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UK COMMISSION FOR
EMPLOYMENT AND SKILLS

Skills for Jobs: Today and Tomorrow



The National Strategic Skills
Audit for England 2010

Volume 2:
The Evidence Report



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Foreword

There are signs that England is emerging from the longest recession on record. To aid recovery and drive growth, the Government has set out the need for a more active industrial policy. This involves looking strategically at the economy, ensuring opportunities and strengths are maximised, and creating the conditions needed for future economic success.

Skills are, of course, a crucial component of these conditions for success. We need to ensure that England has the skills that employers need now and in the future, that its employers are ambitious, and that its people are properly prepared for the opportunities that lie ahead.

A key role of the UK Commission for Employment and Skills is to provide expert, evidence-based advice on skills and employment issues. It is in this capacity we were asked by the Government in 2009 to produce an annual National Strategic Skills Audit for England. This would involve a comprehensive analysis of England's current and future skill needs.

This report is the first National Strategic Skills Audit. It draws on information and intelligence from a range of existing evidence sources, as well as specially commissioned projects. The Audit provides insight and foresight on skill needs and imbalances. It also identifies the sectors, occupations and skills that we need to prioritise to meet the changing needs of the economy and labour market.

Like other UK Commission reports, the National Strategic Skills Audit provides a high quality analysis of the latest research evidence. It will be a useful resource for government, education and training providers, employers and individuals. To maximise impact and understanding, we are publishing a shorter document in parallel with this evidence report summarising the key findings and messages.

On the basis of better information, people and organisations can make more effective choices. This first National Strategic Skills Audit has a valuable role to play here, in helping to make sure that the *right* skills are developed to maximise future productivity and economic success.



Sir Mike Rake

Chairman, UK Commission for Employment and Skills

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1.0 Introduction

1.1 Introduction

Skills for Jobs: Today and Tomorrow is the first National Strategic Skills Audit for England produced by the UK Commission for Employment and Skills. The Audit provides key intelligence on England's existing and future skills needs in both current and emerging industries. The information contained in this and future versions of the Audit (which will be produced on an annual basis) will help the UK Commission to supply the analysis required to develop the nation's skills base so that it meets the immediate and longer-term needs of a fast changing economy.

The National Strategic Skills Audit is an essential element of the Government's more 'active' approach to equipping the country with the skills needed to underpin economic success, an approach articulated through a series of policy documents.

Particularly significant (and a key part of *Building Britain's Future*, the Government's plan to invest for the recovery and make Britain a fairer, stronger and more prosperous society), is the policy statement *New Industry, New Jobs* (BERR, 2009). *New Industry, New Jobs* articulates an active industrial strategy to aid recovery from the downturn, drive growth and create the high-value jobs of the future. It sets down a new approach that has become known as 'industrial activism' that is dependent on a more proactive approach to skills. For an active industrial strategy to be successful, government needs to ensure that the country has the right skills to maximise future productivity and economic growth. This in turn requires early anticipation of emerging skills needs, and improvements in the responsiveness to industrial and competitive change within the skills system. This proactive approach to skills has become known as the 'strategic skills' agenda.

The development and implementation of an active skills strategy was progressed and given further impetus within *Skills for Growth* (BIS, 2009b), the Government's national strategy for economic growth and individual prosperity. This White Paper identified the need to:

'take strategic decisions about how best to meet the skills needs in areas of the economy where we anticipate opportunities for high growth and high employment, or both.'
(2009b:36)

Skills for Growth reaffirmed the integral role that skills have in ensuring economic recovery and future success, acknowledging that the country's future can only be built by people who have the skills demanded by modern work in a globalised economy.

The White Paper also indicated that the UK Commission for Employment and Skills will produce an annual National Strategic Skills Audit, and stressed the important role that the Audit will have in enabling the skills system to both anticipate and respond to future skills requirements.

The National Strategic Skills Audit for England supports the strategic approach to skills by identifying the nation's existing and future skills needs, based on the latest available evidence at a national, regional and sectoral level. The Audit is, therefore, a synthesis of the currently available evidence on the existing and emerging demand for, and supply of, skills in England.

1.2 The aim of the Audit

The overarching aim of the National Strategic Skills Audit is to provide valuable insights to government, employers, education and training providers and individuals on England's strategic skills needs. It is the logical next stage in the development of a labour market needs-led approach to skills development: one that not only ensures that current demand is effectively met by the skills system, but also future demands are identified, anticipated, shaped and stimulated.

The skills system will operate most effectively, in a way that maximises economic prosperity, if high quality information is available. This information needs to enable all parties – government, employers, individuals, universities, colleges and training providers – to make well-informed decisions about which areas of the economy are likely to provide opportunities in terms of high employment and high economic growth, and about areas of likely skills shortage and deficiencies now and in the future.

1.3 Objectives

The National Strategic Skills Audit draws on a wide range of sources from a number of organisations to provide a national overview, and an assessment of immediate and emerging priority skills needs in both existing and emerging industries in England. More specifically the Audit provides:

- a 'big picture' overview of strategic skills needs, assessing economic, social, technical drivers of change;
- an assessment of the likely futures and their implications for the labour market and skills;
- a regional overlay, incorporating consistent and comparable skills data across the English regions;
- an assessment of the skills needs of existing sectors;
- an assessment of the skills needs of the key sectors identified in *New Industry, New Jobs*;
- identification of other economically significant sectors where skills deficiencies might constrain future employment and economic growth;
- assessment of key occupations and skill requirements by sector.

The requirement for labour market intelligence that enables informed decision making is particularly important in our current fiscal position. The pressure on public finance in the foreseeable future will require policy makers at all levels to take difficult resourcing decisions, and there may be greater emphasis on other stakeholders (employers for example) in funding training and qualifications. With the aim of a more informed system in mind, the National Strategic Skills Audit provides a comprehensive, solid and informative evidence base for:

- **Policy-makers** (e.g. government, Regional Development Agencies). Building on existing intelligence the Audit provides an authoritative, strategic overview that will help decision-makers to look at the longer term when prioritising future policy activity and when considering resource allocation. It will influence the development of national and regional skills strategies.
- **Individuals and advisory services** (e.g. Adult Advancement and Careers Service). Enhancing the ability of learners to make well informed decisions from the best possible information about the types of training and qualifications they wish to undertake and the careers they wish to pursue.
- **Colleges/providers and related bodies** (e.g. the Skills Funding Agency). Enabling colleges and providers to assess provision against comprehensive labour market intelligence. This Audit is not a planning resource but it will be used to help inform skills strategies which in turn will also help to shape provision.
- **Employers and related groups/services** (e.g. Chambers of Commerce, Business Link, Sector Skills Councils). Providing intelligence that builds on that currently supplied by SSCs to raise demand, support strategic decision-making within businesses and the implementation of a system that reflects need.

1.4 Methodology

The National Strategic Skills Audit draws on the following five separate strands of work:

- An **initial national and regional LMI assessment** (provided by the Institute for Employment Studies – IES). This drew on a wide range of source materials including:
 - The Labour Force Survey;
 - The National Employers Skills Survey 2009;
 - *Working Futures 2007-2017*;
 - The UK Commission Employment and Skills Almanac 2009;
 - The UK Commission’s *Ambition 2020* report;
 - The work of the Migration Advisory Committee (MAC).

A brief description of the national sources of data used is included in Appendix 1.

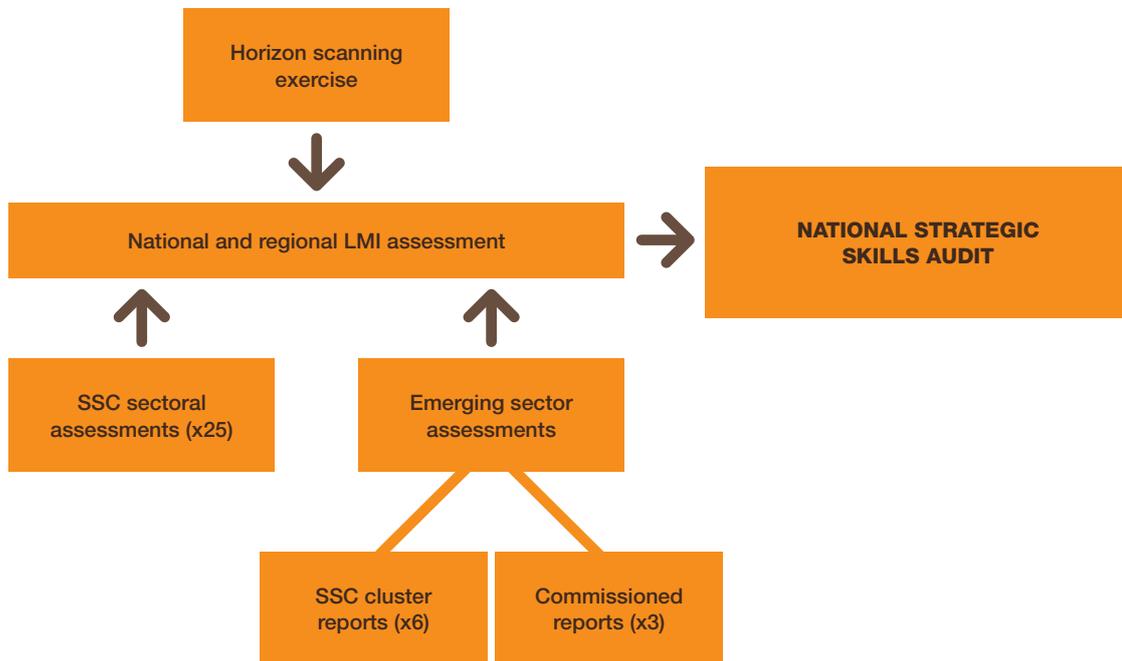
- **25 sector skills assessment summary reports** produced by each of the Sector Skills Councils (SSCs) on the sectors they cover: These reports drew on a mix of national data supplemented by sectoral surveys and other information and qualitative interviews with key sectoral stakeholders.
- **Six additional skills assessment reports focusing on the ‘emerging sectors’** identified in *New Industry, New Jobs* (BERR, 2009) produced by SSCs working collaboratively in appropriate ‘clusters’. **These reports focused on:**
 - advanced manufacturing;
 - professional and financial services;
 - low carbon industries;
 - engineering construction;
 - digital economy;
 - life sciences and pharmaceuticals.
- **Three additional skills assessment reports on three of the emerging sectors** produced for the UK Commission by experts. These were:
 - a report on strategic skills needs in the bio-medical sector, focussing on medical technologies and pharmaceutical industries, produced by the Institute for Employment Research (IER) at Warwick University (Hogarth *et al*, 2010);
 - a report on skills needs in the low carbon energy generations sector produced by PricewaterhouseCoopers (PwC) (PwC, 2010a);
 - a report on the financial services sector produced by PwC (PwC, 2010b).
- **A horizon scanning and scenario development report** produced by the St Andrews Management Institute (SAMI) (SAMI, 2010): This report identifies key issues and changes taking place in the UK and globally which may impact on employment and skills over the long-term using horizon scanning techniques informed through a series of 20 interviews with experts. SAMI identified a set of employment and skills drivers to overlay a set of existing scenarios to produce new scenarios for 2020.

All of the input reports can be accessed at:

<http://www.ukces.org.uk/our-work/research-and-policy/national-strategic-skills-audit>

The diagram set out in Figure 1.1 shows how the different strands were used as 'inputs' to the final Audit:

Figure 1.1: Elements of the National Strategic Skills Audit for England



1.5 Methodological issues

In producing this Audit, a number of methodological issues have been encountered, relating to defining and measuring skills, timescale and data availability. A brief outline of these, and how they have been tackled is presented here.

1.5.1 Defining skills and types of skills deficits

Skills can be difficult to define and measure at an aggregate level. Skills are socially constructed, intangible and often unobservable (Grugulis, 2007). Research uses a number of different measures to assess the quantity, level and content of skills possessed and deployed in the workplace. These vary from sociological perspectives which emphasise the practice of skills in a workplace context to economic perspectives on skills founded on human capital theory. These conceptual differences create a number of challenges in measuring the presence or absence of skills and in forecasting skills needs. In practical terms, skills can often be measured in terms of either the qualifications people hold, or the jobs they do (i.e. their occupation).

In addition, it is important to recognise that measures of employer demand for skills can take a number of different forms. A key distinction is whether skills are deemed to lie in the person or the job, since this affects the unit of analysis used to measure their presence or deficit (Wilson *et al*, 2003). The assessments of skills shortages or deficiencies therefore may focus on those within people or those which are measured through volumes of jobs. Four types are commonly identified in the relevant literature:

- hard-to-fill vacancies;
- skill shortages;
- known skill gaps;
- latent skill gaps.

Some skills needs are caused by factors other than a shortage of labour with the appropriate blend of capabilities, knowledge and experience. Such **'hard-to-fill' vacancies** may be associated with poor pay or unattractive working conditions.

Skill shortages are marked by the absence of sufficient, appropriately qualified and experienced people to undertake particular roles when employers seek them, even if other factors such as recruitment methods and rates of pay are appropriate.

Known skill gaps occur within an existing workforce where individual employees lack the requisite skills to undertake the full range of duties in their job.

Latent skill gaps are unrecognised skills needs within an existing workforce which inhibit the capacity of the individuals and/or organisation to reach their full potential (Mayhew, 2003). Management skills may be an example of this kind of deficiency. Bosworth (2009) and Hogarth *et al* (2009) have shown that management skill deficits may inhibit decisions to move into higher value added product markets. However, it is managers who commonly respond to surveys on employer skill needs, and they may not recognise their own skill gaps and the implications of these.

To this we might add a fifth type of skills for jobs which *do not yet exist* (e.g. which are created as a result of new technologies). In contrast to latent skill gaps which are unknown or unrecognised needs for known jobs, these might be called 'unknown unknowns.' These **emergent skills needs** may require relatively minor additions or adaptations to existing skill sets, or they may require whole new sets (or combinations) of knowledge and competences. The former may be more pervasive than the latter but each can be critical to the development of organisations and the economy and need to be addressed to avoid skill gaps and shortages in the future. This Audit explores all of these types of skills deficit, where data allows.

1.5.2 Measuring skills deficits – demand and supply indicators

Skills deficits take a range of forms, and there is no single perfect measure available to assess them. Changes in skills needs can take the form of employment change in terms of the numbers of appropriately skilled workers rising or falling in the labour market, or the reconfiguration of the supply and demand within occupations, which does not necessarily equate to a demand for a larger or smaller number of workers. The following range indicators of skills needs are commonly used, all of which have advantages and disadvantages:

1. **Skills demand measured through change in, or predictions of, occupational and employment change across sectors:** i.e. through surveys of individuals, and by assessing trends in employers' reports of the volumes of staff employed in different occupations. While this measure is able to drill down to identify changes within sectors and industries, there can be difficulty in capturing occupational change at the desired level, and there may be very limited data available for new and emerging occupations. This measure is also dependent upon skills mapping neatly onto 'whole' jobs, and less readily captures changes in skills needs within occupations. This instead requires more detailed questioning of employers (or individuals) about changes in job content.
2. **Skills demand measured through employers' direct and subjective opinions on current and future skills demand:** This is a direct method of assessing skills shortages relying on the judgement of managers who are in a position to comment. It often reveals shortages of generic skills, and provides useful information in shaping education policy (Green, 2009). However, there is UK evidence which shows some ambiguity in how employers understand and define a number of generic skills such as communication, team working and customer service, which are commonly identified as being in short supply (Hillage *et al*, 2002). It is important, therefore, to recognise that these terms may be understood differently by different employers.
3. **Skills demand measured through wage returns to qualifications/occupations:** Possession of skills or qualifications which generate higher wage returns to the individual can be an indication of employer demand, particularly where comparisons can be drawn between qualifications/skills at the same level, some of which do, and some of which do not, attract higher pay. Wage premia for particular kinds of skills and occupations may develop because of a short-term increase in employer demand, a need to provide an incentive to individuals to develop particular kinds of skills or a simple reflection of the market distribution of rare skills, i.e. a reward for scarce skills which are not easily learned.

4. **Skills supply measured through possession of qualifications:** This approach has the advantage that qualifications are easy to count, and data are readily available. However, some skills which are often sought by employers are not easily amenable to measurement (e.g. 'soft skills' such as problem solving, team working) and even when individuals hold qualifications, employers may be sceptical of the value of some qualifications. Unless they are technically specific and directly related to a particular occupation, qualifications may also act as proxies for a general level of ability. There is also no automatic 'read across' from possessing a qualification to actual usage in the job. This is dependent upon the way in which work is organised and how employers choose to make use of the skills of their staff.
5. **Skills supply measured through the provision of training required to do a job:** On the face of it, participation in training is relatively easy to measure. The difficulty with this approach is in deciding which activities constitute training, whether it must be delivered 'on-the-job' or 'off-the-job,' and whether it must be accredited. In addition there are questions about whether participation in training actually raises skill levels (or for example certifies existing levels of competence), and how well it meets individuals' and employers' needs.

There is also evidence that employers may overestimate the extent of skill shortages, and the data are not necessarily collected from employers who are actively recruiting (Greig *et al*, 2008). Equally, employers may not recognise latent skill gaps (Wilson *et al*, 2004). The data may also be subject to bias arising from employer vested interests in influencing policy and exaggeration or underestimation of the level of skill required. Asking questions about employer behaviour may overcome some of these problems but will not capture employers' unfulfilled desires for different types of skills.

Much analysis shows that measurement of skills needs requires the use of multiple measures to attain a sufficient degree of accuracy, following the argument of Greig *et al* (2008). Ideally, skills needs should be measured using sophisticated predictive econometric models which integrate analyses of both future demand and future supply, combined with an assessment of changes in demand and supply drivers. These are often robust, well tested and suited to capturing long-term trends without being affected by marginal changes or 'noise' within employer surveys. However, the models rely on extrapolating future demand based on historical and long-term trends. This means they are poorly suited to capturing the impact of exogenous (external) shocks which produce discontinuous change. So, for example, the effects of the current global financial crisis are not accommodated within these forecasts.

This means that use of data such as that from *Working Futures* within this report must be subject to judgement about how any changes in relevant labour market, economic and regulatory conditions may affect the credibility of the predictions.

1.5.3 Timescales and data availability

A range of methodological issues encountered were unique to the fact that the Audit was being conducted for the first time, and on a short timescale. These points have been logged and will be covered in the critical assessment of the process undertaken on completion of the Audit.

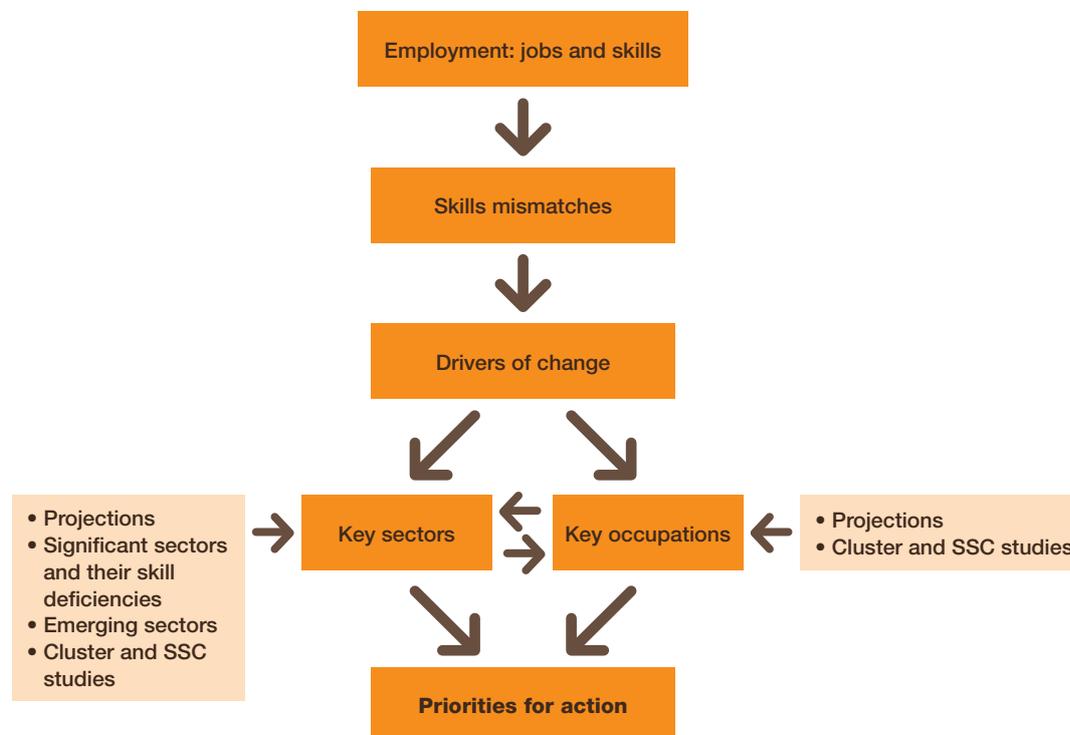
However, two particular issues are more long-lasting, and as they will affect any future Audits, they are worth noting here:

- **Availability of data for England:** Whilst most of the data presented relates to England, some data used in this Audit are available only at a UK-wide level. Both SSCs and the UK Commission have a UK-wide remit. This situation is not ideal. However, given the relative size of the English economy and workforce (representing around 86% of the UK economy and labour market), UK data do broadly reflect the trends in England.
- **Categorisation of data:** For obvious reasons of consistency and comparability, data are structured around a series of conventions, for example standard categorisations for sector, occupation, location, etc. However, as the economy and labour market change, these conventions can constrain the examination of emerging or new areas of work, and therefore skills.

