuing Vocational Training Survey
- Business Demography Statistics

Data from the Labour Force Survey, regional accounts and mid-year population estimates was collated, processed and formatted by Cambridge Econometrics and the Institute for Employment Research (IER), Warwick.

Data from the Annual Survey of Hours and Earnings was collated, processed and formatted by Cambridge Econometrics.

Data from the UK Commission's Employer Skills Survey 2011 was collated and processed by IFF Research and formatted by the UK Commission.

Data from Working Futures was collated, processed and formatted by IER.

Data from the European Continuing Vocational Training Survey and Business Demography Statistics was collated, processed and formatted by the UK Commission.

All data was quality assured by contractors, the UK Commission and by Sector Skills Councils.

It has been necessary to suppress some data within the reports to adhere to official guidelines regarding data quality. The details of suppression strategies applied to data from specific sources are described in more detail below. Data for Scotland, Wales and Northern Ireland for the three smallest SSA sectors is most likely to be suppressed. These are:

- Agriculture, forestry and fishing
- Energy production and utilities
- Information and communication technologies)

Methodological information for core labour market information sources

Method used to derive estimates of gross value added (GVA) per employee job by SSA sector and nation

No official estimates are currently available for the level of productivity by sector and UK nation. The figures presented in this report have therefore been estimated by the UK Commission using the following process.

Levels of workplace gross value added at current basic prices by SIC 2007 Section were derived from the official estimates published by the Office for National Statistics as part of its Regional Accounts series. Levels of employee jobs were taken from the Business Register and Employment Survey for 2009.

The sectoral "footprint" definitions used as the basis for the SSA reports are not coterminous with SIC Sections, however, and in some cases draw on 2-digit SIC divisions. At present the official GVA estimates for nations and regions are only available at a SIC section level.

To overcome this an approach was used which has been developed by Welsh Government to derive gross value added estimates for its priority sectors. This same approach was applied to the SSA sectors across the UK nations. Approximate estimates of GVA at 2-digit level are available for much of the economy from the Annual Business Survey (ABS). These were used to allocate GVA at the 2-digit level with the results being constrained to the official GVA totals by SIC section taken from the Regional Accounts. For those areas of the economy not covered by the ABS, shares of employment at the 2-digit level were used instead, taken from the Annual Population Survey.

Labour Force Survey

About the survey

One of the key data sources used within this report is the Office for National Statistics' (ONS) Labour Force Survey (LFS). The LFS is a survey of households living at private addresses (plus in NHS accommodation and student halls of residence) in the UK.

The survey is conducted on a quarterly basis. The sample is made up of around 41,000 responding (or imputed) households in Great Britain every quarter, and around 1,600 households in Northern Ireland. The LFS uses a rotational sampling design which means that, once selected, a household[35] is kept in the sample for a total of five consecutive quarters.

Interviewers can take answers to questions by proxy if a respondent is unavailable. This is usually from another related adult who is a member of the same household. About a third of LFS responses are collected by proxy. Information on individuals aged 16 – 19 most likely to be obtained by proxy.

Full user guidance can be accessed here: http://www.ons.gov.uk/ons/guide-method/user-guidance/labour-market-statistics/index.html

Preparation of LFS data for this report

The UK Commission provided report authors with a core set of tables based on LFS data for mandatory inclusion within Sector Skills Assessment reports. The data within these tables was prepared by two contractors: Cambridge Econometrics (CE) and Warwick Institute for Employer Research (IER).

Data was prepared in three stages:

1. The original survey data was gathered and coded by IER to the categories and classifications required for the SSA tables. This was then sent to CE
2. CE used the data prepared by IER and derived the indicators and aggregated the data to the dimensions required for the tables
3. The UK Commission checked tables and distributed to report authors

[35] Note, it is the address that is selected and not necessarily the particular people who live there.

Annual data presented within this report is based on an average of four consecutive quarters of data. Data prior to 2009 is based on SIC2003 and data for 2009 and 2010 is based on SIC2007 codes.

Reporting of LFS data

In line with ONS convention, annual LFS data presented within this report has been suppressed if individual cell sizes fall below 6,000. This is because cell sizes of fewer than 6,000 are deemed to be low quality estimates.

Analysis of employment uses all four categories of employments status within the LFS: employee, self-employed, government scheme & unpaid family worker.

Please note, some tables present a total for *All sectors* while others present a total for *Whole economy*. The values for these totals are different because the *Whole economy* total includes the 'Not within scope' category (i.e. sectors that don't fall within an SSA sector), whereas *All sectors* is the total for just the 15 SSA sectors.

Annual Survey of Hours and Earnings

The Office for National Statistics' Annual Survey of Hours and Earnings (ASHE) is based on a 1 per cent sample of employee jobs taken from HM Revenue & Customs (HMRC) PAYE records. Information on earnings and hours is obtained from employers and treated confidentially. ASHE does not cover the self-employed nor does it cover employees not paid during the reference period. In 2011 information related to the pay period which included 13 April.

It should be noted that it was not possible to provide a detailed breakdown by sector for each nation. Too much missing data for number of workers in the ASHE raw data makes it difficult to produce reliable weighted average wages across both nations and sectors. This is why only the overall average wages have been included for each nation in Table 2 of the 'All sectors' she

UK Commission's Employer Skills Survey 2011

The UK Commission's Employer Skills Survey 2011 (UK Commission's ESS 11) was the first large-scale economy-wide employer skills survey to be conducted across the whole of the UK. The survey was managed by the UK Commission for Employment and Skills and was conducted by three contractors: IFF Research, BMG Research and Ipsos Mori (Davies et al, 2012). The project steering group included representatives from all four nation

governments, the Alliance of Sector Skills Councils, the Department for Work and Pensions and the Skills Funding Agency.

Fieldwork was carried out from March to July 2011. Two waves of interviews were conducted. The main survey involved telephone interviews with approximately 87,600 employers and a follow-up survey focusing on investment in training was undertaken with over 11,000 respondents. The data presented within this report draws only on information gathered from the main survey.

The table below provides information on the number of employers interviewed by sector and nation for the main survey.

SSA sector	England	Scotland	Wales	NI	UK
Agriculture, forestry and fishing	1,270	99	133	45	1,547
Energy production and utilities	1,306	106	133	69	1,614
Manufacturing	6,774	182	470	350	7,776
Construction	7,538	300	660	463	8,961
Wholesale and retail trade	13,919	333	1,129	769	16,150
Transportation and storage	4,078	152	300	205	4,735
Accommodation, food and tourism activities	9,630	324	909	455	11,318
Information and communication	2,262	56	111	81	2,510
Creative media and entertainment	3,301	99	227	135	3,762
Financial, insurance & other professional services	4,525	146	391	281	5,343
Real estate and facilities management	3,113	85	133	93	3,424
Government	2,078	163	188	176	2,605
Education	4,597	164	391	287	5,439
Health	2,912	107	242	137	3,398
Care	4,028	101	338	296	4,763
Not within scope	3,722	86	257	162	4,227
Total	75,053	2,503	6,012	4,004	87,572

UK Commission's ESS 11 is a quota survey. Quotas were set on a size by sector within nation / English region basis. In Northern Ireland and Wales, where more interviews were carried out than the required minimum to get national representation, they were predominately distributed in proportion to the population.

In order to include the maximum number of questions without extending the overall length of the interview, the sample was randomly split in half for some sections, and one set of employers were asked one module of questions, and the other half of the sample different questions.

The survey is a local unit (establishment) survey. This means that for large multi-site organisations several branches/ locations may have been interviewed. The establishment level sampling reflects that the survey asks employers about issues that need to be answered by people with day-to-day contact with employees rather than head office.

Respondents are those who have the best overview of HR and training within the establishment. This will tend to be HR or training managers in large establishments and owner/managers or senior managers within small establishments.

The valid population of establishments being used in UK Commission's ESS 11 is all establishments with the exception of sole traders (this means that establishments with one employee and no working proprietors (for e.g. flower stall at a station, where there is one person working but they don't own it themselves) are included). In addition, establishments with multiple working proprietors but no employees are also included.