1.6 The structure of the Audit

The rest of the Audit is set out as follows (Figure 1.2):

Figure 1.2: The National Strategic Skills Audit in outline



The coverage of the remaining chapters of the Audit is as follows:

- Chapter two sets out the **labour market, skills and economic foundation** for the Audit, focusing on employment and skills in England. It covers the overall national and regional economic position, recent employment trends, the current structure of employment by sector and occupation, and the impact of the recession on the labour market.
- Chapter three examines the **extent of 'current skills mismatch'** using a framework that enables the identification of the key skills issues in the labour market in a coherent and systematic way.
- Chapter four examines **the main factors that will shape the economy over the next ten years** and therefore affect the demand for (and supply of) skills and employment in the future.
- Chapter five **identifies the key sectors that will be the major source of economic growth and employment** and significant skills deficit over the next ten years.
- Chapter six examines at a finer level of detail **occupational skill needs within and across sectors**.
- Chapter seven summarises the key messages and **identifies areas where action is needed and timeframes for addressing them**, using a risk-based approach and considering the degree of certainty attached to each skills need.

Of necessity, this Audit is an ambitious endeavour and covers a lot of ground. It is, therefore, a lengthy document. However, summaries are provided at the end of each chapter, and key points are highlighted in bold throughout each chapter to aid understanding. A glossary of terms is also included at the end of the document.

In addition to this main report, a separate shorter volume of key findings (Volume 1) is also available. **For those requiring more detail, the SSC sector skills assessments, the six 'cluster' reports and the related expert sector reports, as well as the horizon scanning report are all available at www.ukces.org.uk/our-work/research-and-policy/national-strategic-skills-audit**

2.0

Jobs and skills: the labour market in England

2.1 Introduction

This chapter of the report sets out the **major characteristics of existing employment and skill levels, together with a brief economic context**. It briefly reviews:

- the overall national and regional economic position;
- recent employment trends;
- the current structure of employment by sector and occupation;
- the sectors of the economy which were growing fastest prior to the recession;
- the impact of the recession on the labour market.

2.2 A growing, globalised economy

The UK economy grew by an average of almost three per cent per annum between 1995 and 2008 (see Table 2.1). The economy in England, which makes up 86 per cent of the UK economy is, on average, one percentage point more productive than the UK as a whole (Beaven *et al*, 2009).

Table 2.1: Annual rate of change in real GDP 1996 to 2009

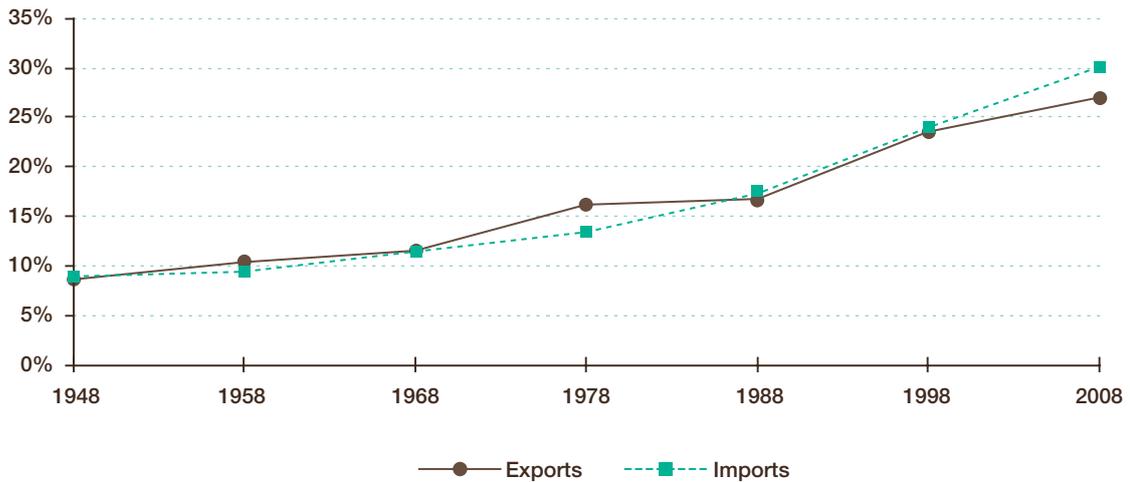
	United Kingdom %	Euro area %	Total OECD %
1996	2.9	1.5	3.1
1997	3.3	2.6	3.7
1998	3.6	2.8	2.7
1999	3.5	2.8	3.5
2000	3.9	4.0	4.3
2001	2.5	1.9	1.3
2002	2.1	0.9	1.7
2003	2.8	0.8	2.0
2004	3.0	1.9	3.2
2005	2.2	1.8	2.7
2006	2.9	3.1	3.1
2007	2.6	2.7	2.7
2008	0.6	0.5	0.6
2009	-4.7	-4.0	-3.5

Source: OECD (2009) *Economic Outlook, Vol. 85*

The average annual growth rate in GDP in the UK has been almost three per cent, compared with 2.5 per cent in countries in the Euro zone.

The UK (and therefore by inference the English economy), depends heavily on international trade, and is **particularly influenced by the dynamics of the global economy** (see Figure 2.1). 60 years ago, exports (and imports) accounted for less than 10 per cent of the economy. Today, the economic significance of international trade has tripled. In 2008 the value of exports was equivalent to 27 per cent of GDP, and imports 30 per cent.

Figure 2.1: Exports and imports in the UK (as a percentage of GDP)

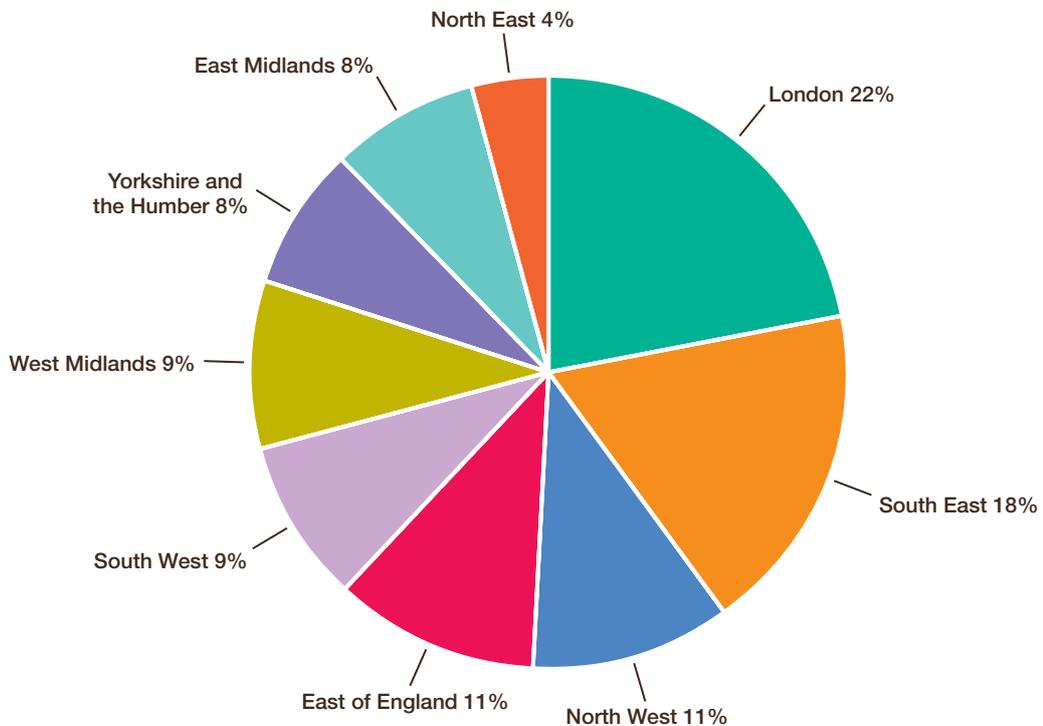


Source: ONS (2009) UK Economic Accounts

2.3 Regional concentration

Almost 40 per cent of the English economy (in terms of economic output) is accounted for by London and the South East (Figure 2.2). This proportion has been rising slightly in recent years, at the expense of the rest of England, particularly the North West and West Midlands, which are the regions that have been growing at the slowest pace. Around a third of England’s employment is also concentrated in London and the South East.

Figure 2.2: Regional share of GDP

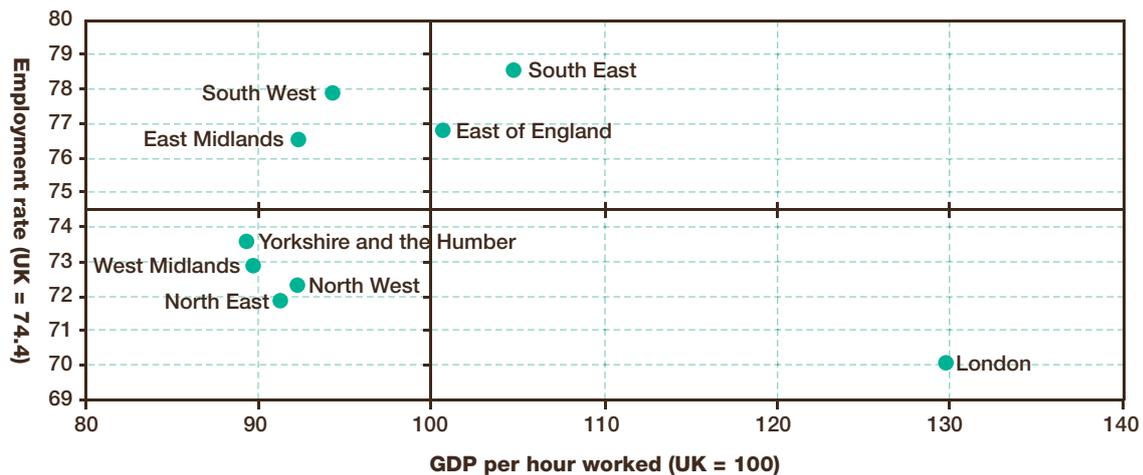


Note: residence basis

Source: ONS (2008a) Regional GVA First Release, December 2008

London and the South East are not only the largest regions economically: they are also the most productive (if GDP per hour worked is used as a measure). Productivity in London is 30 per cent higher than in the UK as a whole. However, it should be noted that productivity depends crucially on sectoral structure, and some sectors have much higher output per head than others. Most other regions in England are between five or 10 per cent less productive than the UK average. However, London has a relatively low employment rate, whereas there is a close relationship between productivity levels and employment rates across the rest of the regions (UKCES, 2009a).

Figure 2.3: Productivity and employment rates in the English regions



Source: UKCES (2009a) *Ambition 2020*, using ONS data

2.4 Growing and contracting sectors

Which sectors have seen the most growth since the early years of the century? Table 2.2 sets out the fastest/slowest growing sectors in the UK between 2002 and 2007 on the basis of the following four key metrics:

- output growth;
- employment growth;
- productivity growth;
- enterprise growth.¹

The **fastest growing sectors** across the four metrics are:

- **business services:** which includes accountancy and law firms, consultancies, architects, advertising and PR agencies, cleaning companies and call centres;
- **real estate:** which also includes renting of machinery and equipment;
- **computing:** including hardware and software consultancy and data processing;
- **financial services:** including banking and insurance;
- **hotels and catering:** i.e. the hospitality sector.

Contracting or slow growth sectors include parts of **manufacturing (e.g. wood, textile and metals)**, as well as **printing, publishing, mining and quarrying**.

1. The change in the number of enterprises. The data for the first three indicators are taken from *Working Futures 2007-2017* (Wilson *et al.*, 2008). The data on the net number of active enterprises comes from the ONS Business Demography series based on the Inter Departmental Business Register. This excludes public administration and agriculture.

Table 2.2: Growing and contracting sectors 2002 to 2007¹

Output	Employment	Productivity	Enterprises	Overall
<i>Fastest growing</i>				
Financial services	Business services	Financial services	Gas and electricity production	Business services
Computing	Construction	Textiles	Business services	Real estate
Business services	Real estate	Post and telecommunications	Real estate	Computing
Real estate	Health and social care	Transport manufacture	Construction	Financial services
Hotels and catering	Education	Machinery manufacture	Health and social care	Hotels and catering
<i>Slowest growing</i>				
Textile manufacture	Textile manufacture	Education	Textile manufacture	Wood and pulp manufacture
Wood and pulp manufacture	Machinery manufacture	Construction	Other manufacturing	Textile manufacture
Publishing, etc.	Metal manufacture	Public administration	Machinery manufacture	Publishing etc.
Mining and quarrying	Chemical manufacture	Miscellaneous services	Publishing etc.	Mining and quarrying
Gas and electricity production	Transport equipment manufacture	Agriculture	Metal manufacture	Metal manufacture

Source: IES calculations based on Working Futures 2007-2017

Sectors differ also in the level of ‘added value’ generated per person employed. This is shown in Table 2.3. Banking, finance and insurance is by some distance, the highest performing sector on this measure, while manufacturing, transport and communications are also strong contributors. When we look at employment, we can see that some of the sectors with the largest levels of employment (as shown in Table 2.2) including distribution, hotels and restaurants, and public administration, education and health, are modest performers in terms of gross value added (GVA) per person.

Table 2.3: Average GVA per worker by sector 2008

	Average GVA per worker per sector 2008
A-B: Agriculture and fishing	£26,300
C, E: Mining and quarrying; energy and water	£19,500
D: Manufacturing	£47,000
F: Construction	£33,500
G-H: Distribution, hotels and restaurants	£32,300
I: Transport and communications	£45,600
J-K: Banking, finance and insurance, etc.	£89,200
L-N: Public administration, education and health	£28,200
O-Q: Other services	£35,800

Source: UKCES (2009b) UK Employment and Skills Almanac 2009 (<https://almanac09.ukces.org.uk>)

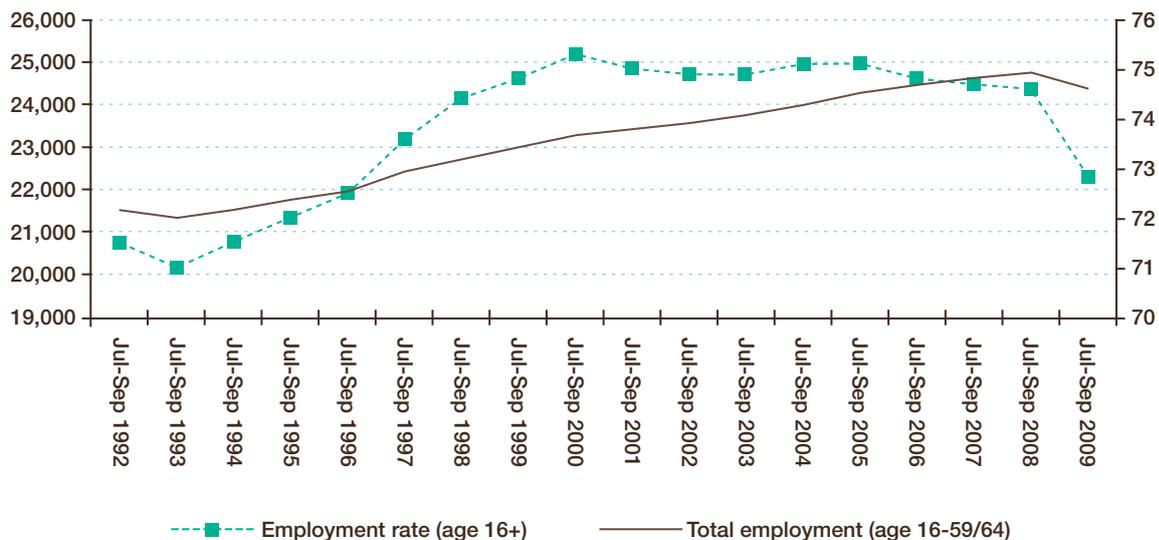
1. Due to the need to keep the data consistent, the analysis is restricted to the years 2002 to 2007 (2004 to 2007 in the case of the number of active enterprises), which therefore precede the recession. Sectors are ranked according to the rate of change in the appropriate indicators. A sector with the highest rate of change achieves the highest ranking and the one with the lowest rate of change is in bottom place. An overall ranking can be calculated by simply combining the four separate rankings.

2.5 A trend towards rising employment

Nearly 25 million people are in employment in England. Although employment levels have fallen over the past year, there are still over three million more people in employment than 15 years ago. The demand for labour, as measured by the number of jobs being made available and filled, has therefore increased by well over 10 per cent over this period.

As a consequence, the employment rate (i.e. the proportion of the working age population who have a job) has also risen and stands at 72.8 per cent (Figure 2.4). The employment rate has, however, plateaued since 2000, and has fallen over the last year from 74 per cent.

Figure 2.4: Employment trends in England 1992 to 2009



Source: Labour Market Trends November 2009

2.6 The characteristics of the employed workforce

More men than women are in employment. 53.5 per cent of the employed labour force are male (on the gender balance by sector and occupation)(see Section 2.7), a slight drop from 54 per cent 10 years previously.

Over three-quarters of those in work are aged between 25 and 60 (see Table 2.4). However, different sectors have different age profiles. For example, those employed in the retail, hospitality and leisure sectors are relatively young, while agriculture, public administration, transport and higher and further education sectors have relatively old age profiles. **Sectors with an ageing workforce could face a disproportionate level of replacement demand for labour** as older people retire, although the trend towards longer working lifetimes may mitigate this effect to some extent.

Table 2.4: People in employment by age and sector (%)

Age band (yrs)	Agriculture and fishing	Mining and utilities	Manufacturing	Construction	Distribution and hospitality	Transport and communications	Finance	Public administration, education and health	Other services	All
0-15	0	0	0	0	0	0	0	0	0	0
16-24	12	10	10	14	28	9	7	7	19	14
25-34	15	24	22	21	19	21	20	20	21	21
35-44	21	27	27	26	21	28	27	27	22	25
45-59	33	33	33	30	25	34	38	38	27	31
60-64	9	5	7	7	5	6	6	6	6	6
65 and over	10	2	2	2	2	2	2	2	4	2
Total	100	100	100	100	100	100	100	100	100	100

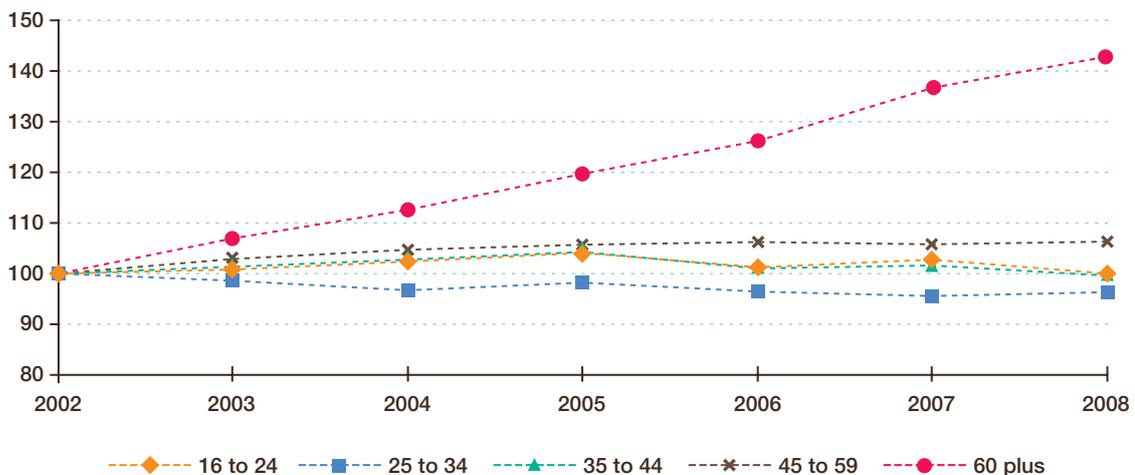
Key: > 25% above average > 25% below average

Source: ONS (2009) Labour Force Survey

In recent years, the numbers of older workers in employment has risen significantly (see Figure 2.5). In 2008, two and a quarter million people aged over 60 were in employment, over 40 per cent more than in 2002, although people aged 60 still only account for a relatively small proportion of the overall employed workforce (8%).

The employment rate for older people has been rising steadily for the last ten years, while those for younger people have been broadly static. The pattern has been repeated across the regions with the fastest growth in older peoples' employment being in the North East and South West, although rates are still relatively low in the North East (and highest in the South East). Employment rates for older people are relatively high in London (Khan, 2009).

Figure 2.5: Employment change by age 2002 to 2009

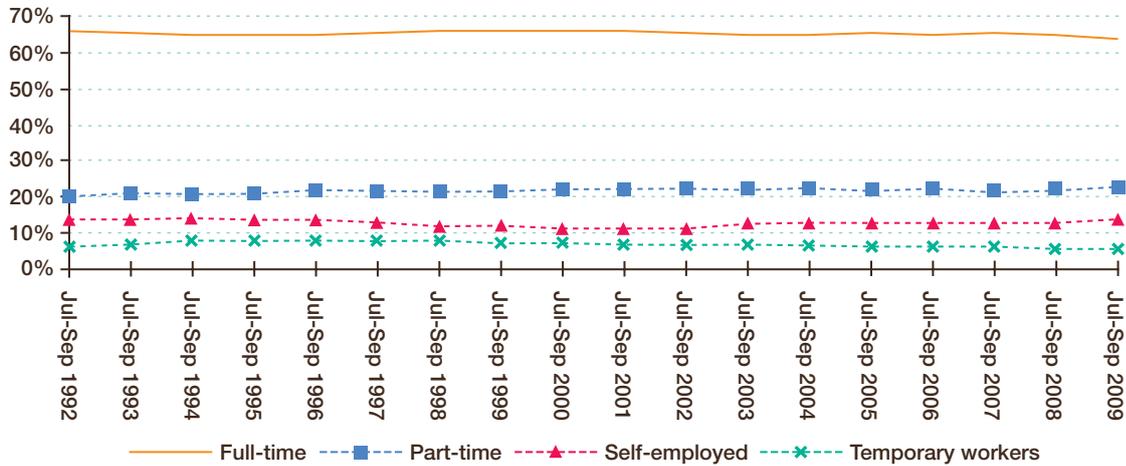


Note: UK data

Source: Labour Force Survey using UK Employment and Skills Almanac 2009 (<https://almanac09.ukces.org.uk>)

In terms of employment status, **around two-thirds of people in employment are employed as employees in full-time jobs, but a fifth are in part-time jobs.** Around 13 per cent are self-employed (mainly full-time). Around six per cent of employees are in temporary work, and the rest in permanent jobs. The proportions in each category have remained broadly stable over the last 15 years (Figure 2.6).

Figure 2.6: Employment status 1992 to 2009

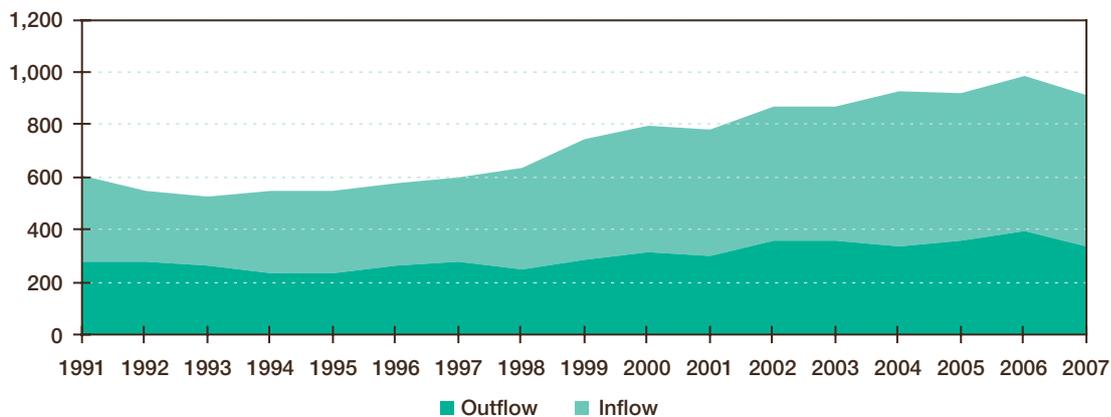


Note: UK data

Source: ONS data using UK Employment and Skills Almanac 2009 (<https://almanac09.ukces.org.uk>)

In terms of ethnicity, some 93 per cent of the employed workforce is white – a proportion that has hardly changed over the last ten years. **However, the proportion of people in employment who were born outside the UK has risen significantly over the same period. The proportion of the working age population born overseas has increased from nine per cent in 1998 to 13 per cent today.** Whilst over two-thirds were born outside the EEA, the growth in numbers in recent years is accounted for largely by migration within the EEA, with a sharp rise in the numbers coming from the eight EU accession countries (known as the ‘A8 countries’) (Czech Republic, Latvia, Estonia, Slovakia, Slovenia, Hungary, Lithuania and Poland). Between 500,000 and 600,000 people a year have entered the UK in recent years (not all of whom enter employment), while between 300,000 and 400,000 leave (see Figure 2.7). However, a large number of EEA workers have left the UK in the last year due to the effects of the economic recession (see <http://www.statistics.gov.uk/pdfdir/mig1109.pdf>).

Figure 2.7: Inflow and outflows of people to the UK



Source: ONS data using UK Employment and Skills Almanac 2009 (<https://almanac09.ukces.org.uk>)

Migrant workers are unevenly distributed between sectors and across occupations. The stock of migrant and UK workers is distributed across sectors as shown in Table 2.5. **The largest numbers of non-UK nationals are concentrated in hotels/catering and other services, as well as banking/finance.** The sectors with higher proportions of non-UK compared to UK workers are hotels/catering, other services and transport/communications.

Table 2.5: Numbers and proportions of UK/non-UK workers working in UK in 2009

	Numbers (000s)							Proportion of total (%)								
	Group A	Group B	Group C	Group D	Group E	Group F	Other	Total	Group A	Group B	Group C	Group D	Group E	Group F	Other	Total
All nationalities	779	2,753	2,368	5,310	2,498	4,656	10,261	28,625	2.7	9.6	8.3	18.6	8.7	16.3	35.8	100.0
UK/GB	737	2,538	2,208	4,797	2,276	4,225	9,549	26,329	2.8	9.6	8.4	18.2	8.6	16.0	36.3	100.0
Foreign nationals of which:	42	215	160	513	222	430	710	2,293	1.8	9.4	7.0	22.4	9.7	18.8	31.0	100.0
Non-EU	18	76	50	261	106	221	429	1,161	1.6	6.5	4.3	22.5	9.1	19.0	37.0	100.0
EU 15/EFTA	10	28	32	106	60	132	187	555	1.8	5.0	5.8	19.1	10.8	23.8	33.7	100.0
EU 27/EFTA	24	139	110	252	116	209	281	1,132	2.1	12.3	9.7	22.3	10.2	18.5	24.8	100.0

high absolute numbers of foreign nationals

proportions of foreign nationals in a sector exceed proportions of UK workers

Source: Salt (2009) *International Migration and the United Kingdom* Report of the United Kingdom Sopemi Correspondent to the OECD

In 2009, incoming economic migrants from A8 countries who registered to work in the UK were split across the top eight sectors employing them as follows (Table 2.6).

Table 2.6: Employment of migrant workers by sector

Sector	Numbers of incoming migrant workers registering to work
Administration, business and management	71,950*
Hospitality and catering	27,340
Agriculture	14,430
Manufacturing	9,700
Food/fish/meat processing	7,195
Retail	6,680
Health and medical	4,925
Construction and land	5,175

* indicates registration with a recruitment agency so not a precise indicator of sector

Source: UK Border Agency et al (2009) Accession Monitoring Report May 2004–March 2009

Many migrants register with employment agencies (although we cannot be sure of the precise numbers that do), which makes classifying the sector in which they work difficult. For those on whom data are available, between 2004 and 2009, 28 per cent of migrants worked as process operatives, while the remainder worked as warehouse operatives (8%), kitchen assistants/packers (6%) or waiters/waitresses, farm workers and room attendants (3% each). Migrant workers are most commonly employed in the East of England, the Midlands and London.

Most workplaces are small but most people work in larger workplaces. Enterprises employing less than 10 people account for 95 per cent of enterprises (nearly 900,000), but employ just over a quarter (26%) of the workforce. Enterprises employing more than 250 people account for just 0.2 per cent of enterprises (around 8,000), but employ over half (52%) of the workforce.

Just 11,500 ‘high growth’ firms with more than ten employees account for more than half of the new jobs created in existing businesses in the last decade (NESTA, 2009). Indeed, a very small number (between 350 and 400) of businesses employing more than 250 people were responsible for about half of this growth.

2.7 The jobs people do and the things they make: the structure of employment

The overall structure of employment in England by sector and occupation is shown in Table 2.7.

We can see that **the sectors which employ the largest numbers of people in England are public administration, education and health (which account for 28% of all jobs), distribution, hotels and restaurants (19%), and banking/insurance and finance (17%)**. Manufacturing now accounts for one job in eight, and construction accounts for one job in 12. **The occupations which employ the largest number of people are the three higher skilled occupational groups, which together account for 44 per cent of all jobs**. Managers/Senior Officials account for 16 per cent of jobs; professional occupations (13%) and associate professional/technical jobs (15%).

A further 11 per cent work in skilled trades, the same proportion who work in ‘elementary’ occupations. Personal service, sales and customer service and operatives, each account for around one job in 12.

Table 2.7: Employment in England by occupation and sector (000s)

	Agriculture and fishing	Energy and water	Manufacturing	Construction	Distribution, hotels and restaurants	Transport and communications	Banking, finance and insurance, etc.	Public administration, education and health	Other services	Total	% of employment
Managers and senior officials	40	49	586	278	948	246	988	587	208	3,930	16
Professional occupations	6	41	283	136	82	78	814	1,670	124	3,234	13
Associate professional and technical occupations	5	31	319	81	246	135	877	1,550	343	3,587	15
Administrative and secretarial occupations	18	22	233	140	347	171	744	971	154	2,802	11
Skilled trades and occupations	147	38	585	994	448	74	105	97	94	2,582	11
Personal service occupations	17	2	8	3	34	100	41	1,503	318	2,025	8
Sales and customer service occupations	2	22	62	12	1,388	79	183	52	40	1,839	8
Process plant and machine operatives	11	30	571	162	236	505	56	82	45	1,698	7
Elementary occupations	73	10	254	160	927	297	393	439	210	2,763	11
Total	319	246	2,900	1,967	4,655	1,683	4,202	6,950	1,537	24,459	100
% of employment	1	1	12	8	19	7	17	28	6	100	

Source: ONS (2009) Labour Force Survey, 2009 Q1 (retrieved from NOMIS)

Analysis at a more detailed occupational level reveals that **a quarter of the working population is employed in just 20 occupations (many of which are characterised by high levels of part-time employment)** (see Table 2.8). The most common job is that of a shop assistant, with 1.2 million people working in that role, and a further 275,000 people working as a retail cashier or check-out operator. Over 700,000 people are care assistants. A further 800,000 are teachers, either working with primary children and early years or in secondary schools. Some new occupations also appear in the list of top 20 jobs: there are over 300,000 software professionals, a similar number of IT managers, and nearly 500,000 educational assistants.

Table 2.8: The 20 biggest occupations in England 2009

Occupation category	Numbers 000s
Sales and retail assistants	1,205
Care assistants and home carers	719
General office assistants or clerks	638
Cleaners and domestics	603
Marketing and sales managers	547
Nurses	515
Accounts wages clerk and bookkeepers	503
Educational assistants	483
Secondary education teachers	417
Retail and wholesale managers	404
Primary and nursery teachers	401
Kitchen and catering assistants	397
Production works and maintenance managers	387
Software professionals	335
Personal assistants and secretaries	316
Heavy goods vehicle drivers	310
Customer care occupations	307
IT managers	297
Financial managers and chartered secretaries	276
Retail cashiers/check-out operators	275

Note: Data are taken from the Labour Force Survey April to June Quarter 2009 and refer to occupations categorised at the 'four digit' level. Residual categories (i.e. 'other' occupations in a category not elsewhere specified) are excluded.

Source: ONS (2009) Labour Force Survey

There are variations in the gendered shares of employment within occupations and between sectors as shown in 2.9.

Table 2.9: Employment by occupation and sector in England (men as % of total employment)

	Agriculture and fishing	Energy and water	Manufacturing	Construction	Distribution, hotels and restaurants	Transport and communications	Banking, finance and insurance, etc.	Public administration, education and health	Other services	Total
Managers and senior officials	73	75	78	86	64	74	67	44	58	66
Professional occupations	77	85	85	90	69	83	76	39	62	58
Associate professional and technical occupations	36	76	62	81	52	72	59	37	58	50
Administrative and secretarial occupations	13	27	20	13	25	35	21	19	21	21
Skilled trades and occupations	85	97	94	99	84	98	90	62	85	92
Personal service occupations	23	-	18	79	21	33	38	13	22	16
Sales and customer service occupations	45	44	37	42	32	43	39	20	35	33
Process plant and machine operatives	87	99	77	100	85	95	87	82	95	87
Elementary occupations	79	92	73	97	49	81	60	27	50	56
Total	74	76	74	89	51	75	58	30	48	54

Source: ONS (2009) Labour Force Survey, Q1 (retrieved from NOMIS)

The distribution of jobs by sector and occupation is strongly gendered. Men occupy the largest share of jobs in the two highest skilled occupations (two jobs in three), as well as the vast majority of skilled trades and process, plant and machine operative employment (around four in five in each case). Women dominate in administrative/secretarial and personal service occupations (around four in five in each case). It is clear that segregation by occupation and gender remains, and occupations are even more strongly gendered the finer the level of disaggregation. This will be important where occupations with high levels of gender segregation have significant existing and/or future skills shortages.

2.8 Where have the new jobs come from?

Since 2000, employment has increased by nearly three million, or around ten per cent, but which jobs have experienced the greatest increase, and which have seen the greatest decline?

There has been considerable occupational change over the last 10 years. Overall, the vast bulk of jobs growth has been in managerial occupations (+1.1 million), professional occupations (+1.05 million), and associate professional/technical occupations (+900,000) as well as personal service (+700,000) occupations. On the other hand, operative occupations have actually declined by 350,000.¹

Table 2.10 lists the 20 fastest growing discrete occupations between 2001 and 2009, ranked in terms of percentage growth. These cover a wide range of jobs including conservation workers, leisure attendants, and paramedics. Overall, this represents marked change since previous analyses of occupational growth. Back in 2002, the fastest growing occupations were hairdressers, nurses, housekeepers, call-centre operators, welfare workers, education assistants, software engineers and stock fillers (Nolan, 2002). **While it can be seen that recent occupational growth has been mostly in service sector roles (with the public sector featuring heavily), there is also a trend towards growth in higher skilled occupations than in the 1990s, as well as evidence of growth in jobs connected with a 'green economy'.**

More than half of the jobs that have grown the fastest since 2001 are in occupations where at least a level 4 qualification is the dominant qualification level. Around a third of the jobs that have grown fastest are in jobs where a level 3 qualification is the dominant qualification.

1. See *Working Futures 2007-2017*

Table 2.10: The 20 fastest growing occupations in England 2001 to 2009

Occupation category	Numbers (2001)	Numbers (2009)	Numerical change	% change since 2001	Predominant qualification level*
Conservation and environmental protection officers	11,797	26,470	14,673	124	Level 4
Paramedics	11,101	23,798	12,673	114	Level 4
Legal associate professionals	24,509	51,250	26,741	109	Level 3
Refuse and salvage occupations	21,750	44,393	22,643	104	Below level 2
Leisure and theme park attendants	11,101	22,471	11,370	102	Level 2
Town planners	13,886	26,931	13,045	94	Level 4
Educational assistants	252,358	482,979	230,621	91	Level 3
Driving instructors	23,265	44,494	21,229	91	Level 2
Registrars and senior educational administrators	25,195	44,210	19,015	75	Level 4
Purchasing managers	24,415	41,457	17,042	70	Level 4
Psychologists	20,947	35,080	14,133	67	Level 4
Undertakers and mortuary assistants	11,157	18,379	7,222	65	Level 3
Beauticians and related occupations	32,476	53,055	20,579	63	Level 3
Youth and community workers	70,868	114,992	44,124	62	Level 4
Senior officials in special interest organisations	17,767	28,385	10,618	60	Level 4
Housing and welfare officers	110,357	176,173	65,816	60	Level 4
Aircraft pilots and flight engineers	15,129	24,079	8,950	59	Level 4
Pharmaceutical dispensers	25,505	40,052	14,547	57	Level 3
Social service managers	32,201	50,463	18,262	57	Level 4
Statutory examiners	11,067	17,275	6,208	56	Level 3

Note: Data are taken from the Labour Force Survey April to June Quarter for each year and refer to occupations categorised at the 'four digit' level. Residual categories (i.e. 'other' occupations in a category not elsewhere specified) are excluded.

* i.e. over 50% of the people in this occupational group are qualified to this level

Source: ONS (2009) Labour Force Survey

By contrast, there are a number of occupations which have experienced considerable decline over the recent years (Table 2.11). These include assemblers of various kinds, shop keepers and various metal related occupations. Technology has changed job functions in offices (for example affecting typists and telephonists) and industrial change has led to contraction of parts of the manufacturing sector (affecting for example electrical and vehicle assemblers, bookbinders and metal making machinists and operatives).

On the other hand, more than half of the jobs that have declined the fastest over the last decade are in occupations where the majority of people are qualified to level 2 or below. In a third of jobs that are in fastest decline, the dominant qualification is at level 3. In only one case is there a fast declining occupation where the majority of people are qualified to level 4 or above.

Table 2.11: The 20 fastest declining occupations in England 2001 to 2009

Occupation category	Numbers (2001)	Numbers (2009)	Numerical change	% decrease since 2001	Predominant qualification level*
Assemblers (electrical products)	108,076	33,885	74,191	-69	Level 2
Collector salespersons and credit agents	26,735	9,794	16,941	-63	Level 2
Assemblers (vehicles and metal goods)	68,745	26,556	42,189	-61	Level 2
Typists	36,682	15,189	21,493	-59	Level 3
Bookbinders and print finishers	36,266	15,385	20,881	-58	Level 3
Metal making and treating process operatives	27,732	11,910	15,822	-57	Level 2
Metal machine setter and setter-operators	94,580	40,708	53,872	-57	Level 3
Telephonists	49,581	22,090	27,491	-55	Level 2
Precious instrument makers and repairers	35,907	16,348	19,559	-54	Level 3
Sewing machinists	74,480	35,757	38,723	-52	Below level 2
Tool makers tool fitters and markers-out	35,691	17,136	18,555	-52	Level 3
Printing machine minders and assist	34,098	18,060	16,038	-47	Level 2
Telephone salespersons	93,014	52,020	40,994	-44	Level 2
Rounds(wo)men and van salespersons	35,300	20,092	15,208	-43	Level 2
Plastics process operatives	69,596	39,492	29,898	-43	Level 2
Textiles and garment trades	59,261	35,492	23,769	-40	Level 3
Quality assurance technicians	20,705	12,450	8,255	-40	Level 4
Shopkeepers wholesale and retail dealers	204,638	123,516	81,122	-40	Level 2
Glaziers window fabric and fitters	59,255	36,397	22,858	-39	Level 2
Metal working machine operatives	110,029	67,626	42,403	-39	Level 2

Note: Data are taken from the Labour Force Survey April to June Quarter for each year and refer to occupations categorised at the 'four digit' level. Residual categories (i.e. 'other' occupations in a category not elsewhere specified) are excluded.

* i.e. over 50% of the people in this occupational group are qualified to this level

Source: ONS (2009) Labour Force Survey

2.9 Employment in the regions

How does the pattern of employment by sector and occupation vary across the different regions in England?¹

The largest concentrations of sectoral shares of employment overall (accounting for at least 15 per cent of the share of employment in each sector) are in (see Table 2.12):

- banking, finance, insurance, public administration, health and education, and other services in London;
- construction, distribution, hotels/restaurants, transport and communications, public administration, health and education and other services in the South East;
- agriculture/fishing in the South East of England, the South West of England and the East of England.

The South East and North West together employ over 30 per cent of people working in mining, quarrying, energy and water supply and have a relatively high share of manufacturing employment.

The North East has a relatively small share of employment in most sectors, reflecting its small working population, as does the East Midlands.

The West Midlands, North West and North East are more heavily reliant on manufacturing as a key sector for employment than other regions.

London and the South East have a higher number of sectors in which they have a large share of total sectoral employment but which are not key sectors in providing employment to those regions.

Table 2.12: Regional shares of sectoral employment (%)

Sectoral employment shares by region (%)	Agriculture/fishing	Mining/quarrying	Manufacturing	Construction	Distribution, hotels and restaurants	Transport and communications	Banking, finance and insurance, etc.	Public administration, education and health	Other services
London	3%	13%	10%	13%	13%	20%	29%	15%	23%
South East	16%	14%	15%	17%	17%	16%	17%	16%	16%
East of England	15%	10%	10%	12%	11%	11%	9%	10%	10%
South West	19%	11%	10%	11%	11%	8%	9%	11%	10%
West Midlands	9%	12%	13%	10%	10%	9%	8%	10%	9%
East Midlands	12%	11%	11%	8%	9%	9%	6%	8%	6%
Yorkshire and the Humber	10%	10%	12%	10%	11%	10%	8%	11%	9%
North West	11%	13%	15%	13%	14%	13%	11%	14%	12%
North East	4%	6%	5%	5%	4%	4%	3%	5%	5%
Total%	100%	100%	100%	100%	100%	100%	100%	100%	100%

 relatively important sector to the region in providing employment

Source: calculated from Labour Force Survey using UK Employment and Skills Almanac data 2009 (<https://almanac09.ukces.org.uk>)

Table 2.13 turns to look at regional shares of occupational employment. This shows that London and the South East have relatively large shares of employment amongst the managerial, professional and associate professional groups. Machine operatives are a relatively important occupation in the regional economies of the West Midlands, East Midlands, Yorkshire and the Humber, the North West and the North East. Sales and customer service occupations are relatively important in the South East, North West and the North East.