Sampling error for the survey results overall and for different sub-groups by which analysis is presented in the report is shown in the table below. Sectoral figures are presented for the 14 SIC 2007 sections which were used for the survey sampling approach.

Figures have been based on a survey result of 50 per cent (the 'worst' case in terms of statistical reliability), and have used a 95 per cent confidence level. Where the table indicates that a survey result based on all respondents has a sampling error of +/- 0.32 per cent, this should be interpreted as follows: 'for a question asked of all respondents where the survey result is 50 per cent, we are 95 per cent confident that the true figure lies within the range 49.68 per cent to 50.32 per cent'.

As a note, the calculation of sampling error has taken into account the finite population correction factor to account for cases where we are measuring a significant portion of the population universe (i.e. even if two sample sizes are the same, the sampling error will be lower if in one case a far higher proportion of the population was covered).

These confidence intervals are based on the assumption of a normal distribution of responses.

Sampling error (at the confidence 95 per cent level) associated with findings of 50 per cent

	Population	Number of interviews	(Maximum) Sampling Error
Overall	**2,299,921**	**87,572**	**+/-0.32**
By country			
England	1,960,298	75,053	+/-0.35
Northern Ireland	65,559	4,004	+/-1.5
Scotland	175,114	2,503	+/-1.94
Wales	98,950	6,012	+/-1.22
By size of establishment			
1-4	1,466,397	18,955	+/-0.99
5-24	648,446	47,770	+/-0.61
25-99	147,319	15,951	+/-1.03
100-249	25,945	3,270	+/-2.27
250+	11,814	1,626	+/-3.12
By sector			
Agriculture	98,458	939	+/-3.18
Mining & Quarrying	2,222	188	+/-6.84
Manufacturing	128,255	7,704	+/-1.08
Electricity, Gas and Water	10,583	1,426	+/-3.35
Construction	241,429	6,654	+/-1.18
Wholesale and Retail	441,365	15,340	+/-0.78
Hotels & Restaurants	167,215	8,471	+/-1.04
Transport and Communications	210,801	7,885	+/-1.08
Financial Services	52,381	1,881	+/-2.22
Business Services	551,612	14,488	+/-0.80
Public Administration	26,058	1,617	+/-2.36
Education	65,499	5,439	+/-1.27
Health and Social Work	140,269	8,161	+/-1.05
Community, Social and Personal Services	163,774	7,379	+/-1.11

Looking specifically at sampling error for SSA sectors at national level, Agriculture in Scotland provides an illustrative example. 99 interviews were completed for this sub-group. Applying the assumptions outlined above, this gives a maximum sampling error of around +/- 10 percentage points. This demonstrates the indicative nature of the detailed survey estimates for smaller sectors.

Within the report, data based on unweighted bases of less than 25 have therefore been suppressed for quality reasons. In addition, data based on unweighted bases of between 25 and 50 have been marked as indicative. More stringent thresholds have been applied in Scotland because of the lower total number of interviews that were conducted. Estimates based on unweighted bases of fewer than 50 have been suppressed, whilst estimates based on bases of 50-99 are marked as indicative in the relevant tables.

Finally, occupations within the survey are defined by 2010 Standard Occupational Classification codes and sectors are defined by 2007 Standard Industrial Classification codes.

Please visit the UK Commission's Employer Surveys website for further information including the full survey report and questionnaire. https://ness.ukces.org.uk/default.aspx

Working Futures

Working Futures 2010-2020 is the latest in a series of detailed projections of UK employment, productivity, labour supply and skills. The projections have been prepared by the Institute for Employment Research (IER) and Cambridge Econometrics (CE) on behalf of the UK Commission for Employment and Skills (UKCES).

The projections are calculated from a number of different data sources, including the Annual Business Inquiry, the Business Register and Employment Survey, and the Labour Force Survey. The results provide a picture of employment prospects up to 2020 by industry, occupation, qualification level, gender and employment status for the UK as a whole, the four nations, and English regions.

As with all projections and forecasts, the results presented in Working Futures should be regarded as indicative of likely trends and orders of magnitude given a continuation of past patterns of behaviour and performance, rather than precise forecasts of the future. At a time of great uncertainty about the short to medium term prospects for the economy, it is important to stress the value of Working Futures in aiding understanding of likely prospects for employment in the longer term (i.e. in 2020). Readers should therefore focus on the

relative position of sectors, and occupations in 2020 and treat the projected values as broad indicators of scale rather than exact predictions.

Further methodological details can be found on the UK Commission's website - http://www.ukces.org.uk/publications/working-futures-technical-report

Annexes

Annex A

Definitions of Manufacturing Sub-sectors

Definitions of Manufacturing Sub-sectors

(Source: SIC 2007: Structure and explanatory notes, Office for National Statistics, 2009

SIC07 codes	Sub-sector Category	Category contents
10	Manufacture of food products	This division includes the processing of the products of agriculture, forestry and fishing into food for humans or animals, and includes the production of various intermediate products that are not directly food products. The activity often generates associated products of greater or lesser value (for example, hides from slaughtering, or oilcake from oil production). This division is organised by activities dealing with different kinds of products: meat, fish, fruit and vegetables, fats and oils, milk products, grain mill products, animal feeds and other food products. Production can be carried out for own account, as well as for third parties, as in custom slaughtering. Some activities are considered manufacturing (for example, those performed in bakeries, pastry shops, and prepared meat shops etc. which sell their own production) even though there is retail sale of the products in the producers' own shop. However, where the processing is minimal and does not lead to a real transformation, the unit is classified to wholesale and retail trade (SIC section G). Preparation of food for immediate consumption on the premises is classified to division 56 (Food and beverage service activities). Production of animal feeds from slaughter waste or by-products is classified in 10.9, while processing food and beverage waste into secondary raw material is classified to 38.3, and disposal of food and beverage waste in 38.21. This division does not include the preparation of meals for immediate consumption, such as in restaurants.
11	Manufacture of beverages	This division includes the manufacture of beverages, such as non-alcoholic beverages and mineral water, manufacture of alcoholic beverages mainly through fermentation, beer and wine, and the manufacture of distilled alcoholic beverages. *This division excludes:* *— production of fruit and vegetable juices, see 10.32* *— manufacture of milk-based drinks, see 10.51* *— manufacture of coffee, tea and maté products, see 10.83*
12	Manufacture of tobacco products	This division includes the processing of an agricultural product, tobacco, into a form suitable for final consumption.

13	Manufacture of textiles	This division includes preparation and spinning of textile fibres as well as textile weaving, finishing of textiles and wearing apparel, manufacture of made-up textile articles, except apparel (e.g. household linen, blankets, rugs, cordage etc.). Growing of natural fibres is covered under division 01, while manufacture of synthetic fibres is a chemical process classified in class 20.60. Manufacture of wearing apparel is covered in division 14.
14	Manufacture of wearing apparel	This division includes all tailoring (ready-to-wear or made-to-measure), in all materials (e.g. leather, knitted and crocheted fabrics etc.), of all items of clothing (e.g. outerwear, underwear for men, women or children; work, city or casual clothing etc.) and accessories. There is no distinction made between clothing for adults and clothing for children, or between modern and traditional clothing. Division 14 also includes the fur industry (fur skins and wearing apparel).
15	Manufacture of leather and related good	This division includes dressing and dyeing of fur and the transformation of hides into leather by tanning or curing and fabricating the leather into products for final consumption. It also includes the manufacture of similar products from other materials (imitation leathers or leather substitutes), such as rubber footwear, textile luggage etc. The products made from leather substitutes are included here, since they are made in ways similar to those in which leather products are made (e.g. luggage) and are often produced in the same unit.
16	Manufacture of wood and wood products	This division includes the manufacture of wooden products, such as timber, plywood, veneers, wooden containers, wooden flooring, wooden trusses, and prefabricated wooden buildings. The production processes include sawing, planing, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or timber that may then be cut further, or shaped by lathes or other shaping tools. The timber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wooden containers.
17	Manufacture of paper and paper products	This division includes the manufacture of pulp, paper and converted paper products. The manufacture of these products is grouped together because they constitute a series of vertically connected processes. More than one activity is often carried out in a single unit. There are essentially three activities: The manufacture of pulp involves separating the cellulose fibres from other matter in wood, or dissolving and de-inking of used paper, and mixing in small amounts of reagents to reinforce the binding of the fibres. The manufacture of paper involves releasing pulp onto a moving wire mesh so as to form a continuous sheet. Converted paper products are made from paper and other materials by various techniques. The paper articles may be printed (e.g. wallpaper, gift wrap etc.), as long as the printing of information is not the main purpose. The production of pulp, paper and paperboard in bulk is included in group 17.1, while the remaining classes include the production of further-processed paper and paper products.