1. More detail is available in *Working Futures 2007-2017* (UK Commission, 2008) and the Almanac (2010)

Table 2.13: Regional shares of occupational employment

	Share of total (%)									
	Managers	Professionals	Associate professionals	Administrative/ clerical staff	Skilled trades	Personal service staff	Sales/customer service staff	Machine operatives	Elementary staff	
London	21%	22%	23%	17%	11%	14%	12%	10%	12%	
South East	17%	18%	17%	16%	16%	16%	17%	13%	16%	
East of England	10%	10%	10%	10%	12%	11%	10%	11%	11%	
South West	11%	10%	10%	10%	12%	11%	11%	9%	10%	
West Midlands	9%	9%	9%	10%	11%	10%	10%	12%	11%	
East Midlands	8%	7%	7%	8%	9%	9%	9%	11%	10%	
Yorkshire and the Humber	9%	9%	9%	10%	11%	11%	11%	13%	11%	
North West	12%	11%	12%	14%	13%	14%	15%	15%	13%	
North East	4%	4%	4%	5%	5%	5%	6%	6%	5%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	

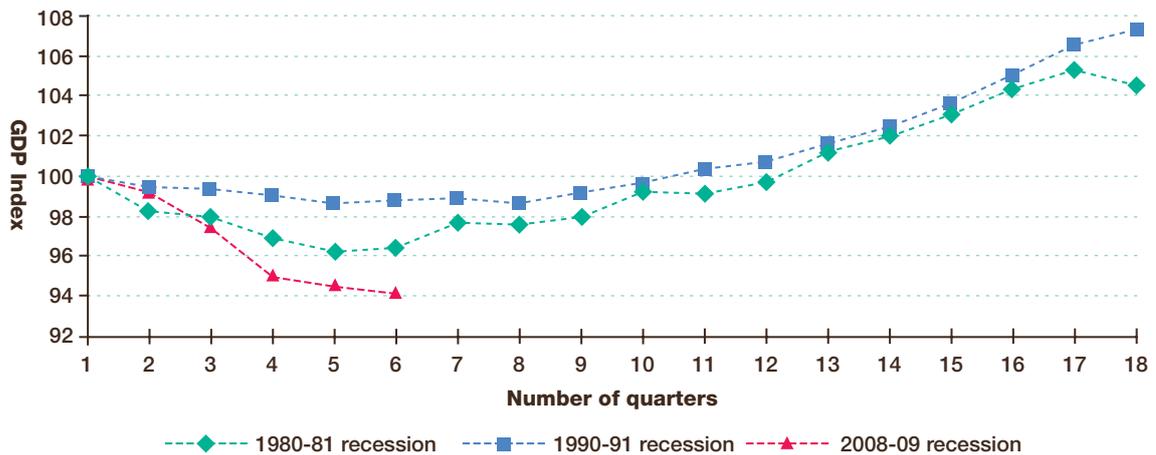
relatively important occupation to the region in providing employment

Source: calculated from Labour Force Survey using UK Employment and Skills Almanac data, 2009 (<https://almanac09.ukces.org.uk>)

2.10 The recession

The recession began in the second quarter of 2008 and appears to be more severe than the two most recent previous recessions, in terms of the rate of decline in GDP. Figure 2.8 shows the rate of change in GDP in the UK indexed to the start of the recession in 2008, and for comparison, the 1980/81 and 1990/91 recessions. This sharp contraction, however, now appears to be at an end with GDP stabilising in the last quarter of 2009.

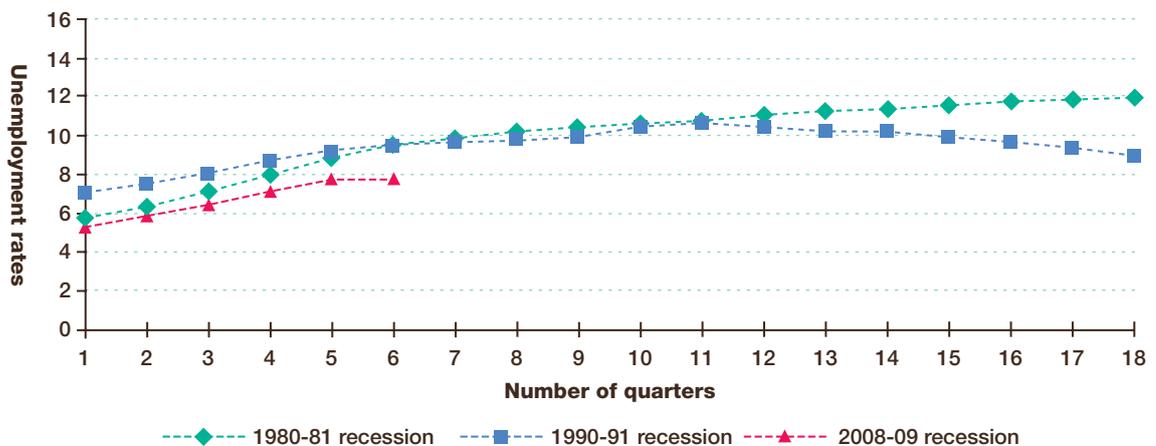
Figure 2.8: Rate of change in GDP in the current and previous recessions



Source: ONS Gross Domestic Product (ABMI): chained volume measures, seasonally adjusted

In recessions, increases in unemployment tend to continue for some time after GDP starts to grow again and exceed its previous level (see Figure 2.9) as people continue to lose their jobs, move onto the unemployment register and take longer to find a new job and flow off again. However, **in the current recession, the rate of increase in unemployment has been less marked than in previous recessions**, as employers appear to be retaining labour to ensure they have the skills to capitalise on in the economic recovery (Cox *et al*, 2009).

Figure 2.9: Rate of change in unemployment rate in the current and previous recessions

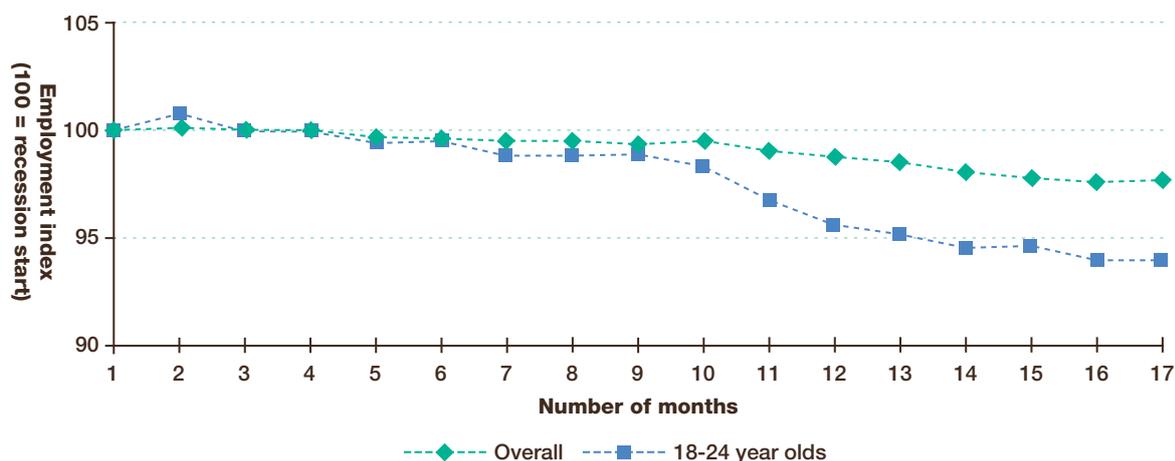


Source: ONS (2009) Labour Force Survey, all those aged 16 and over, seasonally adjusted

The (ILO measured) unemployment rate as at September 2009 was 7.9 per cent in England. Rates vary considerably, however, by region, and are highest in the West Midlands (10%) and the North East (9.5%), and lowest in the South East (6%), Eastern England (6.5%) and the South West (6.6%).

Employment among 18 to 24 year olds has declined by over six percentage points since the start of the recession, though this is partly due to more young people entering further and higher education rather than becoming unemployed (Figure 2.10).

Figure 2.10: Employment rate of young people since the start of the recession



Source: ONS (2009) Labour Force Survey, Oct 2009

Over the same period, the employment rate among people aged between 50 and normal retirement age has remained static, and, indeed, the employment rate among people aged over the retirement age has risen (albeit from a low base) by six per cent.

Contrary to some initial views as the recession began, **there has actually been a lower level of job loss in 'white-collar' occupations (e.g. managers and professionals) than among lower-skilled elementary and intermediate skilled occupations** (Vaitilingam, 2009). Table 2.14 shows the 20 fastest declining occupations during the recession. **The biggest losses are in a wide range of operative, manual and elementary occupations.**

Table 2.14: the fastest declining occupations in England since the start of the recession

Occupation	Spring 2008	Summer 2009	Numerical change	% change
Car park attendants	14,347	6,990	-7,357	-51.3
Scientific researchers	18,264	9,355	-8,909	-48.8
Steel erectors	16,351	9,419	-6,932	-42.4
Assemblers (vehicle and metal goods)	49,537	29,920	-19,617	-39.6
Floorers and wall tilers	50,594	31,721	-18,873	-37.3
Textile process operatives	17,409	10,987	-6,422	-36.9
Metal making and treating process operatives	20,357	12,989	-7,368	-36.2
Bricklayers, masons	109,153	70,044	-3,9109	-35.8
Mobile machine drivers and operatives	57,322	37,806	-19,516	-34.0
Production and process engineers	35,859	24,493	-11,366	-31.7
Advertising and public relations managers	58,860	41,008	-17,852	-30.3
Veterinarians	16,647	11,668	-4,979	-29.9
Communication operators	38,881	27,867	-11,014	-28.3
Glaziers, window fabric and fitters	46,892	33,611	-13,281	-28.3
Career adviser and vocational guidance specialists	31,492	22,746	-8,746	-27.8
Metal working machine operatives	87,288	63,623	-23,665	-27.1
Telecommunications engineers	51,392	37,604	-13,788	-26.8
Lines repairers and cable jointers	14,795	11,002	-3,793	-25.6
Midwives	43,939	33,131	-10,808	-24.6
Clergy	52,307	39,554	-12,753	-24.4

Note: Data are taken from the Labour Force Survey and refer to occupations categorised at the 'four digit' level. Residual categories (i.e. 'other' occupations in a category not elsewhere specified) are excluded. A minimum cell size of 10,000 in the Spring of 2008 has been applied

Source: ONS (2009) Labour Force Survey

The impact has been felt in a number of professional occupations too, like scientific research, advertising and midwives. **Even in the recession, some occupations have actually grown** (see Table 2.15), most notably in sports, travel and entertainment.

Table 2.15: The 20 fastest growing occupations since the start of the recession

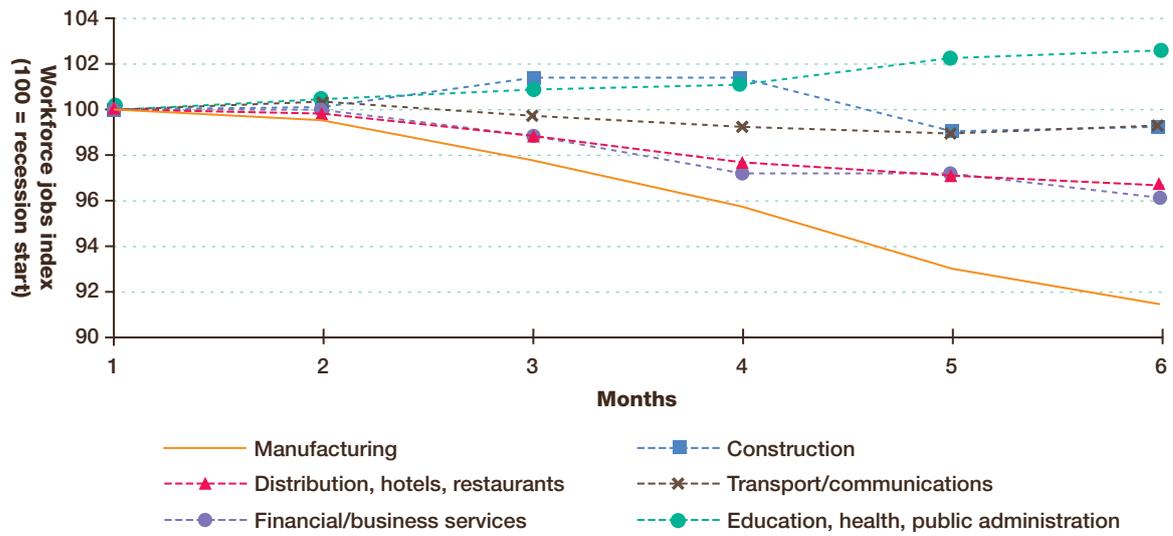
Occupation	Spring 2008	Summer 2009	Numerical change	% change
Actors, entertainers	27,669	52,774	25,105	90.7
Pharmacy managers	5,616	10,056	4,440	79.1
Archivists and curators	7,384	13,197	5,813	78.7
Hotel porters	8,336	14,087	5,751	69.0
Pipe fitters	10,163	16,898	6,735	66.3
Routine laboratory testers	8,436	13,493	5,057	59.9
Rail transport operatives	9,237	14,301	5,064	54.8
Forestry workers	10,005	15,312	5,307	53.0
Recycling and refuse disposal managers	6,781	10,286	3,505	51.7
Conference and exhibition managers	14,633	22,019	7,386	50.5
Environmental health officers	9,674	14,462	4,788	49.5
Social science researchers	14,153	21,082	6,929	49.0
Water and sewerage plant operatives	8,489	12,557	4,068	47.9
Physicists, geologists and meteorologists	19,551	28,915	9,364	47.9
Rail construction and maintenance operatives	8,415	12,434	4,019	47.8
Rounds(wo)men and van salespersons	18,408	26,675	8,267	44.9
Aircraft pilots and flight engineers	16,376	23,694	7,318	44.7
Undertakers and mortuary assistants	11,113	15,898	4,785	43.1
Travel agents	33,912	48,154	14,242	42.0
Sports coaches, instructors and officials	50,980	71,912	20,932	41.1

Note: Data are taken from the Labour Force Survey and refer to occupations categorised at the 'four digit' level. Residual categories (i.e. 'other' occupations in a category not elsewhere specified) are excluded. A minimum cell size of 10,000 in the Summer 2009 has been applied

Source: ONS (2009) Labour Force Survey

In sectoral terms, **the biggest decline in employment has been seen in the manufacturing sector** – down over eight per cent since the start of the recession (Figure 2.11). The financial services and retail sectors have seen a less dramatic decline in employment. Employment in the construction sector remained relatively buoyant at the start of the recession, but has been in rapid decline in recent months. Meanwhile, employment in the public service sector has risen by more than two per cent since the start of the recession (the second quarter of 2008).

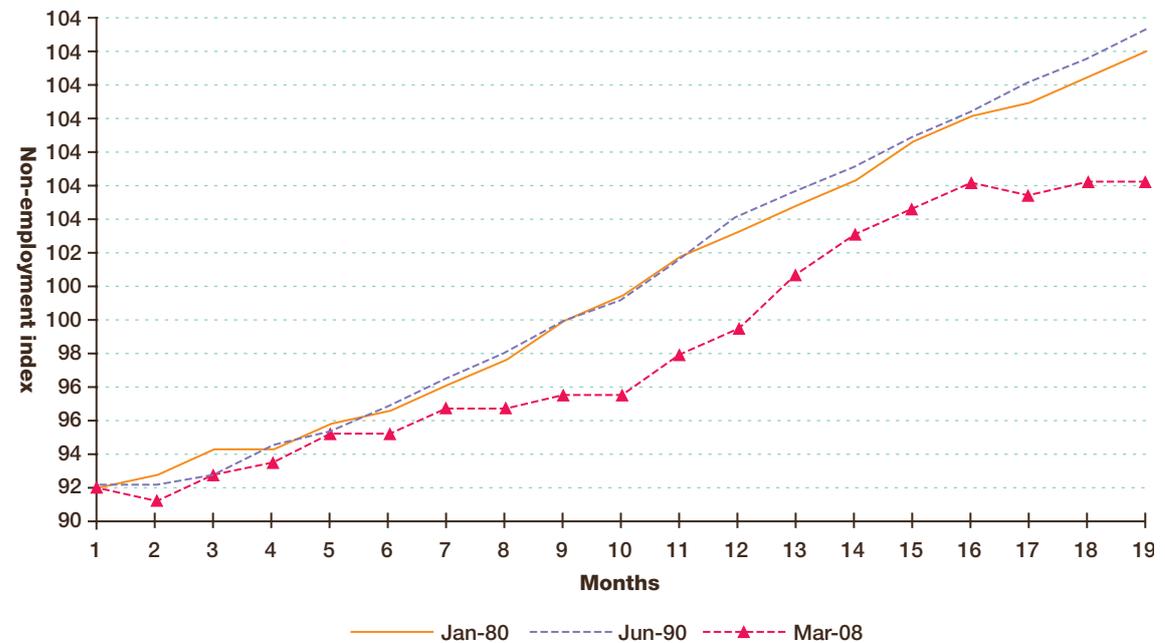
Figure 2.11: Employment by broad sector indexed to 2008 quarter 2 = 100



Source: ONS (2009) Labour Force Survey

There has also been a significantly lower increase in the number of people leaving the labour market (e.g. to incapacity benefits) in the current recession compared with previous recessions (which may be related to changes in the benefits system). Figure 2.12 shows the increase in the number of people moving into 'inactivity' since the start of the recession. In the past 18 months some eight per cent have moved out of the labour market compared with 12 per cent at the same point in previous recessions (although it should be noted that a movement to inactivity is not always a negative change, and may mean, for example, that individuals are returning to education).

Figure 2.12: Rate of change in inactivity since start of recessions: 1980/81; 1990/91; 2008/09



Source: ONS (2009) Labour Force Survey

2.11 The skills of the workforce

We end this chapter with a brief review of **the skills that are available in the current workforce** and the extent to which these match the jobs available. We focus in particular on skills as measured by qualification level, although, as we noted in chapter one, this is only one measure of skills. We summarise the current position, our stretching ambitions for 2020, and the distance between the two by level of qualification as set out in the *Leitch Review* (HM Treasury, 2006) and as accepted by the Government in 2007. More detail is contained in the *Ambition 2020* report produced by the UK Commission (UKCES 2009a).

Table 2.16 summarises the position, showing the numbers/proportion of the workforce in England currently qualified to each level, the numbers needed to achieve the 2020 ambition, together with our projected 2020 attainment and the numbers required to actually meet our ambition. The central point is this: based on recent trends and future projections, **the gap between where we want to be and where we are likely to be is greatest in (1) the numbers needed at level 3; and (2) the numbers needed for people, currently unqualified, to get at least a level 1 qualification**. The likely 'gap' in both cases is of the order of 3.7 million. In short, it would appear that beyond existing trends, we require a greater focus on these two skill levels.

With regard to literacy and numeracy, while the literacy ambition is likely to be met, to achieve the numeracy ambition will require between 1.7 and 2.5 million additional attainments beyond that which is projected. These broad macro-level ambitions, trends and gaps need to be seen as a background for the detailed types of skills that we need, and are discussed in later chapters.

Table 2.14: The qualifications of the English workforce and our 2020 Ambition, 2007-2020, estimated numbers, 000s

	2007		2020 Ambition		Gap		Summary
	%	n (000s)	%	n (000s)	%	n (000s)	
Level 4+	31	8,865	40	13,318	9 below	4,453	4.45 million below ambition
Level 3	20	5,676	28	9,322	8 below	3,646	3.64 million below ambition
Level 2	20	5,800	22	7,325	2 below	1,525	1.53 million below ambition
Below level 2	18	5,158	6	1,998	12 below	-3,160	3.16 million below ambition
No qualifications	11	3,312	4	1,332	7 below	-1,980	1.98 million below ambition
	2020 Projected		2020 Ambition		Gap		Summary
	%	n (000s)	%	n (000s)	%	n (000s)	
Level 4+	40	13,402	40	13,318	Meets ambition	-84	84 thousand above ambition
Level 3	17	5,588	28	9,322	11 below	3,734	3.73 million below ambition
Level 2	19	6,447	22	7,325	3 below	878	878 thousand below ambition
Below level 2	17	5,705	6	1,998	11 below	-3,707	3.70 million below ambition
No qualifications	6	2,057	4	1,332	2 below	-725	725 thousand below ambition

Note: Working age people 19-59/64

Source: ONS (2009) Labour Force Survey and UK Commission analysis with IER

2.12 Conclusions

This chapter has provided a broad brush picture of the key characteristics of jobs and skills, as this is the foundation for understanding our skill requirements. Before the recession, the UK had enjoyed a **sustained period of long term growth**, often out-performing many other EU and OECD countries. Even as we emerge tentatively from the 18 months of recession, **employment levels are more than three million higher than they were 15 years ago** (reflecting in part a larger working age population), though growth in our employment rate has recently stalled. This **growing economy and labour market is also strongly globally connected and dependent**, with both exports and imports each equivalent to well over a quarter of GDP (fully two-thirds more than 20 years ago) and **with one in eight of the working age population having been born abroad, compared to one in 12 just 15 years ago**.

Our **economy and jobs are strongly regionally concentrated**, with London and the South East alone accounting for nearly 40 per cent of England's GDP. There are also **substantial variations in regional employment and productivity levels** as well as in economic structure – both sectoral and occupational.

The employed workforce is ageing. Nearly 40 per cent are now aged 45 or over, and the numbers of those over 60 in employment has grown by 40 per cent in six years, though the age composition of different sectors does differ. Seven per cent of the workforce are of ethnic minority origin, and this has changed little in recent years. However, the proportion of employment accounted for those born outside the UK has doubled from around four per cent to eight per cent in the last ten years.

People also predominantly work full time, around two thirds do so, though 'atypical' employment is also considerable, and has implications for skills development: one in five work part time; one in eight are self employed; and six per cent are on temporary contracts. And, **while most workplaces are small, employing relatively few people, in fact most people actually work in larger workplaces**.

In terms of the things that people make and do, the 'sectoral' structure of employment, the **largest sectors are public administration, education and health, together accounting for more than one job in four**. Distribution, hotels and restaurants account for around another one job in five and banking, finance and insurance a little less. Manufacturing accounts for one job in eight and construction, one in 12.

In terms of the jobs that people do, the 'occupational' structure of employment, **the occupations which employ the largest number of people are the three higher skilled groups of managers/senior officials; professionals and associate professional/technical jobs**. Together, they account for 44 per cent of all jobs. Both the sectoral and occupational structure of employment remain strongly gendered.

Where have the new jobs come from in recent years? Overall, **the vast bulk of growth has been in managerial (+1.1 million), professional (+1.05 million) and associate professional/technical (+900,000), as well as personal service (+700,000) occupations**.

It appears that England is just emerging from the deepest recession for possibly 80 years, though the impact on unemployment to date has been less marked than in the recessions of the early 1980s and 1990s. Nonetheless, unemployment has risen significantly, and in some regions more than others, and has particularly impacted on the employment prospects of young people. **The recession has also impacted most, in terms of employment, on lower skilled and intermediate occupations, rather than on 'white collar' higher skilled occupations. Its sectoral impact has been most severe on manufacturing jobs**.

In terms of the skills of the workforce in England, just over one in 10 have no qualifications, while nearly a third are qualified to level 4 and above. In order to reach our ambitious skills objectives for 2020, a considerable growth in achievements at all levels is required. In particular, on the basis of recent trends and future projections, **further improvements are most needed at level 3, in numeracy and in acquiring at least some qualification**.

3.0

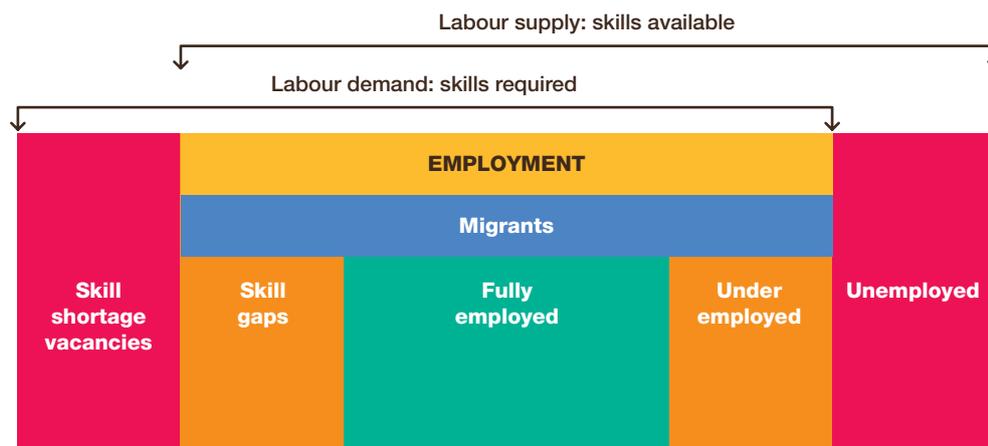
Current skills mismatch

3.1 Introduction

This chapter sets out the framework we have developed to examine current skills mismatches, which will enable us to identify the key skills issues in a coherent and systematic approach to the labour market. In short, it is these mismatches that need to be addressed in adopting a strategic approach to skills development to effectively meet labour market needs.

The framework we have developed, and which is set out in Figure 3.1 below, enables us to examine the degree of match/mismatch in the labour market through examining the demand for, and supply of, skills.

Figure 3.1: Framework for assessing demand/supply mismatch



In chapter two, we focused in the main on employment, or those people *in work*, where there is, at least on the face of it, a match between labour demand and supply. However, labour demand may not be fully met if the labour supply does not possess the volume/type of skills available sufficient to meet those needs. These **'skill shortages'** where employers are unable to, or have difficulty in, recruiting/filling their vacancies are effectively a measure of the mismatch between demand and supply, and represent an 'excess demand' for these skills as well as a key 'pinch point' in the system.

On the other hand, labour supply may exceed labour demand, giving rise to unemployment and the existence of an **unused/unwanted 'skills surplus.'** These may be corrected by market trends in the wage and worker behaviour, with workers responding to market signals to acquire the skills in shortage, or they may persist for a range of reasons associated with market failures or public failures. The identification and assessment of skill shortages is therefore where we begin in this chapter. This is followed by an indication of the skills that are in 'surplus,' the skills of the unemployed.

We then go on to extend our analysis to the **'internal' labour market of organisations**, because it may be the case that, though employed, some workers may not be fully proficient in their job and do not meet all of their employers' needs. This represents an internal **'skill gap,'** and is also damaging as it reduces the organisation's capability and restricts its opportunity to fulfil its potential. It may also be the case, however, that rather than there being a 'skill gap' where demand (the skills required) exceeds supply, (the skills available), there may be **'underemployment'** where the skills that the workforce possess are not fully utilised.¹

Finally, we complete our assessment of skill mismatches by examining one final aspect of the employed workforce: **migrants**. Although employers recruit migrants for a range of reasons, if they are unable to hire domestic workers because the skills are not available in sufficient quantity or quality, they may hire employees from abroad to meet their needs. While this is beneficial for the employer and to the migrant, and indeed has no negative impact on domestic workers if the jobs would have remained unfilled, it may reduce the 'incentive' for domestic workers to acquire these skills. In a relatively open labour market like that in the European Economic Area (EEA), employers may 'prefer' on occasion to hire migrants for reasons of productivity or cost. It may also be a public policy objective to maximise employment opportunities for domestic workers, and so an assessment of the jobs that migrants hold is the final piece of our skills mismatch jigsaw.

1. Please note that the definition of 'underemployment' used in this Audit is a skills-based definition, rather than one based on hours of work.

3.2 Skill shortages: national, regional, occupational and sectoral priorities

3.2.1 The national picture

To what extent do employers have difficulty in recruiting the people they need? In which sectors, regions and occupations are these difficulties most pronounced? **Overall, the number of vacancies that are attributed to skill shortages (or SSVs) is relatively low in England – only 63,000 in a workforce of around 25 million.**

Skills shortage vacancy (SSV) is a technical term used to describe a subset of vacancies, which are defined as 'hard-to-fill' because of a lack of skills, work experience or qualifications in the applicants applying for a role. As such, this measure deals with skills shortages in the labour pool external to organisations, as opposed to measuring a lack of proficiency amongst the existing workforce of an organisation.

For every 1,000 employees there were 2.7 SSVs, according to the 2009 National Employer Skills Survey (Shury *et al*, 2010). This low level is not solely associated with the recession, as even in 2007, prior to the recession, there were only 150,000 SSVs, or six for every 1000 employees. This, however, is significantly more than in 2009, and perhaps more indicative of levels that may recur in the recovery when recruitment activity increases. It nevertheless remains a very small proportion of total employment, and impacts only a small minority of organisations. **In 2009, SSVs were experienced by three per cent of establishments. More than three in four SSVs occur in establishments with less than 25 staff.**

3.2.2 Skill shortages: the regional picture

The regional picture in terms of skill shortages in England is shown in Figure 3.2.

Figure 3.2: Number and distribution of vacancies, hard-to-fill vacancies and skill shortage vacancies in England by region



Base: All vacancies

Source: Shury et al (2010) National Employer Skills Survey for England 2009

Hard-to-fill vacancies are disproportionately concentrated in the East of England, London, Yorkshire and the Humber and North East regions. SSVs are disproportionately concentrated in London, the East of England and the North East. They are disproportionately low in the North West, East Midlands and West Midlands.

There is no necessary relationship between the existence of unmet skill needs, in the form of skill shortages, and the skills/qualifications of a region's workforce (see Tables 3.1 and 3.2). So, high skill regions like London and the East of England still experience relatively high skill shortages, as does a relatively low skill region like the North East. Similarly, skill shortages are relatively low in the Midlands and the North West, despite them being relatively low skill regions. It is also interesting to note the changing pattern of skills levels across the regions in recent years. This is because skill shortages reflect the level and pattern of *skills demand*, as much as skills supply, as well as the specifics of conditions in particular occupations.

Table 3.1: Percentage of working-age (19-59/64) workers by highest qualification held (NQF level) in England by region 2002 and 2008

	London	South East	East of England	South West	West Midlands	East Midlands	Yorkshire and the Humber	North West	North East
2002	%	%	%	%	%	%	%	%	%
NQF 5	9.82	6.35	4.98	3.53	4.03	3.82	3.64	4.25	3.42
NQF 4	29.76	23.49	20.86	23.87	22.69	19.34	21.24	21.97	24.23
NQF 3	16.72	21.32	16.73	21.77	20.28	22.25	23.44	21.39	19.45
NQF 2	17.89	20.44	23.11	22.68	22.03	22.43	21.6	21.06	22.28
NQF 1	17.95	19.42	23.22	20.58	19.96	19.58	18.94	19.13	18.25
No qualification	7.86	8.99	11.09	7.57	11.02	12.58	11.14	12.19	12.37
2008	%	%	%	%	%	%	%	%	%
NQF 5	14.15	7.67	6.52	7.59	7.79	6.06	7.11	6.32	8.21
NQF 4	32.72	27.14	23.41	25.29	25.37	24.54	24.9	24.79	23.38
NQF 3	14.14	20.69	19.19	20.5	19.74	19.46	20.85	20.72	20.29
NQF 2	17.36	19.61	21.75	21.42	19.81	22.56	20.99	21.86	21.76
NQF 1	14.08	17.59	19.51	18.8	16.94	18.19	17.73	16.82	17.17
No qualification	7.54	7.3	9.61	6.39	10.36	9.18	8.42	9.49	9.18
2002-2008	pp	pp	pp	pp	pp	pp	pp	pp	pp
% point change NQF 4+	4.33	1.32	1.54	4.06	3.76	2.24	3.47	2.07	4.79
% point change below NQF 2	-0.32	-1.69	-1.48	-1.18	-0.66	-3.4	-2.72	-2.7	-3.19

regions with highest proportions of workers without qualifications

regions making least progress in proportions with no qualifications or NQF5

regions making most progress in proportions with no qualifications or NQF5

regions with highest proportions of workers with a particular level of qualification

pp = percentage point change

Source: Labour Force Survey using UK Employment and Skills Almanac data for 2002 and 2008 (<https://almanac09.ukces.org.uk>)

Table 3.2: Percentage of pupils in England reaching the end of KS4 achieving five or more good GCSEs including Maths and English by region

	Boys	Girls	Total
North East	41.5	48.5	44.9
North West	43.7	51.3	47.4
Yorkshire and the Humber	40.6	48.3	44.4
East Midlands	43.4	50.8	47.0
West Midlands	41.6	50.9	46.1
East of England	46.0	54.7	50.3
London	46.4	55.0	50.6
South East	48.1	55.4	51.7
South West	44.9	53.8	49.2

Source: UK Employment and Skills Almanac data for 2007/2008 (<https://almanac09.ukces.org.uk>)

At sub-regional level, differences between cities in different locations and other areas have been subject to some attention because of their widely varying skills supply. There is evidence of a 'north/south' and 'city/non-city' divide. A major review of English cities illustrates that cities with highest proportions of people with graduate level qualifications are concentrated in the South East and those with highest proportions of people with no qualifications are in the north and west of England. Although supply of people with degrees has risen everywhere over the past 10 years, the gap between cities with low and high shares of graduates has widened since 1991. Cities and towns in the South East also have a higher proportion of children gaining good GCSE results (Parkinson, 2007).

Analysis of qualifications by political constituency using the Annual Population Survey shows evidence of clustering of localities with high and low proportions of the population educated to particular levels. For example, six out of eight constituencies with highest proportions of residents who have no qualifications are found in urban areas in the West Midlands (UCU, 2009). The 10 constituencies with lowest proportions of their populations holding degrees are mainly found in East Anglia, the West Midlands and Yorkshire and the Humber, mostly in non-city locations.

This evidence suggests that while initial education outcomes are more favourable in non-city locations, the skills supply at graduate level is better in cities and urban areas. Evidence of certain hotspots appear to support this. Rural areas of the North East have the highest proportion of adults with no qualifications in England (see Natural England <http://p1.countryside.gov.uk/LAR/Regions/NorthEast/profile/nesocial.asp>).

The challenge for many regions is matching up employer demand in growing sectors with a local supply of labour which possesses the appropriate levels and types of skills.

3.2.3 Skill shortages: the occupational picture

The overall proportion of vacancies accounted for by SSVs has decreased since 2007 (from 21% to 16%). Table 3.3 shows that there has been a noticeable decrease in particular in the proportion of SSVs among machine operatives since 2007. This may reflect the long-term decrease in numbers of people employed in this kind of manufacturing work, and also the effects of the recession on the sector. The lowest proportions of SSVs are found among administrative/secretarial occupations, elementary occupations and sales/customer service occupations.

The highest proportion of skills shortages are found in the skilled trades (31%) and professional occupations (23%), but their 'density' (i.e. relative to the numbers employed in the occupation) is greatest in the associate professional/technical, skilled trades and personal service occupations. Indeed, nearly half of all skills shortages are in these three groups.

Table 3.3: Vacancies, SSVs and SSV density by occupation

	Vacancies	SSVs	SSVs per 1,000 employees	% of vacancies that are SSVs	
				2007	2009
Unweighted base	35,310	5,118			
All England	385,675	63,100	2.7	21	16
Managers and senior officials	19,750	3,725	0.9	21	19
Professionals	36,825	8,300	3.2	28	23
Associate professionals	64,125	12,700	7.4	22	20
Administrative and secretarial	45,525	4,575	1.4	12	10
Skilled trades	28,975	8,900	5.5	37	31
Personal service	54,700	9,125	5.1	21	17
Sales and customer service	46,325	5,475	1.8	15	12
Machine operatives	20,125	2,900	1.9	24	14
Elementary occupations	61,300	6,925	2.1	15	11

Note: Weighted figures rounded to the nearest 25

Base: All vacancies (weighted 385,675; unweighted 35,310)

Source: National Employer Skill Survey 2009

It is interesting to compare this concentration, essentially in 'intermediate' level jobs/skills, with the stock of qualifications in the workforce and how that has been changing (see Table 3.4).

Table 3.4: Level of highest qualification held by economically active adults in England (Quarter 4 2008)

Calendar year	All economically active adults (000s)	Level 4 and above (%)	Level 3 (%)	Level 2 and below (%)	No qualifications (%)
2001	23,259	27.8	20.2	41	11.0
2002	23,411	28.6	20.6	40.8	10.1
2003	23,496	29.7	20.5	40.2	9.6
2004	23,722	30.5	20.4	39.7	9.5
2005	23,972	31.3	20.3	39.8	8.6
2006	24,238	32.6	19.9	39.1	8.4
2007	24,413	33.6	20.1	38.5	7.9
2008	24,731	33.5	20.2	38.7	7.6
% change 2001-2008		5.7	0	-2.3	-3.4

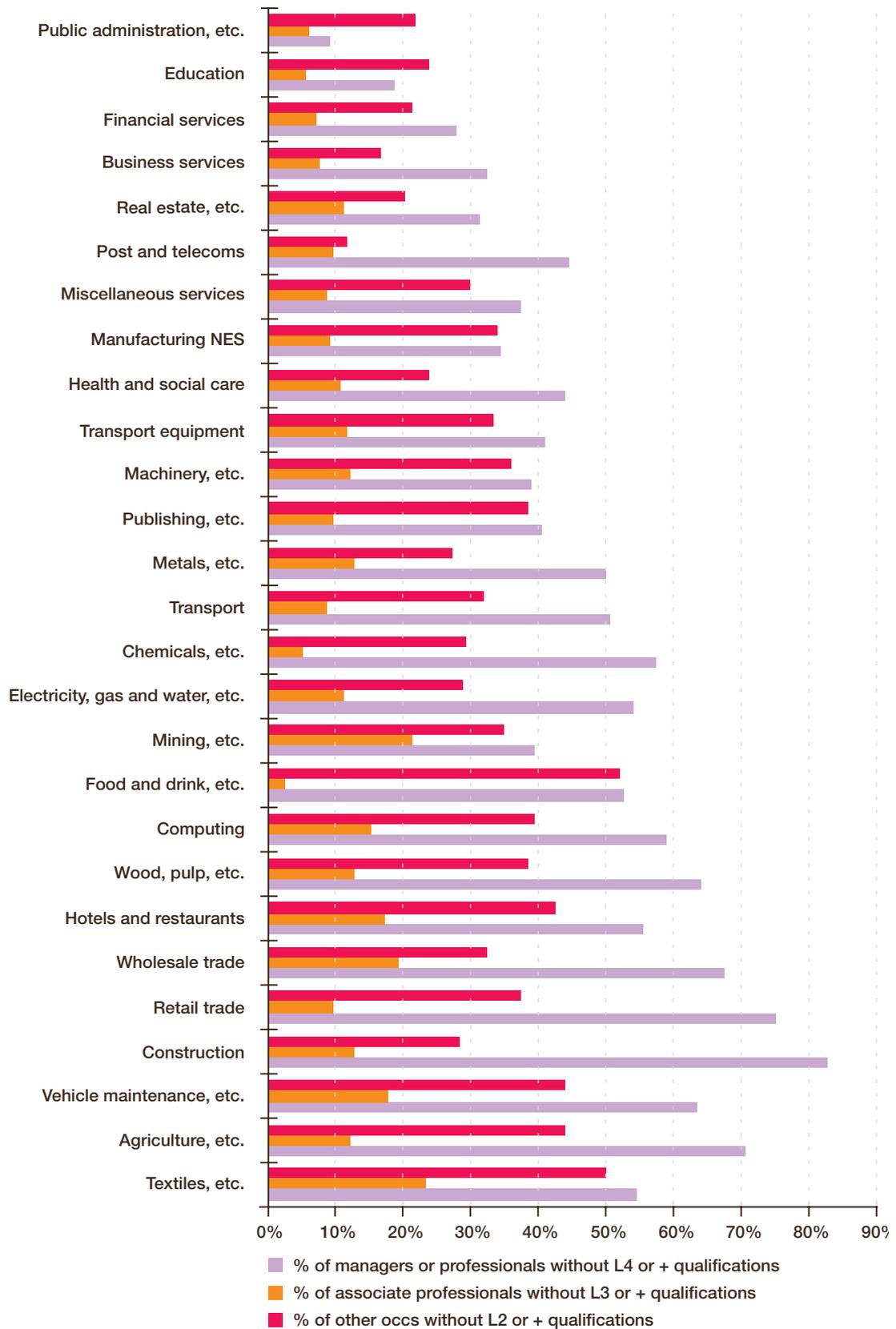
Source: recalculated from October 2009 Statistical First Release on Post-16 Education & Skills: Learner participation, outcomes and level of highest qualification held

Nearly 40 per cent of the economically active are not qualified above level 2, whilst just over a third are qualified to a minimum of level 4. Twenty per cent are qualified to level 3. However, the proportion qualified to level 3 is static, whereas there has been a significant increase in recent years in the proportion qualified to level 4 and above, and a lesser reduction in the proportion with low/no qualifications.

We can examine the data on qualification levels by occupation in order to see **what proportion of those in a particular job are qualified to a minimum appropriate (NQF) level.** However, allocating the 'right' minimum level to the 'right' occupation is by no means straightforward. For instance, while there may be widespread agreement that people in 'professional' occupations should be qualified to at least level 4, in some sectors, managers could also be expected to be qualified at level 4 while in others level 3 might be more appropriate (see for example Skills for Logistics, 2009). Nonetheless, in Figure 3.3, we set out the proportion of workers without minimum qualifications appropriate to their occupation (defined as the proportion of managers without level 4+; the proportion of associate professional/technical jobs held without a level 3+; and the percentage of other occupations with a level 2+).

On this basis, **the 'qualification deficit' is generally higher in the manufacturing related sectors than in service related sectors.** In addition, however, **the deficit is highest in higher level occupations. At the associate professional level in most sectors, 10 per cent or more are not qualified to a minimum level 3. At managerial/professional levels, many sectors have half or more not qualified to level 4.** Qualifications, however, may not be a reliable indicator of skill level and, for example, a survey of creative and cultural employers (CCS, 2009) indicates that a lack of experience rather than lack of qualifications is the most important cause of skill shortages.

Figure 3.3: Proportions of workers without minimum appropriate qualifications for their occupation by sector in England



Source: ONS (2009) Labour Force Survey

It is worth referring to Apprenticeships here as this has been a key means in recent years by which the Government has sought to increase the supply of skilled workers to meet specific skills shortages (see Table 3.5).

Table 3.5: Apprenticeship framework achievements by level and age (2005/06 to 2008/09)

Level	Age	2005/06	2006/07	2007/08	2008/09
		Full year (final)	Full year (final)	Full year (final)	Full year (provisional)
Apprenticeship (level 2)	Under 16	400	400	300	300
	16-18	44,600	49,700	46,800	43,000
	19-24	25,300	28,200	28,400	32,700
	25+	-	100	900	11,200
	Total	70,300	78,400	76,300	87,200
Advanced Apprenticeship (level 3)	Under 16	100	100		-
	16-18	13,900	15,500	16,200	14,800
	19-24	14,300	17,800	19,700	20,200
	25+	100	100	300	4,700
	Total	28,400	33,400	36,200	39,700
All Apprenticeships	Under 16	500	500	300	300
	16-18	58,500	65,200	63,000	57,800
	19-24	39,600	46,000	48,100	52,900
	25+	100	200	1,200	16,000
	Total	98,700	111,800	112,600	126,900

Note: Apprenticeship starts and achievements for 2008/09 are provisional. Starts will rise by approximately 2-3% and achievements will rise by approximately 10% when final data is returned by providers. Information is available in the December 2009 SFR

Source: DIUS Statistical First Release, 2009

Table 3.5 shows the numbers of apprentices completing their programmes since 2005/6. It shows a significant increase of 28 per cent in the numbers of people completing Apprenticeships from just short of 100,000 to nearly 127,000.

However, the majority of Apprenticeships achieved remain at level 2 (just less than 70%, although the increase in numbers at level 3 is nearly 40 per cent (compared to 24% at level 2)). It is interesting to note that there has been a large increase in the number of people aged 25 or above beginning and completing both levels of apprenticeship. This is promising for the long-term labour supply of intermediate skills in the context of an ageing workforce, which places greater demand on boosting the supply of skills among the existing workforce.