18	Printing and reproduction of recorded media	This division includes printing of products, such as newspapers, books, periodicals, business forms, greeting cards, and other materials, and associated support activities, such as bookbinding, plate-making services, and data imaging. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations. Processes used in printing include a variety of methods for transferring an image from a plate, screen or computer file to a medium, such as paper, plastics, metal, textile articles, or wood. The most prominent of these methods entails the transfer of the image from a plate or screen to the medium through lithographic, gravure, screen or flexographic printing. Often a computer file is used to directly ''drive'' the printing mechanism to create the image or electrostatic and other types of equipment (digital or non-impact printing). Though printing and publishing can be carried out by the same unit (a newspaper, for example), it is less and less the case that these distinct activities are carried out in the same physical location. This division also includes the reproduction of recorded media, such as compact discs, video recordings, software on discs or tapes, records etc. This division excludes publishing activities (see SIC section J).
19	Manufacture of coke and refined petroleum products	This division includes the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining which involves the separation of crude petroleum into component products through such techniques as cracking and distillation. This division also includes the manufacture for own account of characteristic products (e.g. coke, butane, propane, petrol, kerosene, fuel oil etc.) as well as processing services (e.g. custom refining). This division includes the manufacture of gases such as ethane, propane and butane as products of petroleum refineries. Not included, is the manufacture of such gases in other units (20.14), manufacture of industrial gases (20.11), extraction of natural gas (methane, ethane, butane or propane) (06.20), and manufacture of fuel gas, other than petroleum gases (e.g. coal gas, water gas, producer gas, gasworks gas) (35.21). The manufacture of petrochemicals from refined petroleum is classified in division 20.
20	Manufacture of chemicals and chemical products	This division includes the transformation of organic and inorganic raw materials by a chemical process and the formation of products. It distinguishes the production of basic chemicals that constitute the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry classes.
21	Manufacture of basic pharmaceutical products	This division includes the manufacture of basic pharmaceutical products and pharmaceutical preparations. This includes also the manufacture of medicinal chemical and botanical products.
22	Manufacture of rubber and plastic products	This division includes the manufacture of rubber and plastics products. This division is characterised by the raw materials used in the manufacturing process. However, this does not imply that the manufacture of all products made of these materials is classified here.

23	Manufacture of other non-metallic products	This division includes manufacturing activities related to a single substance of mineral origin. This division includes the manufacture of glass and glass products (e.g. flat glass, hollow glass, fibres, technical glassware etc.), ceramic products, tiles and baked clay products, and cement and plaster, from raw materials to finished articles. The manufacture of shaped and finished stone and other mineral products is also included in this division.
24	Manufacture of basic metals	This division includes the activities of smelting and/or refining ferrous and non-ferrous metals from ore, pig or scrap, using electrometallurgic and other process metallurgic techniques. This division also includes the manufacture of metal alloys and super-alloys by introducing other chemical elements to pure metals. The output of smelting and refining, usually in ingot form, is used in rolling, drawing and extruding operations to make products such as plate, sheet, strip, bars, rods, wire or tubes, pipes and hollow profiles and in molten form to make castings and other basic metal products.
25	Manufacture of fabricated metal products	This division includes the manufacture of "pure" metal products (such as parts, containers and structures), usually with a static, immovable function, as opposed to the following divisions 26-30, which cover the manufacture of combinations or assemblies of such metal products (sometimes with other materials) into more complex units that, unless they are purely electrical, electronic or optical, work with moving parts. The manufacture of weapons and ammunition is also included in this division. *This division excludes:* *— specialised repair and maintenance activities, see 33.1* *— specialised installation of manufactured goods produced in this division in buildings, such as central heating boilers, see 43.22*
26	Manufacture of computer, electronic and optical products	This division includes the manufacture of computers, computer peripherals, communications equipment, and similar electronic products, as well as the manufacture of components for such products. Production processes of this division are characterised by the design and use of integrated circuits and the application of highly specialised miniaturisation technologies.
27	Manufacture of electrical equipment	This division includes the manufacture of products that generate, distribute and use electrical power. Also included is the manufacture of electrical lighting, signalling equipment and electric household appliances. This division excludes the manufacture of electronic products (see division 26).
28	Manufacture of machinery and equipment nec	This division includes the manufacture of machinery and equipment that acts independently on materials either mechanically or thermally or performs operations on materials (such as handling, spraying, weighing or packing), It includes their mechanical components which produce and apply force, and any specially manufactured primary parts. This includes the manufacture of fixed and mobile or hand-held devices, regardless of whether they are designed for industrial, building and civil engineering, agricultural or home use. The manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division. This division distinguishes between the manufacture of special-purpose machinery, i.e. machinery for exclusive use in a specific industry or a small cluster

		of specific industries, and general-purpose machinery, i.e. machinery that is being used in a wide range of industries. This division also includes the manufacture of other special purpose machinery, not covered elsewhere in the classification, whether or not used in a manufacturing process, such as fairground amusement equipment, automatic bowling alley equipment, etc. This division excludes the manufacture of metal products for general use (division 25), associated control devices, computer equipment, measurement and testing equipment, electricity distribution and control apparatus (divisions 26 and 27) and general-purpose motor vehicles (divisions 29 and 30).
29	Manufacture of motor vehicles	This division includes the manufacture of motor vehicles for transporting passengers or freight. The manufacture of various parts and accessories, as well as the manufacture of trailers and semi-trailers, is included here. The maintenance and repair of motor vehicles produced in this division are classified in 45.20.
30	Manufacture of other transport equipment	This division includes the manufacture of transportation equipment such as ship building and boat manufacturing, the manufacture of railway rolling stock and locomotives, air and spacecraft and the manufacture of parts thereof.
31	Manufacture of furniture	This division includes the manufacture of furniture and related products of any material except stone, concrete and ceramic. The processes used in the manufacture of furniture are standard methods of forming materials and assembling components, including cutting, moulding and laminating. The design of the article, for both aesthetic and functional qualities, is an important aspect of the production process. Some of the processes used in furniture manufacturing are similar to processes that are used in other segments of manufacturing. For example, cutting and assembly occurs in the production of wood trusses that are classified in division 16 (Manufacture of wood and wood products). However, the multiple processes distinguish wood furniture manufacturing from wood product manufacturing. Similarly, metal furniture manufacturing uses techniques that are also employed in the manufacturing of roll-formed products classified in division 25 (Manufacture of fabricated metal products). The moulding process for plastics furniture is similar to the moulding of other plastics products. However, the manufacture of plastics furniture tends to be a specialised activity.
32	Other manufacture	This division includes the manufacture of a variety of goods not covered in other parts of the classification. Since this is a residual division, production processes, input materials and use of the produced goods can vary widely and usual criteria for grouping classes into divisions have not been applied here.
33	Repair and installation of machinery and equipment	This division includes the specialised repair of goods produced in the manufacturing sector with the aim of restoring machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included. This division does only include specialised repair and maintenance activities. A substantial amount of repair