3.2.4 Skill shortages: the sectoral picture

Patterns of vacancies across sectors are shown in Table 3.6 together with proportions of vacancies that are SSVs – together with the critical ‘skill density’ measure of skill shortages. The table shows that **the largest volumes of skill shortages are in business services and health and social work**. Indeed, over a third of SSVs occur in these two sectors. **However, the highest proportions of SSVs are found in agriculture, electricity/gas/water and construction industries**. The greatest *density* of skill shortages is to be found in agriculture, electricity/gas/water, hotels and catering, health and social work and ‘other’ services.

Table 3.6: Number and density of vacancies in England by broad SIC sector

	Vacancies	SSVs	% of vacancies that are SSVs	SSVs per 1,000 employees
<i>Unweighted base</i>	35,310	5,118		
Overall	385,675	63,100	16	3
Agriculture	5,200	1,375	26	4
Mining and quarrying	225	50	19	2
Manufacturing	24,350	4,400	18	2
Electricity, gas and water	1,575	475	30	4
Construction	12,100	2,750	23	2
Retail and wholesale	50,475	7,675	15	2
Hotels and catering	44,325	6,350	14	4
Transport, storage and communications	17,525	2,750	16	2
Financial intermediation	13,675	2,200	16	2
Business services	71,500	13,175	18	3
Public administration and defence	19,175	1,275	7	1
Education	28,950	3,950	14	2
Health and social work	60,875	10,450	17	4
Other services	26,975	4,600	17	4

Note: Figures rounded to the nearest 25

- highest levels of SSVs by sector
- sectoral proportions of vacancies that are SSVs
- highest sectoral levels of ‘skill density’ vacancies

Source: National Employer Skill Survey (2009)

Table 3.7 provides details of the occupational pattern of skill shortages across different sectors.

Table 3.7: Profile of skill-shortage vacancies in England by sector and occupation

Row percentages	Base: all SSVs		%	Managers	Professionals	Associate professionals	Administrative	Skilled trades	Personal service	Sales	Operatives	Elementary	Unclassified
	Unweighted	Weighted											
Overall	5,118	63,089	%	6	13	20	7	14	14	9	5	11	1
Agriculture	59	1,374	%	3	2	1	0	48	4	0	10	31	0
Mining and quarrying	9	43	%	1	1	1	1	1	1	1	1	1	1
Manufacturing	532	4,409	%	6	20	13	4	28	0	11	13	5	*
Electricity, gas and water	21	475	%	1	1	1	1	1	1	1	1	1	1
Construction	159	2,739	%	12	11	7	5	49	0	3	9	3	*
Retail and wholesale	484	7,672	%	8	1	14	7	26	*	30	9	4	0
Hotels and catering	441	6,347	%	7	0	2	3	29	2	3	1	55	0
Transport, storage and communications	247	2,758	%	3	1	13	16	4	2	11	48	3	1
Financial intermediation	153	2,201	%	6	1	46	26	0	1	16	0	0	4
Business services	851	13,170	%	8	20	25	11	7	2	9	6	11	1
Public administration and defence	145	1,287	%	7	9	22	11	39	0	2	4	6	0
Education	481	3,961	%	1	42	24	5	1	21	1	4	1	0
Health and social work	1,185	10,442	%	3	21	30	4	1	37	1	*	2	1
Other services	351	4,605	%	3	11	32	6	3	35	2	1	8	*

Base: All skill-shortage vacancies.

Note: Percentages sum to 100 across each row (subject to rounding)

* denotes a figure greater than 0% but less than 0.5%

! at least 20% of employers in a sector reporting SSVs for any given occupation

! is used where the base size was under 25

Source: National Employer Skills Survey (2009)

The variation in the occupations which are causing SSVs differs across sectors. **The largest share of SSVs across all sectors is among associate professional staff, where seven sectors have at least 20 per cent of their vacancies in this occupational group.** For example, nearly a half of all SSVs in electricity, gas and water and in financial intermediation are at this level.

In addition, the analysis conducted by the SSCs in their sector assessments provided as inputs to this Audit also reveal skills shortages amongst this occupational group. For example, in a survey of employers carried out in 2008, Skillfast-UK asked about the specific technical areas for which skilled candidates are in short supply. This study identified shortages at associate professional level (as well as for skilled trades and operative level jobs). Skills in design and textile technology were the most notable areas of shortage (Skillfast-UK, 2009). Other examples of skills identified as in short supply at this level include: food technologists (Improve, 2009), and vehicle technicians (IMI, 2009).

We can also see from Table 3.7 that at least a quarter of SSVs are accounted for by skilled trades occupations in six sectors. These are especially high in agriculture and construction, where nearly half of all SSVs in these sectors are in skilled trades.

However, SSC analysis shows that the recession has reduced demand for skilled trades in the construction sector, and the industry is reporting fewer skill shortages compared to 2008, alongside a considerable decrease in recruitment difficulties in general to a record low (ConstructionSkills, 2009). In agriculture, the shortages are most common among farmers and farm workers, and also florists (Lantra, 2009a). A lack of skilled chefs is by far the most commonly cited skills shortage by employers in the hospitality sector. Half of all chef vacancies are deemed to be 'hard-to-fill' by employers. Employers in this sector report that 34 per cent of chef vacancies are hard to fill due to a lack of skilled applicants. The main areas of shortage appear to be in the fine dining element of the sector, and restaurants serving Asian and Oriental cuisine (People 1st, 2009). Other examples include skilled trades involved in garment alteration and repair, pattern cutting and grading and hand-craft garment making in the textile sector (Skillfast-UK, 2009).

SSVs in personal services occupations account for at least 20 per cent of the shortages in education, health/social work and other services. Employers of social care workers have reported difficulties in recruiting and retaining staff in the past, although there is evidence that recruitment difficulties are now easing and levels of job satisfaction in the sector are high (Skills for Care and Development, 2009).

Almost one-third of the skills shortage vacancies in the retail sector occur in sales occupations. Recent research (ORC cited in Skillsmart Retail, 2009) among 616 retailers across the UK, highlighted differences in skills, qualities and attributes between young and older applicants for shop floor roles. Respondents identified the main areas of skills lacking in young applicants as work ethic/attitude to work; good verbal communication; and customer handling skills. For older applicants to shop floor positions, retailers identified different areas of skills that were lacking, notably IT/computer literacy and relevant job experience in retail. At least 20 per cent of SSVs in manufacturing, business services, education and health/social work are accounted for by the professional occupational group. The study commissioned as a part of this Audit on the low carbon industries (PwC, 2010a) found persistent skills shortages across most engineering disciplines both for highly qualified engineers and experienced technicians, for project managers with an engineering qualification, but also in more specialised areas such as geologists and marine and aeronautical engineers. The reports of shortages of engineers are not, of course, confined to the low carbon sector. For example, a significant current deficit of broadcast engineers is reported in the broadcast communications sector (Skillset, 2009) and electrical, mechanical and civil engineers in the utilities sector (Energy & Utility Skills).

Other professionals in short supply include:

- Social Workers: Skills for Care and Development (2009) report that the Local Government Workforce Survey 2009 found that 72 per cent of respondents reported difficulty recruiting children's social workers (and 60 per cent reported retention difficulties). The number reporting difficulties in recruiting adult social workers had increased to 46 per cent for recruitment.
- Advice workers, counsellors and community development workers and other positions that require interaction with service users and the possession of specific skills: Skills for Justice (2009) found in a survey of third sector employers that the primary reasons for these recruitment difficulties are lack of specific skills and necessary experience.
- Pharmacists and specialists in physiological sciences and respiratory physiology (Skills for Health, 2009).
- Food scientists and technologists: Improve (2009) cite a 2007 research study in the food and drink sector in which more than half (53%) of industry employers surveyed said there was a shortage of people to fill food scientist and technologist roles, and that this shortage was being driven by an increased demand for these personnel by employers.
- Actuaries: There is evidence that demand significantly exceeds supply for this profession. Despite the recession, demand for actuaries continues to grow as insurance companies seek better means of managing and mitigating their risks (PWCb, 2010).

Given the importance of intermediate-type skill shortages in a range of sectors, it is worth turning again to look at Apprenticeships. As we have already noted, Apprenticeships is one key way in which Government has sought to increase the supply of skilled workers, and this is particularly so for jobs at the intermediate level.

First, the volume and levels of change in Apprenticeship completions across sectors is of interest (see Table 3.8). This shows that the main areas of Apprenticeship activity are in construction (one in nine of all Apprenticeships), hairdressing, customer service, engineering, childcare and hospitality. The main growth has been in management, contact centres, construction and childcare.

Second, completion rates (for Apprenticeships and Advanced Apprenticeships) also vary widely by sector, being relatively high (at over 60%) for accountancy and telecommunications frameworks, but less than half on hospitality, retail, plumbing, health and social care and vehicle maintenance.

Table 3.8: Apprenticeship programme achievements in selected frameworks

Framework area	Level in 2007/08	% of total in 2007/08	Average annual % change 2003/04 to 2007/08	Level in 2008/09 (provisional)
Children's care learning and development	7,600	6.7	80.6	8,900
Construction	12,800	11.4	89.3	11,500
Contact centres	700	0.6	62.5	1,000
Customer service	9,000	8.0	27.3	12,700
Electricity industry	200	0.2	25.0	100
Electrotechnical	3,200	2.8	15.0	2,900
Engineering	7,800	6.9	25.0	7,400
Engineering construction	100	0.1	0.0	200
Food and drink manufacturing operations	100	0.1	0.0	-
Hairdressing	9,700	8.6	30.1	8,800
Health and social care	4,100	3.6	43.3	6,100
Hospitality and catering	7,500	6.7	13.3	8,400
IT and telecommunications	-	-	-	1,600
IT services and development	1,700	1.5	-2.6	500
IT user	1,800	1.6	-	1,700
Management	1,100	1.0	250.0	3,000
Automotive industry	1,300	1.2	-11.5	200
Retail	4,300	3.8	12.1	5,500
Retail financial services	100	0.1	-	200
Sales and telesales	200	0.2	-	1,800
Travel and tourism services leisure and business	800	0.7	-2.8	800
Vehicle maintenance and repair	4,200	3.7	-	5,100

■ high levels of growth in/volume of apprenticeship completions

■ biggest decline in apprenticeship completions. NB blank cells relate to one or more suppressed data points where absolute numbers are less than 50

Source: DCSF Statistical First Release November 2009

3.2.5 Skill shortages in higher skilled occupations: evidence from the Migration Advisory Committee (MAC)

The Migration Advisory Committee (MAC) has undertaken a number of studies to assess occupational skills shortages in order to inform UK managed migration policy. Assessment is based on three principles: 'skilled' (NQF level 3 or above); 'shortage' (based on a number of indicators including skill-shortage vacancies but also including pay and hours worked); and 'sensible' (taking into account supply constraints and wider labour market and economic implications).

The most recent MAC report (2009) excludes skills shortage measures from the calculations because of the reliance on data from the 2007 National Employer Skill Survey which may no longer be accurate, but finds this has little impact on the list of occupations produced. **The jobs and occupations on the shortage list produced by the MAC in Autumn 2009 account for fewer than 500,000 employees, and less than two per cent of total employment in the UK** (and it needs to be remembered that this estimate relates to the total number of people – migrants and non-migrants, currently working in these jobs) (MAC, 2009:6). It is important to note that the MAC studies, by definition, only cover shortages of workers in *skilled* occupations (as per their own definition). The list of skill shortage occupations identified by the MAC in Autumn 2009 is shown in Table 3.9.

Table 3.9: List of skill shortage occupations identified by MAC, 2009

Related occupation title and SOC code (see notes 1 and 2)	Job titles included on the shortage occupation list
Production, works and maintenance managers (1121)	ONLY the following job title within this occupation: project manager within the electricity transmission and distribution industry
Managers in mining and energy (1123)	ONLY the following job titles within this occupation: site manager, station manager, shift/group leader within the electricity transmission and distribution and the electricity generation industries
Civil engineers (2121)	ONLY the following job titles within this occupation: geotechnical engineer, geotechnical design engineer, geotechnical specialist, reservoir panel engineer, rock mechanics engineer, soil mechanics engineer, geomechanics engineer, tunnelling engineer, petroleum engineer, geoenvironmental engineer, contaminated land engineer, drilling engineer, completions engineer, fluids engineer, reservoir engineer, status resource engineer, offshore and subsea engineer, control and instrument engineer, process safety engineer, planning drilling engineer, subsurface engineer, project civil engineer in the electricity generation industry and contaminated land engineer
Mechanical engineers (2122)	ONLY the following job title within this occupation: mechanical engineer in the electricity transmission and distribution and the electricity generation industries
Biological scientists and biochemists (2112)	ONLY the following job titles within this occupation: cardiac physiologist, clinical neurophysiologist, clinical vascular scientist, respiratory physiologist and sleep physiologist
Physicists, geologists and meteorologists (2113)	ONLY the following job titles within this occupation: engineering geologist, hydrogeologist, geophysicist, geoscientist, geophysical specialist, engineering geophysicist, and engineering geomorphologist, nuclear medicine scientist and radiotherapy physicist. Also staff working in diagnostic radiology (including magnetic resonance imaging)
Electrical engineers (2123)	ONLY the following job titles within this occupation: electrical engineer in the oil and gas industry and power system engineer, control engineer, protection engineer, project control engineer, control and instrumentation engineer, assistant engineer, electrical engineer within the electricity transmission and distribution industry
Chemical engineers (2125)	ALL jobs within this occupation
Design and development engineers (2126)	ONLY the following job title within this occupation: design engineer within the electricity transmission and distribution industry
Production and process engineers (2127)	ONLY the following job title within this occupation: plant process engineer within the electricity generation industry
Planning and quality control engineers (2128)	ONLY the following job titles within this occupation: planning/development engineer and quality, health, safety and environment engineer within the electricity transmission and distribution industry
Engineering professionals n.e.c. (2129)	ONLY the following job titles within this occupation: project engineer, proposals engineer within the electricity transmission and distribution industry
Medical practitioners (2211)	ONLY the following job titles within this occupation: consultants within the following specialities: audiological medicine, genitourinary medicine, haematology, medical microbiology and virology, neurology, nuclear medicine, obstetrics and gynaecology, occupational medicine, paediatric surgery Consultants within the following specialities of psychiatry: forensic psychiatry, general psychiatry, learning disabilities psychiatry and old-age psychiatry Also non-consultant, non-training, medical staff posts in the following specialities: anaesthetics, paediatrics and general medicine specialities delivering acute care services (intensive care medicine, general internal medicine (acute), emergency medicine, general surgery, obstetrics and gynaecology, and trauma and orthopaedic surgery) Also ST4 level trainees in paediatrics
Pharmacists/ pharmacologists (2213)	ONLY the following job titles within this occupation: registered pharmacist working in the NHS or hospitals (including pre-registration pharmacist working in the NHS or hospitals)
Dental practitioners (2215)	ONLY the following job title within this occupation: consultant in paediatric dentistry
Veterinarians (2216)	ONLY the following job title within this occupation: veterinary surgeon
Secondary education teaching professionals (2314)	ONLY the following job title within this occupation: secondary education teacher within the subjects of maths or science
Special needs education teaching professionals (2316)	ONLY the following job title within this occupation: all teaching posts in special schools
Social workers (2442)	ONLY the following job title within this occupation: social worker working in children's and family services
Nurses (3211)	ONLY the following job titles within this occupation: specialist nurse working in operating theatres, operating department practitioner and specialist nurse working in neonatal intensive care units
Engineering technicians (3113)	ONLY the following job title within this occupation: commissioning engineer
Science and engineering technicians n.e.c. (3119)	ONLY the following job title within this occupation: production controller in the electricity generation industry

Table 3.9: List of skill shortage occupations identified by MAC, 2009 (continued)

Related occupation title and SOC code (see notes 1 and 2)	Job titles included on the shortage occupation list
Medical radiographers (3214)	ONLY the following job titles within this occupation: HPC registered diagnostic radiographer, HPC registered therapeutic radiographer and sonographer
Medical and dental technicians (3218)	ONLY the following job titles within this occupation: nuclear medicine technologist and radiotherapy technologist
Speech and language therapists (3223)	ONLY the following job title within this occupation: speech and language therapist (Agenda for Change bands 7+ or their independent sector equivalents)
Therapists n.e.c. (3229)	ONLY the following job title within this occupation: HPC registered orthoptist
Dancers and choreographers (3414)	ONLY the following job titles within this occupation: skilled classical ballet dancer and skilled contemporary dancer
Musicians (3415)	ONLY the following job title within this occupation: skilled orchestral musician
Photographers and audio-visual equipment operators (3434)	ONLY the following job titles within this occupation: roles within visual effects and 2D/3D computer animation for film, television or video games: animation supervisor, animator, computer graphics supervisor, technical director, CG supervisor, modeller, rigging supervisor, rigger, matte painter, texture artist, compositing artist, producer, production manager, editor, R&D tools, R&D software, software engineer, system engineer
Welding trades (5215)	ONLY the following job title within this occupation: high integrity pipe welder
Metal working production and maintenance fitters (5223)	ONLY the following job title within this occupation: licensed and military certifying engineer/inspector technician and airframe fitter
Line repairers and cable jointers (5243)	ONLY the following job title within this occupation: overhead linesworker within the electricity transmission and distribution industry
Electrical/electronics engineers n.e.c. (5249)	ONLY the following job title within this occupation: site supervisor within the electricity transmission and distribution
Butchers, meat cutters (5431)	ONLY the following job titles within this occupation: skilled meat boner and skilled meat trimmer
Chefs, cooks (5434)	ONLY the following job title within this occupation: skilled chef
Care assistants and home carers (6115)	ONLY the following job title within this occupation: skilled senior care worker
Animal care occupations n.e.c. (6139)	ONLY the following job title within this occupation: skilled work rider
Fishing and agriculture related occupations n.e.c. (9119)	ONLY the following job title within this occupation: skilled sheep shearer

Source: Migration Advisory Committee (2009)

Note: (1) n.e.c. stands for 'not elsewhere classified'. (2) For official job descriptions relating to 4-digit occupations in SOC2000, see www.statistics.gov.uk/methods_quality/ns_sec/downloads/SOC2000_Vol1_V5.pdf

This list indicates a **broad range of shortages in science, technology and engineering occupations, particularly healthcare and the electricity industry, as well as a shortage of education professionals for subjects needed by those wishing to enter some of these occupations.** Also notable are staff shortages in forms of care work and some fine arts professions.

Data from the National Employer Skills Survey, the MAC analysis and sector-based research show some **strong patterns of common skills shortage vacancies.** Although incidence is relatively low, and declining as the recession influences the labour market, **some shortages persist, particularly at the technician level. Associate professional occupations show the highest overall incidence of vacancies, most commonly in service/public sector industries, and there is evidence of difficulties in filling skilled trades in six sectors.** Education and health and social work have a relatively high incidence of vacancies across three different occupations. Higher level professional and managerial occupations have relatively lower incidences of SSVs, possibly because they are filled with an adequate graduate supply, which has expanded in recent years. Despite increase in completions in many subject areas, the overall volumes of Apprenticeships compared to supply of graduates appears relatively low. SSVs in associate professional and skilled trades occupations persist, and this suggests an inadequate supply.

3.3 The skills of the unemployed

As we can see from Table 3.10 and Figure 3.4, **the occupational distribution of those out of work is significantly different from those that are in work (and indeed, from the main sources of jobs growth in the labour market)**. 43 per cent of Jobseeker's Allowance claimants, 38 per cent of the ILO unemployed and 48 per cent of the long-term unemployed were previously in operative or elementary occupations. This is between twice and three times the proportion of the unemployed found in the 'top' three occupational groups (managers, professionals and associate professional). Obviously **there is a profound mismatch between the jobs that need to be done and the jobs that the unemployed are probably able to do without significant upskilling**. This represents a major 'surplus' of skills that are not in high demand in the labour market. This problem is even more severe for those on the JSA and the long-term unemployed than for the short term unemployed and economically inactive.