		is also done by manufacturers of machinery, equipment and other goods, in which case the classification of units engaged in these repair and manufacturing activities is done according to the value added principle which would often assign these combined activities to the manufacture of the good. The same principle is applied for combined trade and repair. The rebuilding or remanufacturing of machinery and equipment is considered a manufacturing activity and included in other divisions of this section. Repair and maintenance of goods that are utilised as capital goods as well as consumer goods is typically classified as repair and maintenance of household goods (e.g. office and household furniture repair, see 95.24). Also included in this division is the specialised installation of machinery. However, the installation of equipment that forms an integral part of buildings or similar structures, such as installation of electrical wiring, installation of escalators or installation of air-conditioning systems, is classified as construction. *This division excludes:* *— cleaning of industrial machinery, see 81.22* *— repair and maintenance of computers and communications equipment, see 95.1* *— repair and maintenance of household goods, see 95.2*
72	Scientific research and development	This division includes the activities of three types of research and development: 1) basic research: experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without particular application or use in view, 2) applied research: original investigation undertaken in order to acquire new knowledge, directed primarily towards a specific practical aim or objective and 3) experimental development: systematic work, drawing on existing knowledge gained from research and/or practical experience, directed to producing new materials, products and devices, to installing new processes, systems and services, and to improving substantially those already produced or installed. Research and experimental development activities in this division are subdivided into two categories: natural sciences and engineering; social sciences and the humanities. *This division excludes:* *— market research, see 73.20*

Annex B

Mapping of SIC 2-digit categories

to SSC Sectoral Scope

SSC 'Footprints' across Manufacturing

Source: UKCES website

SIC code	Sub-Sector	SSC
10	Manufacture of food products	Improve
11	Manufacture of beverages	Improve
12	Manufacture of tobacco products	(no SSC?)
13	Manufacture of textiles	Creative Skillset (ex.Soft Furnishings - Proskills)
14	Manufacture of wearing apparel	Creative Skillset
15	Manufacture of leather and related good	Creative Skillset
16	Manufacture of wood and wood products	ProSkills
17	Manufacture of paper and paper products	ProSkills
18 – 18.14	Printing and reproduction of recorded media	ProSkills
18.20/1	Reproduction of sound recording	Creative & Cultural Skills
18.20/2	Reproduction of video recording	Creative Skillset
18/20/3	Reproduction of computer media	e-skills UK
19	Manufacture of coke and refined petroleum products	Cogent
20	Manufacture of chemicals and chemical products	Cogent (except Man-made fibres -
21	Manufacture of basic pharmaceutical products	Cogent
22	Manufacture of rubber and plastic products	Cogent (except Rubber Tyre
23	Manufacture of other non-metallic products	ProSkills
24	Manufacture of basic metals	Semta (except processing of Nuclear
25	Manufacture of fabricated metal products	Semta
26	Manufacture of computer, electronic and optical products	Semta
27	Manufacture of electrical equipment	Semta
28	Manufacture of machinery and equipment nec	Semta
29	Manufacture of motor vehicles	Semta (exc Caravans - SkillsActive)
30	Manufacture of other transport equipment	Semta
31	Manufacture of furniture	ProSkills
32	Other manufacture	C&CSkills (except Sports Equ't –
33	Repair and installation of machinery and equipment	Semta
72	Scientific research and development	Semta (exc. R&D in Biotechnology -

Annex C

Definitions of the occupations within SOC Major Groups

SOC MAJOR GROUP OCCUPATION DEFINITIONS

MAJOR GROUP 1: MANAGERS, DIRECTORS AND SENIOR OFFICIALS
This major group covers occupations whose tasks consist of planning, directing and coordinating resources to achieve the efficient functioning of organisations and businesses. Working proprietors in small businesses are included, although allocated to separate minor groups within the major group. Most occupations in this major group will require a significant amount of knowledge and experience of the production processes, administrative procedures or service requirements associated with the efficient functioning of organisations and businesses.

MAJOR GROUP 2: PROFESSIONAL OCCUPATIONS
This major group covers occupations whose main tasks require a high level of knowledge and experience in the natural sciences, engineering, life sciences, social sciences, humanities and related fields. The main tasks consist of the practical application of an extensive body of theoretical knowledge, increasing the stock of knowledge by means of research and communicating such knowledge by teaching methods and other means. Most occupations in this major group will require a degree or equivalent qualification, with some occupations requiring postgraduate qualifications and/or a formal period of experience-related training.

MAJOR GROUP 3: ASSOCIATE PROFESSIONAL AND TECHNICAL OCCUPATIONS
This major group covers occupations whose main tasks require experience and knowledge of principles and practices necessary to assume operational responsibility and to give technical support to Professionals and to Managers, Directors and Senior Officials. The main tasks involve the operation and maintenance of complex equipment; legal, business, financial and design services; the provision of information technology services; providing skilled support to health and social care professionals; serving in protective service occupations; and managing areas of the natural environment. Culture, media and sports occupations are also included in this major group. Most occupations in this major group will have an associated high-level vocational qualification, often involving a substantial period of full-time training or further study. Some additional task-related training is usually provided through a formal period of induction.

MAJOR GROUP 4: ADMINISTRATIVE AND SECRETARIAL OCCUPATIONS
Occupations within this major group undertake general administrative, clerical and secretarial work, and perform a variety of specialist client-orientated administrative duties. The main tasks involve retrieving, updating, classifying and distributing documents, correspondence and other records held electronically and in storage files; typing, word-processing and otherwise preparing documents; operating other office and business machinery; receiving and directing telephone calls to an organisation; and routing information through organisations. Most job holders in this major group will require a good standard of general education. Certain occupations will require further additional vocational training or professional occupations to a well-defined standard.

MAJOR GROUP 5: SKILLED TRADES OCCUPATIONS
This major group covers occupations whose tasks involve the performance of complex physical duties that normally require a degree of initiative, manual dexterity and other practical skills. The main tasks of these occupations require experience with, and understanding of, the work situation, the materials worked with and the requirements of the structures, machinery and other items produced. Most occupations in this major group have a level of skill commensurate with a substantial period of training, often provided by means of a work-based training programme.

MAJOR GROUP 6: CARING, LEISURE AND OTHER SERVICE OCCUPATIONS
This major group covers occupations whose tasks involve the provision of a service to customers, whether in a public protective or personal care capacity. The main tasks associated with these occupations involve the care of the sick, the elderly and infirm; the care and supervision of children; the care of animals; and the provision of travel, personal care and hygiene services. Most occupations in this major group require a good standard of general education and vocational training. To ensure high levels of integrity, some occupations require professional qualifications or registration with professional bodies or relevant background checks.

MAJOR GROUP 7: SALES AND CUSTOMER SERVICE OCCUPATIONS
This major group covers occupations whose tasks require the knowledge and experience necessary to sell goods and services, accept payment in respect of sales, replenish stocks of goods in stores, provide information to potential clients and additional services to customers after the point of sale. The main tasks involve knowledge of sales techniques, a degree of knowledge regarding the product or service being sold, familiarity with cash and credit handling procedures and a certain amount of record keeping associated with those tasks. Most occupations in this major group require a general education and skills in interpersonal communication. Some occupations will require a degree of specific knowledge regarding the product or service being sold, but are included in this major group because the primary task involves selling.

MAJOR GROUP 8: PROCESS, PLANT AND MACHINE OPERATIVES
This major group covers occupations whose main tasks require the knowledge and experience necessary to operate and monitor industrial plant and equipment; to assemble products from component parts according to strict rules and procedures and to subject assembled parts to routine tests; and to drive and assist in the operation of various transport vehicles and other mobile machinery. Most occupations in this major group do not specify that a particular standard of education should have been achieved but will usually have a period of formal experience-related training. Some occupations require licences issued by statutory or professional bodies.

MAJOR GROUP 9: ELEMENTARY OCCUPATIONS
This major group covers occupations which require the knowledge and experience necessary to perform mostly routine tasks, often involving the use of simple hand-held tools and, in some cases, requiring a degree of physical effort. Most occupations in this major group do not require formal educational qualifications but will usually have an associated short period of formal experience-related training.

Annex D

Specifications of the main

Manufacturing occupations

Main *non-generic,* non-elementary Occupational Categories

of importance to Manufacturing

SOC2000 categories with the largest numbers in the Manufacturing workforce (each more than 50,000 in employment in 2010):

1121 PRODUCTION, WORKS AND MAINTENANCE MANAGERS

5223 METAL WORKING PRODUCTION AND MAINTENANCE FITTERS

8111 FOOD, DRINK AND TOBACCO PROCESS OPERATIVES

8125 METAL WORKING MACHINE OPERATIVES

5241 ELECTRICIANS, ELECTRICAL FITTERS

5215 WELDING TRADES

5221 METAL MACHINING SETTERS AND SETTER OPERATORS

1121 PRODUCTION, WORKS AND MAINTENANCE MANAGERS

Production, works and maintenance managers plan, organise, direct and co-ordinate the activities and resources necessary for production in manufacturing industries and the maintenance of engineering items, equipment and machinery.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

There are no pre-set entry standards. Entry is possible with either a degree or equivalent qualification, relevant experience or without academic qualifications. On-the-job training is provided and professional qualifications are available.

TASKS

• liaises with other managers to plan overall production activity and daily manufacturing and maintenance activity;

• manages production to ensure that orders are completed to an agreed date and conform to customer and other requirements;

• monitors production and production costs and undertakes or arranges for the preparation of reports and records;

• arranges for regular inspections of plant, machinery and equipment to detect wear or deterioration;

• establishes causes of breakdowns, arranges for any necessary repairs, keeps records of faults and checks completed maintenance work for compliance with statutory regulations.

RELATED JOB TITLES

Engineering manager

Factory manager

Production manager

Service manager

Shift manager

Works manager

5223 METAL WORKING PRODUCTION AND MAINTENANCE FITTERS

Metal working production and maintenance fitters erect, install and repair electrical and mechanical plant and industrial machinery, fit and assemble parts and sub-assemblies in the manufacture of metal products and test and adjust new motor vehicles and engines.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

Entrants usually possess GCSEs/S grades, a GNVQ/GSVQ or a BTEC/SQA award. Modern Apprenticeships in Engineering Maintenance at NVQ/SVQ Level 3 are available. NVQs/SVQs in Aircraft Engineering Maintenance are available at Level 3. Further professional qualifications are required to become a licensed aircraft engineer.

TASKS

• examines drawings and specifications to determine appropriate methods and sequence of operations;

• fits and assembles parts and/or metal subassemblies to fine tolerances to make aircraft and marine engines, prototype metal products, agricultural machinery and machine tools;

• fits and assembles, other than to fine tolerances, prepared parts and sub-assemblies to make motor vehicles, printing and agricultural machinery, orthopaedic appliances and other metal goods;

• examines operation of, and makes adjustments to, internal combustion and jet engines and motor vehicles;

• erects, installs, repairs and services plant and industrial machinery, including railway stock, textile machines, aircraft frames and engines, coin operated machines, locks, sewing machines, bicycles and gas and oil appliances.

RELATED JOB TITLES

Aircraft engineer

Aircraft fitter

Aircraft ground engineer

Bench fitter

Engineering fitter

Fitter and turner

Machine fitter

Maintenance fitter

Mechanic-fitter

Millwright

Plant fitter

8111 FOOD, DRINK AND TOBACCO PROCESS OPERATIVES

Food, drink and tobacco process operatives set, operate and attend machinery to bake, freeze, heat, crush, mix, blend and otherwise process foodstuffs, beverages and tobacco leaves.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

There are no formal academic entry requirements, though some GCSEs/S grades can be an advantage. Off- and on-the-job training is available. NVQs/SVQs in Food and Drink Manufacturing Operations are available at Levels 1, 2 and 3. NVQs/SVQs in Tobacco Processing are available at Level 2.

TASKS

• sets, operates and attends machinery and ovens to mix, bake and otherwise prepare bread and flour confectionery products;

• operates machinery to crush, mix, malt, cook and ferment grains and fruits to produce beer, wines, malt liquors, vinegar, yeast and related products;

• attends equipment to make jam, toffee, cheese, processed cheese, margarine, syrup, ice, pasta, ice-cream, sausages, chocolate, maize starch, edible fats and dextrin;

• operates equipment to cool, heat, dry, roast, blanch, pasteurise, smoke, sterilise, freeze, evaporate and concentrate foodstuffs and liquids used in food processing;

• mixes, pulps, grinds, blends and separates foodstuffs and liquids with churning, pressing, sieving, grinding and filtering equipment;

• processes tobacco leaves by hand or machine to make cigarettes, cigars, pipe and other tobacco products.

RELATED JOB TITLES

Bakery assistant

Brewery worker

Dairy worker

Process worker (*food products mfr*)

8125 METAL WORKING MACHINE OPERATIVES

Metal working machine operatives operate machines to cut, shape, abrade and otherwise machine metal, use hand and power tools to remove surplus metal and rough surfaces from castings, forgings or other metal parts, and clean, smooth and polish metal workpieces.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

There are no formal academic entry requirements. Training is typically received on-the-job. NVQs/SVQs in Engineering Machining are available at Level 1.

TASKS

• secures workpiece in drilling, boring, milling, planing, grinding, lapping, honing, electrochemical, or other shaping machines, or loads metal stock on to press;

• sets controls, starts machine and operates controls to feed tool to workpiece or vice versa and repositions workpiece during machining as required;

• withdraws workpiece and examines accuracy using measuring instruments;

• operates burning, chipping and grinding equipment to remove defects from metal parts, and files, chisels, burns and saws off surplus metal;

• smoothes rough surfaces with hand tools, abrasive belts and wheels, compressed air, jets of vapour, or blasting with shot, grit, sand or other abrasive material;

• selects and secures polishing head to machine tool, prepares head with emery, grease or other substance, sets speed and angle of polishing head, and operates controls to feed polishing head to workpiece or vice versa.

RELATED JOB TITLES

Fettler (*metal trades*)

Grinding machinist (*metal trades*)

Metal polisher

Press operator (*metal trades*)

Shot blaster

Tool room machinist

5241 ELECTRICIANS, ELECTRICAL FITTERS

Electricians and electrical fitters assemble parts in the manufacture of electrical and electronic equipment, and install, maintain, and repair electrical plant, machinery, appliances and wiring.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

Academic qualifications may not be required, though some GCSEs/S grades or an equivalent qualification may be an advantage. NVQs/SVQs in Servicing Electronic Systems are available at Levels 1, 2 and 3. Modern Apprenticeships combining practical work experience and technical training are available at Levels 2 and 3. Entrants must have good eyesight and normal colour vision.

TASKS

• examines drawings, specifications and wiring diagrams to determine the method and sequence of operations;

• selects, cuts and lays wires and connects to sockets, plugs or terminals by crimping, soldering, brazing or bolting;

• cuts, bends and installs electrical conduit;

• assembles parts and sub-assemblies using hand tools and by brazing, riveting or welding;

• installs electrical plant, machinery and other electrical fixtures and appliances such as fuse

boxes, generators, light sockets etc.;

• examines electrical plant or machinery, domestic appliances and other electrical assembly for faults using test equipment and replaces worn parts and faulty wiring.

RELATED JOB TITLES

Electrical contractor

Electrical engineer

Electrical fitter

Electrician

Maintenance electrician

5215 WELDING TRADES

Welding trades workers join metal parts by welding, brazing and soldering, and cut and remove defects from metal using a variety of equipment and techniques.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

Entrants typically possess GCSEs/S grades or an appropriate GNVQ/GSVQ. Training is typically by apprenticeship incorporating practical experience and technical training. NVQs/SVQs are available at Levels 1, 2 and 3. Modern Apprenticeships are available at NVQ/SVQ Level 3. To gain employment, welders must pass a Welder Approval Test to demonstrate the required skills.