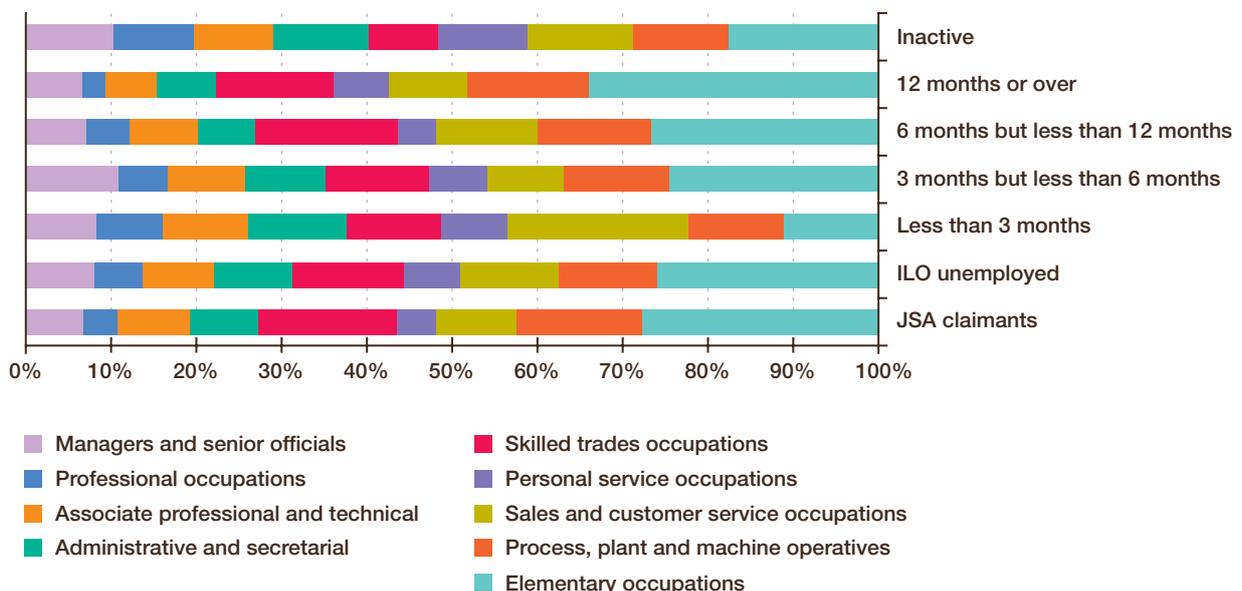
Table 3.10: Previous occupation of inactive and unemployed adults, July to September 2009

	JSA claimants	ILO unemployed	Less than 3 months*	3 months but less than 6 months*	6 months but less than 12 months*	12 months or over*	Inactive
Managers and senior officials	7%	8%	8%	11%	7%	7%	10%
Professional occupations	4%	6%	8%	6%	5%	3%	9%
Associate professional and technical	9%	8%	10%	9%	8%	6%	9%
Administrative and secretarial	8%	9%	12%	9%	7%	7%	11%
Skilled trades occupations	16%	13%	11%	12%	17%	14%	8%
Personal service occupations	5%	7%	8%	7%	5%	6%	11%
Sales and customer service occupations	9%	12%	14%	9%	12%	9%	12%
Process, plant and machine operatives	15%	12%	8%	12%	13%	14%	8%
Elementary occupations	28%	26%	21%	24%	27%	34%	21%
Total	100%	100%	100%	100%	100%	100%	100%

Source: ONS (2009) Labour Force Survey

* ILO Unemployed

Figure 3.4: Previous occupation of inactive and unemployed adults, July to September 2009



Source: ONS (2009) Labour Force Survey

Table 3.11 and Figure 3.5 provide details of the qualifications of the unemployed and compare these to the qualifications of those in work. At both the top and bottom of the qualification distribution we can see that **the unemployed have substantially lower qualifications levels than those in employment**. For example, only seven per cent of those in work have no qualifications compared to 21 per cent of the long-term unemployed. **Nevertheless**, it is still the case that, for example, **nearly one in seven of the ILO unemployed have a degree, and nearly 40 per cent have a level 3 qualification or above**. So, while there is a substantial mismatch between the skills of those not in work (as measured by qualifications and their previous job) and those in work, it is also the case that many have at least the qualification level that mirrors that of those in work. Whether these skills are appropriate for the job opportunities available is another question.

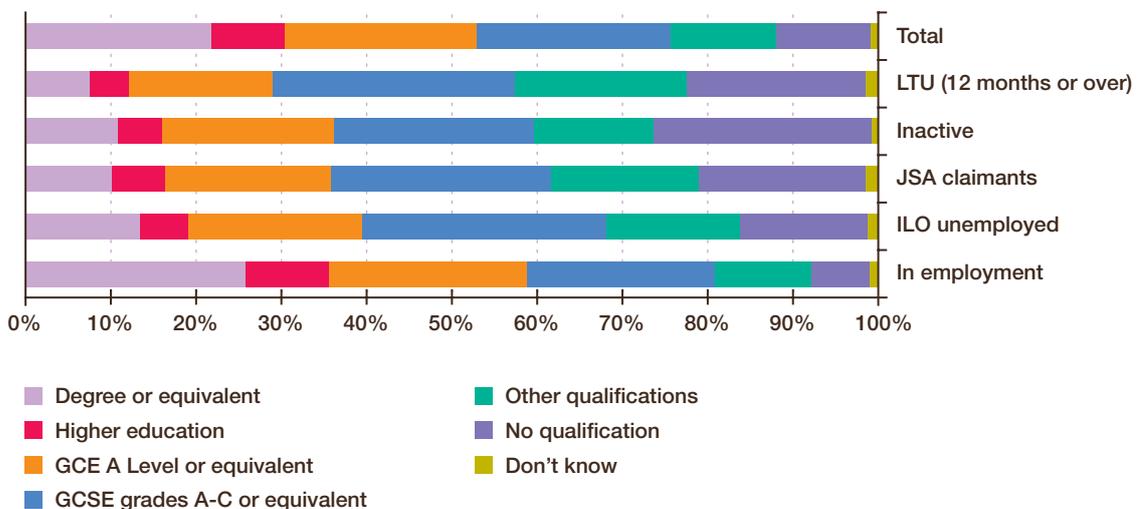
Table 3.11: Highest level of qualifications for unemployed and economically inactive adults

	In employment	ILO unemployed	JSA claimants	Economically inactive	Long-term unemployed (12 months +)*	All working age adults
Degree or equivalent	26%	13%	10%	11%	8%	22%
Higher education	10%	6%	6%	5%	4%	8%
GCE A Level or equivalent	24%	21%	20%	20%	17%	23%
GCSE grades A-C or equivalent	22%	28%	26%	24%	28%	23%
Other qualifications	11%	16%	17%	14%	20%	12%
No qualification	7%	15%	20%	25%	21%	11%
Don't know	1%	1%	1%	1%	1%	1%
Total	100%	100%	100%	100%	100%	100%

Source: ONS (2009) Labour Force Survey

* ILO Unemployed

Figure 3.5: Highest level of qualifications for unemployed and economically inactive adults



Source: ONS (2009) Labour Force Survey

Note: Data apply to all working age adults

3.4 Which skills and qualifications carry high wage returns?

The returns to skills and qualifications give some indication of employer demand, with highly sought after skills and qualifications attracting higher returns and vice-versa. Wage premia for particular kinds of skills may develop because of a short-term increase in employer demand, a need to provide an incentive to individuals to develop particular kinds of skills, persistent skill shortages, or a simple reflection of the market distribution of rare skills (i.e. a reward for scarce skills which are not easily learned).

There is an extensive literature on the returns to different types and levels of academic and vocational qualifications.¹ As a general principle, **wage premia increase with higher levels of qualifications**. Therefore, the more highly qualified an individual, the more likely they are to receive a high wage premium. Furthermore, the relative earnings premium to highest levels of qualification (level 4 and above or tertiary) has been increasing in most OECD countries over the last decade, including the UK. **Academic qualifications generally carry higher wage premia than vocational qualifications**, especially at lower levels, but at level 4 and above vocational qualifications can outperform academic qualifications.

Turning first to academic qualifications, earnings premia of between 10-21 per cent can be gained from possessing GCSEs or 'O' levels, a further 15-23 per cent for 'A' levels, and a further 10-26 per cent for a degree when averaged across all individuals holding that qualification (Dearden *et al*, 2000). More recent work reviewed by McIntosh (2009) confirms these figures for intermediate academic qualifications with 5+ GCSEs or 'O' levels providing an average return of 11-29 per cent and two or more 'A' levels providing a further premium of 14 per cent. Returns to degrees do vary significantly by subject with far higher wage premia for STEM (Science, Technology, Engineering and Mathematics) related subjects and there is a suggestion that there may be no wage premia for arts/humanities courses from which graduates are unable to find graduate level work – which could be indicative of oversupply in these areas (Powdthavee and Vignoles, 2006).

There is also some evidence that the range of wage premia for graduates in the UK may be weakening or widening (Purcell *et al*, 2005; O'Leary and Sloane, 2005; Green and Zhu, 2007). Green and Zhu (2007) suggest this is caused primarily by graduates needing to take non-graduate level jobs on leaving university and therefore earning lower wages than would otherwise be the case. Support is provided for this notion by considering only those graduates managing to secure graduate level jobs on leaving university. For this group the dispersion of returns shows no sign of widening. Thus Green and Zhu conclude that returns may not be falling for graduates on average, but the range of earnings they receive is widening.

It is not simply the subject and level of qualifications but also assessments of their relevance to the workplace that appear to be important in determining employment outcomes for learners. Mason *et al* (2006) show an impact from 'employability' skills content within degrees on job outcomes. Work experience within degree programmes appears to be more beneficial than teaching and assessment of these skills within universities. However, it is possible that there is a selection effect in that courses offering work experience attract students who already possess some of the skills that work experience confers. They also found employer involvement in course design has a positive effect on likelihood of entry to a graduate level occupation. A one unit change in the level of employer involvement in course design and delivery is associated with a 29 per cent increase in the probability of graduates obtaining a graduate level job.

Wage premia for vocational qualifications tend to be lower for than academic equivalents at the same level. This is particularly true at intermediate levels (level 2 and 3). For instance, McIntosh (2009) reports that when compared to individuals without qualifications and when held as the individual's highest qualification, vocational qualifications at level 2 provide a return of up to 20 per cent. This varies according to the nature of the qualification with RSAs providing the highest (20%), BTECs providing 11 per cent (not significant), City and Guilds seven per cent and NVQs four per cent. For those gaining their NVQ level 2 through an employer rather than a College or Government training scheme returns can be as high as 10 per cent. At level 3 vocational qualifications again provide a spread of returns from 11 per cent for NVQs to 25 per cent for ONC/ONDs.

Apprenticeships also carry healthy marginal wage returns (McIntosh, 2009). Compared to those with level 2 qualifications (either academic or vocational), those who complete a level 3 Apprenticeship earn a wage premium of 22 per cent for males and 14 per cent for females. Relative to a holders of other qualifications at level 1 or 2, Apprenticeships at level 2 provide a return of 20 per cent for males and four per cent for

1. For a summary of the evidence, see Garrett *et al* (2010, forthcoming) and for a review of vocational qualifications at levels 2 and 3, McIntosh (2009)

females (not statistically significant). There is a possibility that limited numbers of Apprenticeship places means that those gaining and completing them have higher basic ability levels, so higher wages reflect innate ability rather than the value of the qualification itself. Further detail and analysis of the returns to Apprenticeships including a cost benefit analysis is provided by McIntosh (2007).

Vocational qualifications are valued more highly in some sectors and occupations than in others. NVQ level 2s are most valued in skilled and personal service occupations (13% and 9% respectively) relative to those without qualifications and in energy and water (13%), construction (9%) and public education and health sectors (8%) (McIntosh, 2009). A similar sectoral and occupational pattern is noted for other intermediate vocational qualifications but with a much greater range of returns. For further details of how the returns to intermediate vocational qualifications vary by sector and occupation and other variables such as age of acquisition, acquisition route and ability, see McIntosh (2009).

There is also sectoral variation in the returns to Apprenticeships, suggesting they are valued more in some sectors than others. Employees in the construction sector who complete Apprenticeships can expect an average wage increase of 32 per cent compared to an employee with another level 2 qualification, whereas there appears to be no wage premia for employees who hold Apprenticeships in the retail sector (McIntosh, 2007).

However, vocational qualifications typically take less time to acquire than their academic equivalents and when one estimates the wage return per year of study the gaps narrows considerably (McIntosh, 2009). Professional qualifications often carry very high earnings premia, ranging from 15-40 per cent but these cover a very wide range of types of qualification, making comparison difficult (Dearden *et al*, 2000).

Using evidence from surveys of workers about skills required in their jobs and their earnings shows that generic skills are sought after by employers. When combined with influencing skills (involving either the composition of documents, oral presentation skills or interpersonal skills) complex IT skills carry a wage premium of at least 10 per cent (Felstead *et al*, 2007).

The main message from the evidence on returns to qualifications is that higher levels of qualification attract higher wage returns. Academic qualifications carry a premium over vocational qualifications and higher level vocational qualifications carry a premium for level 4 and above. However, when the time taken to study for qualifications is considered the gap between vocational and academic qualifications narrows because of the longer study time required for the latter. Returns to qualifications vary between sectors; where general levels of qualifications are higher, there are lower premiums attached to lower level qualifications. There are occupational patterns to the returns to intermediate vocational qualifications with skilled occupations and personal service occupations providing the largest premia.

Employer influence over content of qualifications taught in higher education and exposure to work experience appear to yield enhanced likelihood of graduate level employment. The same can be said of intermediate vocational qualifications, particularly Apprenticeships. This suggests that employability skills as well as qualifications which denote either technical knowledge or a general level of cognitive ability are valued by employers of graduates. There is some tentative evidence to suggest a change in the balance of supply between science and arts/humanities graduates with some suggestion of an oversupply among some of the latter subject areas.

- Aerospace employers report that graduates entering the industry lack employability skills: in some cases they estimated that graduates would take up to two years to acquire the necessary skills to make a positive contribution to the business (Semta *et al*, 2009).
- Skillfast-UK's 2008 survey of businesses (Skillfast-UK, 2009) found that 60 per cent of businesses that employ designers said that recent design graduates lacked the necessary technical skills for a job in the sector, whilst 65 per cent lacked the required commercial awareness. Graduate applicants and, to some extent, existing staff are in need of improving their commercial awareness in its broadest sense. This inability to be entrepreneurial and proactive translates into missed business opportunities or an inability to appreciate the effects of the current crisis on clients (Financial Services Skills Council, 2009).
- The ability to commercialise technological innovations and developments has been cited as essential in several sectors identified in *New Industry, New Jobs*, including advanced manufacturing, digital, life sciences and biotechnology, and low carbon (Semta *et al*, 2009; e-skills-UK *et al*, 2009; Cogent *et al*, 2009; Energy & Utility Skills *et al*, 2009).

3.5 Skill gaps: the national, occupational, sectoral and regional picture

3.5.1 Skill gaps: the national picture

We now turn to the existence of skill gaps within the existing employed workforce. Skill gaps arise where employees are seen to be not fully proficient in their job. The overall extent of skill gaps, their distribution by size of establishment and occupational group is set out in tables 3.12 and 3.13.

Overall, one in five establishments report experiencing a skill gap of some kind in its existing workforce, an increase of four percentage points since 2007. The proportion of workers reported as exhibiting skill gaps is seven per cent, or 1.7 million. This may reflect growing employer awareness of existing skill gaps and/or changes in the nature of work staff are required to do, especially as business pressures have increased due to the recession.

The existence of skill gaps is more likely to be reported in larger establishments, though even amongst smaller ones (say, employing less than 25 people), the number of skill gaps still amounts, in total volume, to more than that in the largest establishments. The greatest increase in the incidence of skill gaps since 2007 is also among larger employers with over 200 staff.

Table 3.12: Incidence, number and density of skill gaps by size of establishment

	% of establishments with any skill gaps		Number of employees not fully proficient (i.e. number of skill gaps)	% of staff reported as having skill gaps	Share of employment	Share of all skill gaps
	2007	2009				
	%	%				
Overall	15	19	1,702,500	7	100	100
Size:						
Fewer than 5	8	10	90,300	4	9	5
5 to 24	21	26	359,300	7	23	21
25 to 99	30	39	380,700	7	25	22
100 to 199	39	48	195,100	7	11	11
200 to 499	42	55	331,300	10	15	19
500+	48	59	345,700	9	16	20

Base: First two columns all establishments, remainder all employment

Note: The number of employees not fully proficient has been rounded to the nearest 100

Source: National Employer Skills Survey 2009

It should be noted that the reality of the labour market is that there will be a good deal of substitution between skill shortages and skill gaps. When faced with inadequate applicants, some employers will leave the vacancy unfilled (a skill shortage), whilst other employers may feel it is better to recruit someone who is not appropriately skilled, in which case the deficiency will reveal itself as a skill gap.

To overcome this issue, the two separate indicators can be combined into a single measure: the proportion of establishments who report that they face a 'skills issue'. When expressed in this form we can see that in 2009, 21 per cent of establishments were suffering from a skills issue (see Table 3.13).

Looking over time, we can see that on this combined skill measure, the proportion of employers with a skills issue decreased over the period 2003-2007, from 25 per cent to 18 per cent, but then rose again in 2009. Whilst this may seem counter-intuitive in a period of recession, and skill shortage vacancies have fallen, the proportion of establishments suffering skill gaps has increased.

Table 3.13: Proportion of employers reporting skills issues in England 2003-2009

Skill gaps and skill shortage vacancies	2003	2005	2007	2009
With skills issue	25	20	18	21
No skills issue	75	80	82	79
Total	100	100	100	100

Source: National Employer Skill Survey 2003, 2005, 2007 and 2009

Note: all measures are establishment-based

3.5.2 Skill gaps: the occupational picture

As Tables 3.14 and 3.15 show, **most skill gaps are found in elementary, managerial, sales and administrative staff**, with a small increase in the proportion of firms reporting managerial skill gaps since 2007.

Table 3.14: Distribution of skill gaps by occupation 2003-2009

Row percentages	Number of skill gaps (000s)		Managers	Professionals	Associate professionals	Administrative	Skilled trades	Personal services	Sales	Operatives	Elementary
Total 2003	2,400	%	12	10	8	13	8	6	19	8	16
Total 2004	1,540	%	10	10	7	12	9	6	20	10	15
Total 2005	1,265	%	11	7	6	12	8	9	19	8	20
Total 2007	1,361	%	12	9	7	14	8	7	19	7	17
Total 2009	1,702	%	14	9	7	13	8	9	18	7	17

Base: All skill gaps

Note: Percentages sum to 100% in each row (subject to rounding)

Source National Employer Skills Survey 2009

Table 3.15: Distribution of skill gaps by occupation by size for 2009

Row percentages	Number of skill gaps (000s)		Managers	Professionals	Associate professionals	Administrative	Skilled trades	Personal services	Sales	Operatives	Elementary
<i>Size:</i>											
Fewer than 5	90	%	27	3	4	16	14	6	17	3	10
5 to 24	359	%	13	4	5	11	10	9	24	4	20
25 to 99	381	%	10	6	6	9	8	13	19	6	23
100 to 199	195	%	12	11	7	12	7	8	18	7	17
200 to 499	331	%	13	9	9	14	6	7	20	8	14
500+	346	%	17	15	8	18	5	7	11	9	10

Base: All skill gaps

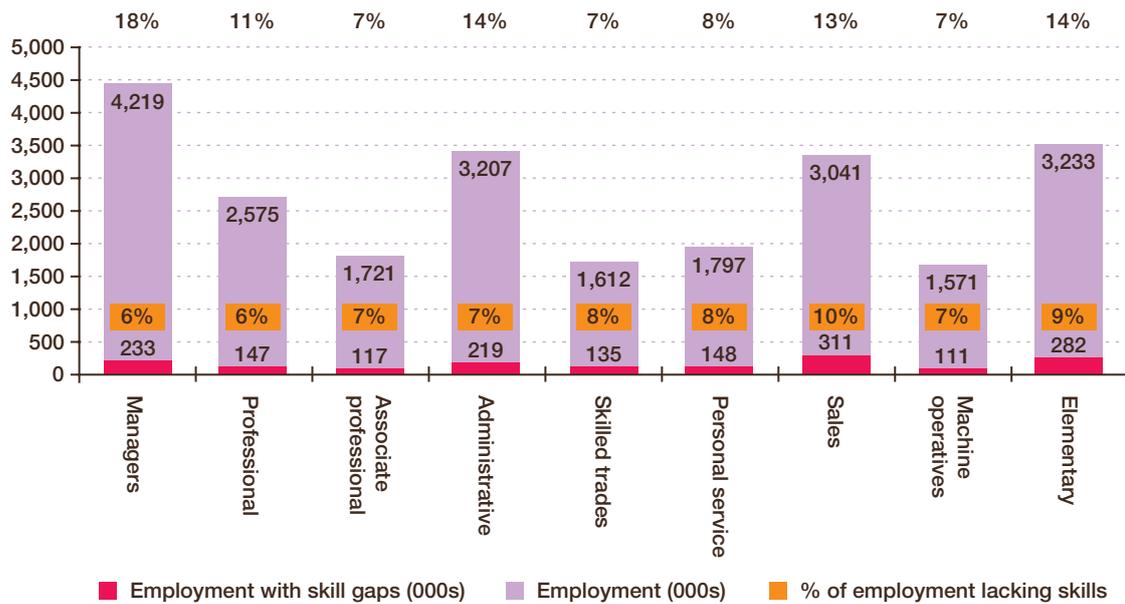
Note: Percentages sum to 100% in each row (subject to rounding)

Source: National Employer Skills Survey, 2009

Managerial skill gaps are most prevalent in smaller (under five employees) and larger (over 500 employees) workplaces, although it should be noted that most staff in these organisations occupy management roles. In larger organisations with more than 500 staff, management, professional and administrative staff have a larger share of skill gaps than other staff or than these occupational groups in smaller organisations.

Figure 3.6 shows that, as in 2007, **workers doing sales or elementary roles are more likely to have skill gaps**. These are most likely to relate to specific job-related skills or customer service, team working, and (oral) communication skills and, in some cases, basic and language skills (see for example Improve, 2009 in the food and drink sector). In sectors such as retail and process manufacturing the prevalence of such skill gaps is generally attributed to high labour turnover (Improve, 2009; Skillsmart Retail, 2009).

Figure 3.6: Distribution of skill gaps by occupation



Base: All employment

Source: National Employer Skills Survey, 2009

Customer service-related skill gaps are not restricted to employees in sales occupations. Drivers and related staff in both the logistics and public transport sectors are also reported to lack customer service and communication skills (Skills for Logistics, 2009; GoSkills, 2009). Customer service skills are also reported as being an important gap in the automotive sector, hospitality, building services and housing, cleaning and facilities management (IMI, 2009; People 1st, 2009; Skillsmart Retail, 2009; Asset Skills, 2009).