TASKS

• selects appropriate welding equipment such as electric arc, gas torch, etc.;

• connects wires to power supply, or hoses to oxygen, acetylene, argon, carbon dioxide, electric arc, or other source and adjusts controls to regulate gas pressure and rate of flow;

• guides electrode or torch along line of weld, burns away damaged areas, and melts brazing alloy or solder into joints;

• cleans and smoothes weld.

RELATED JOB TITLES

Arc welder

Electric welder

Fitter-welder

Solderer (*metal trades*)

Spot welder

Welder

5221 METAL MACHINING SETTERS AND SETTER OPERATORS

Workers in this unit group operate machines to drill, bore, grind, cut, and mill or to otherwise shape metal workpieces.

TYPICAL ENTRY ROUTES AND ASSOCIATED QUALIFICATIONS

There are no formal academic requirements although some employers may require GCSEs/S grades. Training is usually received on-the-job. NVQs/SVQs at Level 2 are available.

TASKS

• examines drawings and specifications to determine appropriate method, sequence of operations and machine setting;

• selects and fixes work-holding devices and appropriate cutting, shaping, grinding and/or forming tools;

• sets machine controls for rotation speeds, depth of cut and stroke, and adjusts machine table, stops and guides;

• operates automatic or manual controls to feed tool to workpiece or vice versa and checks accuracy of machining;

• repositions workpiece, changes tools and resets machine as necessary during production run;

• instructs operators on the safe and correct method of operation of the machine.

RELATED JOB TITLES

Centre lathe turner

Machine setter (*metal trades*)

Machine tool setter

Setter (*metal trades*)

Setter-operator (*metal trades*)

Tool setter-operator

Annex E

Sub-sectoral analysis of drivers of change

Manufacture of *Food Products* and *Beverages* (SIC 10 and 11):

- Environmental change - Food production and consumption in the UK and world-wide are significant and growing contributors to climate change. Food consumption is ultimately responsible for a significant proportion of the UK's greenhouse gas emissions.
- Globalisation and market power - The evidence suggests that companies are relocating outside the UK due to cost advantages: however this is not the only reason for the decline in Food and Drink Manufacturing and Processing (FDMP) employment. Steady growth in labour productivity and limited growth in consumer expenditure have also contributed to the contraction in employment.
- Technology and innovation – Recent innovations have impacted heavily on the way food is manufactured and processed. Despite this, the take-up of automation in the FDMP industry has been relatively poor with a reluctance to invest in new and alternative production methods. This is partly attributed by labour being readily available and affordable across the industry, but more so by the perceived low return on investment with new machinery.
- Consumer demand - The FDMP industry is almost totally demand-led, with demand levels for the different products influenced by a range of social, demographic and health factors.
- Regulation and compliance – The FDMP industry has been identified as being driven by excessive and complex regulation, dominated by legal requirements on the quality and safety of food. However, it has also been recognised that heavy product regulations often hamper the necessary upgrading of the industry in Europe. Greater regulation is anticipated as the threat of climate change intensifies, particularly for producers who currently employ processing techniques associated with higher levels of greenhouse gas emissions.

(Improve, 2010)

Manufacture of *Textiles*, *Wearing Apparel* and *Leather and Related Goods* (SIC 13, 14, and 15) (drawing on extensive employer consultations)**:**

- Sector Image and an Ageing Workforce - The ageing workforce has major implications for the sector and there is significant concern that as people retire, certain skills will be lost that will not be able to be replaced in the UK. This is particularly the case for more traditional and technical skills. For example, businesses in Northern Ireland highlighted concerns in respect of hand stitching, machine stitching, pattern grading, pattern cutting and sampling, whilst in Scotland, there were particular concerns in relation to weaving, and specifically the use of traditional rather than technologically advanced machinery. The use of traditional machinery is particularly important to tweed manufacturers and weavers. What is more, key occupations that are expected to contribute to the continued success of the sector suffer from a lack of awareness outside the industry as to the role carried out. Consultees have concerns that those who do enter the sector do not have the full set of skills required to fill the roles, which is emphasised by the perception of a long-term decline in apprenticeship up-take, and with it the training infrastructure. This is a trend that has only recently begun to be reversed, and there is a long way to go, but there is encouraging take-up in numbers of the new Fashion and Textiles Apprenticehsip.
- Impact of Legislation and the Sustainability Agenda - As consumers increasingly take into consideration the environmental impact of the products they buy, as well as social perceptions such as working conditions, businesses in the fashion and textiles sector will increasingly need to ensure that their products and processes are responding to these requirements. The sector, therefore, requires individuals that understand how legislation and sustainability impact upon businesses. The sector also requires innovative and creative individuals who can help businesses to effectively respond to these demands, and exploit the opportunities presented by these changes.
- Economic Environment - The recent economic environment has led to high levels of unemployment across the UK. As a result, some parts of the fashion and textiles sector have seen an increase in the number of individuals applying for job vacancies. However, this has not been consistent across the sector. Some consultees feel that, unlike other countries, the economy has a wide range of other sectors where people can seek employment. As a result, in some instances there has been a decline in individuals seeking employment in fashion and textiles despite the potential for employers to benefit from better qualified staff.

- Globalisation and move to Higher Value Added Products - Globalisation has placed increasing pressure on the UK fashion and textiles sector in terms of severe competitive pressure on labour costs. As a result, a significant proportion of manufacturing employment, and associated skills, have been lost abroad. Firms continue to place greater consideration on 'balanced sourcing', where a certain proportion of the manufacturing process remains in the UK, whilst elements move overseas and move up the production chain. This has direct implications on the types of skills required in the UK, namely higher value-added and knowledge-based skills. What is more, research into the role of employers in sectoral skills development has highlighted the need for the UK to develop a better qualified and skilled workforce in order to maintain growth and innovation.
- In addition, there is an increasing demand for individuals with out-sourcing management knowledge in terms of the production environment together with knowledge of materials, plus supply chain management skills. Economic adjustments and the growing value of the British brand are encouraging the return of UK-based fashion and textiles manufacturing, especially at the higher value end. However this generally requires large scale capital investment as well as the infrastructure to ensure the supply of traditional skills.
- Responding to Technological Advances - The application of the latest technologies has major implications for the skills required by businesses in the sector. It presents an ongoing challenge for businesses and training providers to keep abreast with technological advances to ensure that the workforce is appropriately skilled and able to produce and sell competitive products, in terms of both cost and quality.
- Product Marketing and the British Style - Maximising the benefits and impact of the ‘UK brand' within the fashion and textiles sector requires specialist skills, for example an understanding of how to design and manufacture products that meet consumer demands, plus an ability to effectively market and sell these products, both domestically and to traditional and emerging overseas markets in a way that builds upon the UK brand.
- Fast Fashion and Responding to Consumer demands - In order to respond to the rise of ‘fast fashion’, firms have had to think carefully about how best and most quickly they can satisfy the changing needs of the end user. The sector needs to have a comprehensive understanding of its consumers, which requires good commercial awareness and customer facing skills.

- In addition, the sector needs to have creative design skills, supported by flexible and efficient production practices, effective communications and marketing within the supply chain, and efficient logistics operations and use of advanced IT systems.
- A Re-defined Sector - Consultations confirmed that the decline of the sector has resulted in a reduced network of infrastructure, for example a reduced pool of skills and a decline in training provision due to lower demand and fewer geographical clusters of businesses. However, with increasing demand from companies based in the UK, or those either considering or moving production back to the UK, there is a need to ensure that the skills supply infrastructure can meet this demand. In the light of a reduction in the average workforce size, this has also increased the demand for multi-skilled workers who can carry out a number of tasks within a workplace.
- Diversification and the rise of Technical Textiles - If the technical textiles sub-sector is to grow effectively, there is an ongoing need for individuals capable of developing and commercialising new, innovative products and processes. The sector needs high-level technical and scientific skills, supported by ongoing research and development. In respect of R&D it will be vital for industry and academia, particularly Higher Education Institutions, to work more effectively in partnership. As consultees stated, in seeking to provide a suitably trained workforce for engagement with technical textiles, it is too simplistic to provide generic training of the kind used by other elements of the fashion and textiles sector. Emphasis needs to be placed on obtaining skills and experience from other manufacturing and scientific sectors. This includes the need to attract more STEM graduates into the sector.

SkillSet (2011)

Manufacture of Petroleum, Chemical, Pharmaceutical and Rubber and Plastic Products (SIC 19, 20, 21 and 22), summarising key extracts from the implications for *Chemicals*, *Pharmaceuticals & Medical Biotechnology*, *Polymers*, *Petroleum*, *Oil & Gas* and *Nuclear* industries (as indicated) of the drivers considered by Cogent.

- (Legal and) Environmental – Most of the Science-based industries within this grouping are subject to greater or lesser risks of environmental pollution and/or substantial carbon emissions. As a result this group of sub-sectors are more heavily regulated than most others – see below (under Legal).
- Economic – Energy prices are key for the Chemicals and Polymers sectors, in particular the global price of oil, and exchange rates. These will also determine the market environment for the Oil and Gas sector (although from the opposite perspective). In the domestic petroleum market, in addition to price and exchange rate fluctuations, competitive pressures and other financial shocks are resulting in rationalisation of suppliers. Subsidies for new nuclear generation and for decommissioning and waste management have been ruled out, which leaves only the comparative benefits of electricity market reform as incentives to reduce carbon emissions. The economic environment of pharmaceutical companies is heavily influenced by the dynamics of the generic products markets. UK based companies can still maintain an edge in terms of quality, reliability, proximity to end-use markets and familiarity with western markets, providing they apply stringent lean manufacturing principles. In addition, competitive pressures have triggered rapid increases in numbers of Contract Manufacturing Outsourcing (CMO) companies in the UK and other western countries. Biotechnology companies concentrate on the highest value activity (discovery), and outsource drug development and manufacturing to CMOs, which provides some competitive advantage but still leaves manufacturers in competition with facilities in low-cost, low-tax regions.
- Technological - Most of these industries have involved – indeed arisen from – Science-based innovation. Take up of Industrial Biotechnology within the Chemicals sector has been comparatively slow but is growing. Developments in Material Science continue to influence innovation in polymers. New technology will increasingly focus on improving productivity from existing oil and gas wells, and improving the accessibility of previously uneconomic ones. The next generation of Nuclear reactors are expected to be evolutionary in design, and research into nuclear fusion appears still to be some way off commercial exploitation. Significant R&D into the use of photosynthetic algae as a biofuel source has been carried out by one ‘major’ as a long term investment with potential benefits for the Petroleum industry, including increased productivity, the use of land and water that is normally unsuitable for crop production, the fact that this is a

renewable source, and that the bio-oil produced has a similar structure to today's petroleum and refined products, so that the biofuels produced are compatible with existing transportation technology and infrastructure. All these technologies require high level and high-tech skills.

- Sociological (Social and Ethical) – The possible health, safety and environmental consequences of unplanned events in these sectors are of paramount concern, and heavily influence public attitudes to them and public acceptance of them. While the products of the Pharmaceuticals and Medical Biotechnology industry are designed for the good of human kind, some indirect activities and effects of the sub-sector pose ethical concerns, in particular in relation to in vivo testing. Additional social/ethical concerns in the UK about Genetically Modified Organisms remain as barriers to progress in many areas. Previous deep social concerns about the Nuclear industry have generally been replaced by more positive attitudes arising from the fact that a) people are more aware of the need for adequate energy supply to support UK economic activity, and b) a greater concern with the seriousness of carbon emissions, from which Nuclear energy production does not suffer. The longer term effects on public attitudes of the 2011 accident at Fukushima are still to emerge.
- Legal (and Environmental) – The impact of regulation such as COMAH (Control of Major Accident Hazards), COSHH (Control of Substances Hazardous to Health) and REACH (Registration, Evaluation, Authorisation and restriction of CHemicals) are significant for the Chemicals sub-sector, and compliance requirements form an important part of the Industry's skills requirements. As the industry has moved towards a larger number of smaller enterprises, ensuring that quality, safety and environmental compliance permeate the supply chain is a common theme. The Pharmaceuticals industry operates in a tightly regulated environment. In addition to the compliance requirement of products, companies must also work within the economic constraints of the Pharmaceutical Price Regulation Scheme (PPRS), and the requirements of the National Institute for Health and Clinical Excellence (NICE). The UK's safety regulatory scheme for the nuclear industry is based on the 'As Low as Reasonably Practicable' principle as well as complementary environmental regulation, and the regulators have been a key element in government's approach to justifying new nuclear build. Skills and training are heavily focussed on ensuring compliance with the stringent regulations of the Petroleum refinery industry. The polymer industry is not heavily regulated, but since it is dominated by SMEs it is affected by the volume of general commercial regulation that impacts upon it.

- Political – Most of the sectors in the Science-based industries are strategic and have received political support from government over the years. However, in spite of general support from government to both civil and defence nuclear generation, certain subsidies are disappearing (see the economic driver (above)). In addition, legislation in response to environmental pollution and global warming concerns have added cost, and sometimes barriers to growth, to several of these industries (see Legal (above)). As UK offshore oil & gas platforms pass peak production, the facilities offer a network and repository options for carbon storage as part of any national carbon capture and storage (CCS) strategy.

Cogent (2011)

Manufacture of Wood-, Paper-, Other Non-metallic- Products, and Furniture (SIC 16, 17, 23, and 31)

- Environmental Issues and Sustainability – Shifting voters' perceptions are being recognised as an important factor in achieving environmental sustainability in these industries, and the advantages of cost reductions and improved efficiency are also influential. There are three official schemes that currently cover emissions - the EU Emission Trading Scheme (EU ETS), the Carbon Reduction Commitment (CRC), and Climate Change Agreements (CCAs). The EU ETS targets the largest carbon emitters including, amongst others; electricity generators, energy intensive industries and those involved in combustion activities. Any organisation (not covered by a CCA) which qualifies for the EU ETS has been given a number of free "carbon licences". These are gradually reduced, meaning that companies will increasingly have to purchase licences if they want to continue producing carbon emissions at the same levels. CCAs are agreements made between government and certain energy-intensive industries to make more realistic carbon reductions where the EU ETS scheme would have been hard to enforce without severely damaging industry-wide prospects. They are also intended to protect countries from excessive 'carbon leakage' (the movement of companies to countries where carbon laws are more lax). This group of sectors have some of the most energy intensive industries in Britain, including Ceramics, Glass, Building Products and Paper, which have considerable requirements for heating materials to very high temperatures – evidence from employer surveys has shown that many companies in these industries are currently reducing emissions in line with a CCA.
- Environmental issues and the UK's move towards an environmentally sustainable economy will have major implications in the skills arena. In relation to Carbon emissions, skills related to the monitoring and reporting of carbon and other emissions will become critical, but there is significant evidence that many companies across the economy are outsourcing this work rather than handling it in-house. As such, the resulting skills gaps may well appear within external 'carbon consultancies' rather than in the manufacturing companies themselves. The low carbon agenda and energy efficiency are also acting as major drivers for the introduction of new working practices, technologies and machinery – all three of which act as signnificant drivers for skills development. These skills are initially at higher levels as new products, processes, and practices are developed. Subsequent mass market implementation of sustainable practices will need input from workers at all levels, so that skill needs are likely to grow at lower levels as implementation increases. It may be that low carbon and sustainability content will be built into National Occupational Standards (NOS) and the qualifications that are based

on them in much the same way as skill requirements for Health and Safety practices are currently included. Adoption and recognition of the required skills into standards of competence in this way will ensure that sustainable and low carbon practices form a central tenet of working practices across the footprint.

- The Economy - The UK economic slowdown has had a profound effect on organisations in these sub-sectors: 87 per cent of the products of enterprises in these industries are primarily sold either locally, regionally or nationally within the UK, and are therefore totally dependent on conditions in the domestic economy. A smaller proportion of these companies export more products and services than companies in manufacturing as a whole, and there is evidence that some industries are expanding their overseas presence. Overall, three quarters of employers in these industries reported being affected by the recent recession. Companies in these industries in Northern Ireland appear to be the most affected of all in the UK, possibly due in part to the major recession experienced by its neighbour and key trading partner (the Republic of Ireland), and those in Scotland have seemingly been affected least – trends that reflect the effects of the recession on the wider economies of the devolved administrations. In general, employers reported that customers were spending and ordering less and that demand for products had reduced. These sub-sectors provide products to a wide range of industries, and the effects of the recession have been passed back up the supply chain.
- Energy - As indicated, this sectoral grouping contains some of the most energy-intensive industries in the UK, with some using incredibly energy-intensive processes to heat materials to very high temperatures (e.g. ceramics companies using kiln firing processes, Building Products companies using large kilns for the firing of bricks, and Glass companies heating raw materials to produce molten glass before moulding and shaping takes place). The production of paper is also very energy intensive, and companies in other industries within this group use many other heavily mechanised processes. Energy prices have been increasing over the last decade, with a particularly steep increase over the past three years. As indicated, energy taxes/ tariffs associated with the UK's move towards a low carbon economy are affecting prices: however by far the largest influence has been market pricing mechanisms based on demand and supply. Data from the Department for Energy and Climate Change shows that from 2004 to 2009 average industrial electricity prices rose by 133 per cent (106 per cent in real terms), with an increase of six per cent (five per cent in real terms) in 2009. Over the same period, average industrial gas prices have increased by 98 per cent (76 per cent in real terms), offset by a slight decrease of 10 per cent (11 per cent in real terms) in 2009.

- For energy-intensive industries, rises in energy prices have a comprehensive negative impact. In a 2010 survey of these employers, 68 per cent of respondents said that the rise in energy prices over the previous three years had decreased their profit margins, whilst a fifth thought that the increase in energy prices had decreased the competitiveness of their products when compared to products produced abroad. Also, 17 per cent of companies felt the price rises had led to investment in new machinery/production methods and 15 per cent felt they had lost customers due to price rises. Around one in 10 of these companies in the 2010 survey felt they had made redundancies as a direct result of rising energy prices. The future price of energy is therefore one of the most important factors for companies operating in many of these industries. Trying to map prices into the future is difficult as energy prices are notoriously volatile and can be affected by a vast array of factors. Ofgem, who regulate the electricity and gas markets in Great Britain, have made several projections for the prices of gas and electricity that clearly suggest that there will be a significant rises in both gas and electricity prices over the coming decade.

Overall, companies in these industries singled out, in a 2009 survey, *Lack of product demand*, *Energy costs*, and *Competition from within the UK*, as being the factors posing the greatest challenge to their business' prospects going forward.

ProSkills UK (2010)

Engineering Manufacture (SIC 24, 25, 26, 27, 28, 29, 30), plus **Repair and Installation of Machinery and Equipment (SIC 33)**, and **Scientific Research and Development (SIC 72)** covering implications for *Metals* and *Metal Products*, *Electronics-, Electrical-, and Mechanical- Engineering* & *Automotive-*, *Aerospace-*, and *Marine-*, *Engineering Manufacturing*.

These industries are, between them, major contributors to the UK economy – around half of the manufacturing total - for all five indicators shown in Table 2.1, in fact more than 50 per cent for exports and employment provision. While each sub-sector is important in its own right, it is important to recognise that there are strong relationships between them. Thus some industries provide product(s) that is needed for others: the main examples of this are metals and metal products, electronics, and in some cases electrical and mechanical engineering. Many of the 'outputs' of all of these are 'inputs' – as components or sub-systems – for industries like aerospace-, automotive-, and marine- engineering manufacture, as well, of course, as sectors beyond manufacturing like construction and building services.

In addition, the growth over recent decades of out-sourcing has resulted in elements of what was previously done within single large manufacturing enterprises now being provided by smaller, specialist companies.

Both these effects result in the growth of a wide range of supply chains, and it is the smooth functioning of these, and the adequate supply of skills to - and between - them, that is integral to the cost-effective performance, and overall productivity, of UK Engineering Manufacture. The growing recognition of this reality has led to increased attention to the importance of supply chain management in general, and skills management within the supply chain in particular.

Semta's approach to assessing future skill needs – and in particular to the change drivers that will influence these - takes into account the macro-level developments, but also emphasises that, as recognised in the current shift in skills policy, action in the end needs to be taken by enterprises themselves, and that macro-economic/analytical perspectives are rarely how issues are seen by company leaders. At the level of the business, drivers are manifest in relation to market developments (although often influenced by the macro-level factors), and skills needs generally arise in response to business drivers.

The demand for skills is a derived demand: companies need people to perform functions and roles, some known in advance, others not. Thus the demand for skills for Engineering

Manufacture depends on the work to be done by the companies in these industries. The SSC assessment for these industries therefore starts off with an employer-led perspective.

The main drivers of future[36] skills requirements within Engineering Manufacturing in the UK have been found – in surveys of employers in these industries[37] – to be as follows, in order of importance:

- *new legislative or regulatory requirements;*
- *introduction of new technologies or equipment;*
- *development of new products and services;*
- *introduction of new working practices; and*
- *increased competitive pressure.*

These have been the main focus for Semta's (policy response) actions.

In terms of longer-term drivers of business change in UK Engineering Manufacture that will have skills implications, the analysis for these industries identified the following:

- *Increasingly competitive global economic climate* - In the future, engineering manufacturing companies will be more dependent on flexibility and speed, *nimbleness* and agility, as well as on localised production. Advanced manufacturing is also likely to become more *service-orientated* due to increased customer demand. This will have consequences for the organisation of production, supply-chain management and customer relations. Furthermore, there is a continuous increase in Foreign Direct Investment (FDI) in manufacturing outside Europe. Asia and China in particular, are becoming an increasing force in the global marketplace for Engineering Manufacture. Despite the inevitable exodus of less-skilled production jobs to lower-wage economies, countries like China will generate huge demand for imports and their lagging technical competence will take some time to redress. India also envisages the prospect of seizing a substantial share of global contract manufacturing business.
- *Rapid advances in science and technology* - This will include the fields of composite materials, nanotechnologies, materials science, electronics, mechatronics and Information and Communication Technologies (ICT). The development of new production processes based on research outcomes, and the integration of hitherto separate technologies exploiting the converging nature of scientific and technological

[36] The 'next 12 months'
[37] From response data to the *National Employers Skills Survey* (09) – see UKCES (2010c)

developments, may radically change both the scope and scale of advanced manufacturing.

- *Environmental challenges and sustainability requirements* - The engineering manufacturing industries will continue to have to comply with stricter environmental regulation in the future, which should further stimulate the adoption of energy- and resource-saving technologies.
- *Socio-demographic aspects* - Engineering Manufacturing will, in the coming years, be called upon to provide solutions meeting new societal needs and the demands of an increasingly ageing public, having an impact on mobility, size of the workforce, and on customer requirements. In terms of labour supply, engineering manufacturing and research activity will be confronted with the retirement of the current higher age groups, while innovation might require completely new sets of skills, the availability of which, in both manufacturing and research, could become a critical factor.
- *The regulatory environment, standards and IPR* - Stricter environmental and safety regulation will no doubt lead to changes in manufacturing. The Intellectual Property Rights (IPR) system will have to respond to changes in an innovation process that is increasingly based on knowledge sharing and networking. The adoption of new technologies in manufacturing will also depend on the availability of industrial standards and testing procedures.
- *Values and public acceptance of new technology* - There is a need to take ethical concerns into account when science and new technology are being adopted and exploited. At the same time, it should be noted that this could lead to enterprises that are too constrained by national, and European, regulation falling behind in some areas of technology.

(Semta, 2009)

The UK Commission for Employment and Skills is a social partnership, led by Commissioners from large and small employers, trade unions and the voluntary sector. Our mission is to raise skill levels to help drive enterprise, create more and better jobs and economic growth.

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