Skill gaps are less commonly reported in skilled occupations, although in some sectors skill gaps have emerged among this group as the demands on their roles have increased. Over the last 10 years, those qualified to NVQ level 3 (craft/skilled trades occupation) have decreased from 44 per cent to 33 per cent of the workforce. Investment in new technology and a focus on moving up the value chain has led to an 'off shoring' of lower value craft and operator level production activity. However, those technical jobs that remain at this level are increasingly more complex due to innovation, so there is a constant workforce development requirement for up-skilling and multi-skilling (Semta, 2009). Technical skill gaps in the electronics sector are often associated with using Computer Aided Design and Computer Aided Engineering equipment (Semta, 2009).

So, how does the pattern of training compare with the existence of skill gaps? Are employers responding effectively? Table 3.16 shows that training provision is associated with employers reporting the presence of skill gaps, regardless of organisation size, suggesting it is used to overcome existing skills deficits in current staff. In addition, over 70 per cent of employers reported increasing training to try to overcome skill gaps.

The most common reason given in employer responses to the NESS (Shury *et al*, 2010) for not training staff is that workers are fully proficient. Small scale qualitative research tends to support this assertion. For example, an analysis of why smaller organisations in Yorkshire and the Humber do not train their staff showed evidence of long-serving staff who did not seek training unless they wished to change employer/career, an absence of competitive pressures for businesses to alter product market strategies as they did not export and the presence of other constraints (e.g. size/availability of premises which limited growth) (Devins *et al*, 2008).

Table 3.16: Relationship between training provision and skill gaps

Row %		Base (weighted)	Base (unweighted)	% Train at all 2007	% Train at all 2009	% Trainees as a proportion of current workforce 2007	% Trainees as a proportion of current workforce 2009
Overall	Gap	21,654	15,754	83	85	69	66
	No gap	1,229,853	63,264	65	68	60	69

Source: National Employer Skills Survey, 2007

Table 3.17 and Table 3.18 show that **training is most frequently provided for workers in the most senior occupational category who are likely to have the highest level of skills and existing qualifications**. Data from the Labour Force Survey show that the proportions of different categories of worker who participate in training are concentrated among managers and professionals and those with higher levels of qualifications. There has been little variation in the proportions of people reporting participation in training through LFS over the last decade.

Table 3.17: Work related training experienced in England according to occupational status and level of qualification

	All people	% last 4 weeks	(men)	(women)	% last 13 weeks	(men)	(women)
Managerial or professional occupations	10,352,700	17	15	21	33	29	39
<i>Level of education</i>							
NVQ 4+	7,860,300	19	16	22	36	32	41
NVQ 3 or below	15,609,400	11	10	13	22	20	25

Source: ONS (2009) Labour Force Survey Q1 (retrieved from NOMIS)

The NESS findings (Shury *et al*, 2010) show rather more variation in training provision over time by occupation. The incidence of both on the job and off the job training has decreased for personal service, administrative/secretarial and professional occupations since 2007. For sales and customer service and elementary occupations, training methods show evidence of change from off the job to on the job delivery. Skilled trade occupations have experienced a net increase in training provision, which is in the form of off the job training.

Table 3.18: Incidence of training by occupational group

Occupation	Incidence of on the job training		Incidence of off the job training	
	2007	2009	2007	2009
Managers and senior officials	58%	50%	53%	53%
Professional occupations	14%	6%	12%	8%
Associate professional and technical occupations	10%	8%	10%	7%
Administrative and secretarial	30%	25%	34%	19%
Skilled trades occupations	14%	13%	13%	17%
Personal service occupations	12%	6%	11%	6%
Sales and customer service occupations	17%	28%	24%	13%
Process, plant and machine operatives	6%	7%	7%	6%
Elementary occupations	14%	18%	19%	1%
Weighted base		366,432	673,264	244,888

Source: National Employer Skills Survey, 2007 and 2009

- occupations experiencing decline between 2007 and 2009 of at least 5% in the proportions receiving on the job training
- occupations experiencing increase between 2007 and 2009 of at least 4% in the proportions receiving on the job training
- occupations experiencing decrease between 2007 and 2009 of at least 5% in the proportions receiving off the job training
- occupations experiencing increase between 2007 and 2009 in off the job training

An increase in the incidence of reported skill gaps, and concentration among management, administration, sales and elementary workers suggests that these are fairly widespread across different occupations. Associations between training provision and the presence of skill gaps in organisations raises questions about the purpose and volume of training provided and/or its success in targeting and closing skill gaps effectively. Training is most commonly provided to workers in higher skilled jobs and higher occupational categories but NESS data (Shury *et al*, 2010) shows incidence of provision has decreased across all categories of occupations since 2007, with the exception of off the job training for managers. This raises questions both about whether decline in training provision for most groups may be exacerbating skill gaps and mismatches between demand for, and supply of skills, and the quality of the training provided for managers.

3.5.3 Skill gaps: the sectoral picture

Analysing skill gaps by sectors provides the results shown in Table 3.19.

Table 3.19: Incidence and number of skill gaps by broad SIC sector

	% of establishments with any skill gaps	Number of employees not fully proficient (i.e. number of skill gaps)	% of staff reported as having skill gaps	Share of employment	Share of all skill gaps
	%		%	%	%
Overall	19	1,702,500	7	100	100
Agriculture	13	18,400	6	1	1
Mining and quarrying	16	1,500	6	0	0
Manufacturing	20	203,500	9	10	12
Electricity, gas and water	30	9,400	9	0	1
Construction	18	76,700	7	5	4
Retail and wholesale	20	292,900	8	17	17
Hotels and catering	26	164,700	11	6	10
Transport, storage and communications	17	89,000	7	6	5
Financial intermediation	22	82,100	8	4	5
Business services	15	298,300	7	19	17
Public administration and defence	23	59,100	5	5	3
Education	25	110,000	5	9	6
Health and social work	23	211,900	8	12	12
Other services	18	92,100	8	5	5

Base: First column all establishments, remainder all employment

Note: The number of employees not fully proficient has been rounded to the nearest 100

 sectors with high or above average indicators of skill gaps

Source: National Employer Skills Survey, 2009

Establishments with a higher than average share of skill gaps are found in manufacturing, electricity/gas/water and hotels/catering, which also have higher than average proportions of staff with skill gaps. **Overall, manufacturing and hotels/catering have higher shares of skill gaps than their share of employment.** At least 20 per cent of employers in retail/wholesale, financial intermediation, public administration/defence, education and health/social work also have skill gaps. Density of skill gaps among staff groups is lower than average in public administration/defence, education, but higher than average in manufacturing and electricity/gas/water. While business services has a lower share of skill gaps than of employment, it has the joint highest absolute share of all skill gaps together with retail, which is explained by the large overall shares of employment held by these two sectors.

The types of skill gaps within sectors also vary as shown in Table 3.20.

Table 3.20: Nature of skill gaps by broad SIC sector

		Technical and practical	Customer handling	Team working	Oral communication	Problem solving	Written communication	Management	General IT user skills	Literacy	Office administration	Numeracy	IT professional skills	Foreign languages
Row percentages														
All	%	64	51	50	46	46	37	34	28	24	22	21	17	13
Agriculture	%	73	34	40	38	40	24	27	22	19	15	19	13	9
Mining and quarrying	%	77	53	16	17	13	16	17	13	5	53	3	1	*
Manufacturing	%	73	29	52	45	53	39	37	35	29	23	30	17	14
Electricity, gas and water	%	53	25	53	32	32	43	32	36	9	21	1	1	3
Construction	%	68	35	41	34	40	32	31	28	18	19	21	14	6
Retail and wholesale	%	57	57	51	45	43	27	26	23	19	18	18	11	10
Hotels and catering	%	60	69	58	52	47	25	33	17	22	13	24	12	17
Transport, storage and communications	%	55	58	67	55	62	53	36	37	37	32	30	18	19
Financial intermediation	%	81	65	43	43	39	38	34	35	15	22	14	29	22
Business services	%	61	47	41	45	42	42	41	29	19	24	14	22	13
Public administration and defence	%	57	58	54	52	46	49	48	36	24	40	15	19	4
Education	%	72	38	48	37	40	34	36	40	30	25	23	27	10
Health and social work	%	66	52	51	43	49	44	37	33	32	26	22	21	13
Other services	%	67	56	55	51	48	40	39	32	28	18	25	24	9

■ skill gaps reported by at least 50% of employers

■ skill gaps reported by at least 25% of employers

Base: All skill gaps followed up

Source: National Employer Skills Survey, 2009

Job-specific technical and practical skill gaps are most common and found in over 50 per cent of employers reporting skill gaps in all sectors. **Particularly high levels were found in financial intermediation, education, mining/quarrying, manufacturing and agriculture. Of the generic skills, customer handling and team working were the most frequent causes of skill gaps. Sectors experiencing the highest incidence of skill gaps across the broadest range of skills include transport, storage and communications, other services and public administration and defence.**

The nature of the gaps at management level can take a number of forms:

- Project management is a specific skill gap reported across a range of sectors (Lifelong Learning UK, 2009; e-skills UK, 2009a; Energy and Utility Skills, 2009; Semta *et al*, 2009). Programme and project management consistently appear as a skill gap for all grades of civil servants in the last two employee skills surveys (in 2009 and 2007) (Government Skills, 2009).
- Financial management skills are another common gap (People 1st, 2009; Government Skills, 2009; Lantra, 2009a). The precise nature of the skills deficit often depends on the nature of the sector. Research by Lifelong Learning UK (2009a) for example found a significant skill gap within the work-based learning sector focussed around the complexities of dealing with demand-led funding, including: understanding the demand-led funding formula; data management, in relation to submitting information to the Individualised Learner Record (ILR); and contracting, through developments such as the maximum contract value and its use.
- Risk management. Skill sets relating to risk management and risk assessment were identified as lacking in the finance sector (Financial Services Skills Council, 2009; PwC, 2010b). Furthermore, awareness of risk management and health and safety legislation were identified as skills needs by WBL interviewees because of the rate of change and increasing requirement when seeking contracts to deliver provision (Lifelong Learning UK, 2009).
- People management. Managing people has been identified as the greatest skill gap for managers and this is an issue for both senior management and first-line managers. For some companies the reason lies with the fact that people have 'worked their way up' the company or the senior management team are part of the founding family. This results in managers who have never received any formal management training resulting in a reduced tool kit when it comes to managing the business generally but more specifically a lack of understanding organisational behaviour (Improve, 2009).
- Contract and relationship management. With both clients and also with contractors in supply chains (ConstructionSkills *et al*, 2009; Semta *et al*, 2009; e-skills UK, 2009a). A related deficit is the ability to create and manage partnerships and alliances and to work across organisational boundaries (SkillsActive, 2009) and skills related to collaboration and partnership working within and between organisations and with local groups and communities (Lifelong Learning UK, 2009).
- The ability to commercialise new opportunities generated by technological or market changes (People 1st, Skillsmart Retail). This need is partly driven by the transformational power of IT, which requires a co-ordinated and integrated business and IT strategy. There is, therefore, a rapidly increasing need for business leaders and managers to develop technology-related skills (e-skills UK, 2009a). For example, there is a need for more effective teaching and learning, including blended learning involving a range of teaching methods and sites, and in particular focusing on more online resources (Lifelong Learning UK, 2009).

Because the presence of skill gaps within occupations within sectors understandably reflects the distribution of those occupations between sectors, it is therefore important to identify sectors with higher or lower than average shares of workers with skill gaps relative to the proportions employed in particular occupations. The results of this analysis are shown in Table 3.21.

Table 3.21: Broad SIC sectors with a disproportionately high or low proportion of occupational skill gaps compared with employment

	Disproportionately HIGH share of employees with gaps relative to employment	Disproportionately LOW share of employees with gaps relative to employment
Managers	Electricity, gas and water supply (26% v 16%)	Agriculture, hunting and forestry and fishing (15% v 33%) Construction (16% v 26%) Retail and wholesale (11% v 18%) Hotels and restaurants (9% v 17%) Other (14% v 21%)
Professionals	Mining and quarrying (39% v 19%)	Electricity, gas and water supply (4% v 7%) Public administration and defence (9% v 15%)
Associate professionals		
Administrative and secretarial	Other services (20% v 14%)	Mining and quarrying (7% v 14%)
Skilled trades	Agriculture, hunting and forestry and fishing (29% v 20%) Mining and quarrying (16% v 11%) Construction (44% v 35%)	Transport, storage and communication (3% v 6%)
Sales and customer service occupations	Hotels and restaurants (17% v 12%) Transport, storage and communication (22% v 11%) Financial intermediation (38% v 28%) Public administration, defence and compulsory social security (7% v 2%)	
Machine operatives		Mining and quarrying (18% v 29%) Electricity, gas and water supply (9% v 16%)
Elementary occupations	Agriculture, hunting and forestry and fishing (30% v 21%) Construction (12% v 9%)	

Source: National Employer Skills Survey, 2009

The most common occupations with high shares of skill gaps relative to employment are sales/customer services which are problematic in four sectors. In contrast, low shares of managerial employees with skill gaps are found in five sectors.

The data suggests that there may be some challenges associated with skill gaps for those moving into senior roles as the electricity, gas and water supply industry has a low share of professionals with skill gaps relative to employment but high shares of managers with skill gaps relative to the numbers employed. This pattern also occurs for associate professionals and professionals in mining and quarrying.

This evidence can be compared with sectoral variations reported by workers of the level of under and over-skilling in jobs (Bevan and Cowling, 2007). Those sectors where more employees reported themselves under-skilled than the average across all sectors were: transport and communication, finance and manufacturing, with at least eight per cent of workers in each sector affected. Sectors with more than average proportions of employees reporting themselves as over-skilled were: retail, public administration, other services, real estate, transport and communications. The above average proportions of transport and communications workers reporting themselves as over-skilled conflicts with the evidence from the NESS (Shury *et al*, 2010) for sales and customer service occupations in that sector. However, above average proportions of financial services employees reporting under-skilling is consistent with the NESS evidence for sales and customer service occupations.

So, how does the pattern of training across sectors relate to the existence of skill gaps? Table 3.22 shows patterns of training by broad industrial sector. This shows typically highest incidence of training in public sector employers, as well as mining/quarrying, gas/electricity/water supply and financial intermediation. These private sector industries have regulatory requirements related to health and safety and consumer protection which are likely to account for higher incidence of training. Equally, sectors which undertake less training may do so because the skill levels required by the dominant occupations are lower than other sectors.

Table 3.22: Training activity by broad SIC sector

Row %	Base (unweighted)	Base (weighted)	%	Train at all	Any off-the-job training	On-the-job training only	Trainers training 90%+ of staff	Trainers training <25% of staff	Trainees as a percentage of current workforce
Overall	79,152	1,492,367	%	68	51	17	26	7	56
Agriculture	2,350	73,725	%	55	43	12	16	3	42
Mining and quarrying	120	1,245	%	80	64	16	28	19	53
Manufacturing	9,374	103,135	%	60	43	17	14	14	44
Electricity, gas and water	231	1,410	%	82	69	13	28	10	67
Construction	5,283	131,115	%	66	55	11	19	4	53
Retail and wholesale	15,502	322,700	%	60	40	20	21	8	48
Hotels and catering	5,609	132,815	%	66	44	22	25	9	54
Transport, storage and communications	4,501	56,925	%	61	44	17	23	9	49
Financial intermediation	2,456	36,435	%	80	59	21	37	7	57
Business services	13,375	352,890	%	68	51	17	25	5	53
Public administration and defence	1,031	17,200	%	87	74	13	39	10	63
Education	5,096	44,200	%	92	84	8	44	5	69
Health and social work	7,178	102,700	%	88	77	11	47	6	73
Other services	7,046	115,270	%	68	52	16	27	6	50

sector training activity notably above average

sector training activity notably below average

Base: All employers

Source: National Employer Skills Survey, 2009

Establishments with a higher than average share of skill gaps are found in manufacturing, electricity/gas/water and hotels/catering, which also have higher than average proportions of staff with skill gaps, but skill gaps are also common across a number of other sectors. There is no clear association between levels of training provided and in these sectors and incidence of skill gaps, although manufacturing and electricity/gas/water have above average proportions of employers who train less than a quarter of their staff. A number of sectors have above average shares of staff with skill gaps relative to employment levels, particularly among sales and customer service occupations. Job specific technical and practical skills are the most common cause of skill gaps while among generic skills, team working and customer handling were the most common deficits. Customer service skills are a common important gap in the automotive sector, hospitality, building services and housing, cleaning and facilities management. Literacy and numeracy appear to be common skill gaps in manufacturing and retailing. There is widespread evidence from SSCs of management skill gaps and the precise needs vary widely between sectors. There is no clear association between the presence of skill gaps and training provision.

3.5.4 The types of skills causing SSVs and skill gaps

The major types of skills reported which account for SSVs and skill gaps fall into two main categories shown in Table 3.23 and Table 3.24. These are technical/practical skills in over half of SSVs and skill gaps, followed by a range of generic skills. Employer concerns about both SSVs and skill gaps have increased since 2007. **Concerns about oral communication, customer-handling, problem-solving, team working and written communication skills, are each reported in at least one-third of SSVs,** while concerns about skill gaps in customer handling and team working skills are already widespread and have increased notably.

These concerns reflect a mixture of job specific skills encapsulated in the technical category and generic skills which are becoming increasingly important to employers (Green, 2009). It is also possible that recession may lead to short-term changes in the types of skill gaps encountered by organisations. Research into the impact of the economic downturn on employer skills needs in the South East of England has indicated that organisations are placing more emphasis on skills in sales/marketing, financial management, planning and forecasting as well as multi-skilling among frontline staff (Cox *et al*, 2009).

Table 3.23 shows that the types of skills needed among staff with skill gaps are, unsurprisingly, typically associated with occupational categories, for example management skills shortages are most commonly found in management occupations and administrative staff most commonly lack office administration skills. Overall, managers, professionals and associate professional occupations have the widest range of skill gaps.

The 2009 NESS (Shury *et al*, 2010) asked new questions about skills needs for particular occupations over the next 12 months. Results showed that managers were judged most likely to need to upskill, and that future skills needs were both strongly related to occupational categories, and similar to existing skill gaps. Thus, technical and practical skills show the highest incidence of increased demand across all occupations, with demands for management skills strongest among management and professional occupations, demands for soft skills strongest among sales, personal services and elementary roles, and technical and practical skills being required more than average by associate professionals, skilled trades and plant/machine operators.

Table 3.23: Causes of skill-shortage vacancies in 2007 and 2009

Causes of skill-shortage vacancies	2007	2009	% point increase
Technical, practical or job specific skills	52	62	10
Customer handling skills	32	41	9
Team working	26	37	11
Oral communication skills	33	35	2
Problem solving skills	29	38	9
Written communication skills	25	34	9
Management skills	23	32	9
Literacy	22	30	8
Numeracy	18	26	8
Foreign language	12	18	6
Weighted base (all establishments with ss vacancies)	67,269	63,089	
Unweighted base (all establishments with ss vacancies)	4,588	5,118	

Source: National Employer Skills Survey, 2009

Table 3.24: Skill lacking overall and by occupation

	All 2007	All 2009	Managers	Professionals	Associate professionals	Administrative	Skilled trades	Personal services	Sales	Operatives	Elementary
Unweighted base	120,592	158,759									
Weighted base (000s)	1,121	1,369									
	%		%	%	%	%	%	%	%	%	%
Skills lacking											
Technical and practical skills	51	64	48	78	77	62	75	63	59	71	64
Customer handling	41	51	43	41	48	51	33	52	70	29	57
Team working	40	50	57	44	49	45	37	55	45	58	57
Oral communication	41	46	45	42	42	45	33	48	48	45	52
Problem solving	35	46	48	49	49	49	42	46	42	54	42
Written communication	27	37	39	41	44	45	30	47	29	41	30
Management	26	34	77	53	44	29	23	28	20	28	21
General IT user	22	28	33	33	32	48	20	27	25	28	16
Literacy	19	24	14	17	23	25	20	39	18	36	29
Office administration	18	22	28	23	28	52	12	17	16	17	12
Numeracy	15	21	11	16	19	21	19	27	17	35	28
IT professional	12	17	23	22	28	28	10	16	13	12	9
Foreign languages	9	13	10	15	11	11	6	13	12	21	16

Base: All skill gaps followed up

Note: Column percentages exceed 100% because of multiple responses

Source: National Employer Skills Survey 2007 and 2009

What are the implications of all this for skill matching? The major types of skills reported which account for SSVs and skill gaps are technical/practical skills (in over half of SSVs and skill gaps), followed by a range of generic skills. Employer concerns about both SSVs and skill gaps which have also increased since 2007. This may be a reflection of changing skills needs during recession, but it also fits with broader trends in upskilling. Concerns about skills gaps in customer handling and team working skills are already widespread and have increased notably. These issues raise questions about the capacity of existing learning provision to meet these needs, given some of the very high levels of skill gaps being reported.

3.5.5 Skill gaps: the regional picture

Table 3.25 shows that **skill gaps are greatest in the South West and South East and the West Midlands**, though distribution of skill gaps across the regions is actually remarkably even – and more so than in 2007. **The biggest increases in skill gaps have been in the West Midlands, South West, North West and South East.** The absolute numbers of employees with skill gaps is highest in London and the South East reflecting their absolute size. However, the regions with a higher share of skill gaps than their share of employment, are the South West, South East and West Midlands.

Table 3.25: Incidence and number of skill gaps by region

	% of establishments with any skill gaps		Number of employees not fully proficient (i.e. number of skill gaps)	% of staff reported as having skill gaps		Share of employment	Share of all skill gaps
	2007	2009		2007	2009		
Overall	15%	19%	1,702,500	6%	7%	100	100
South West	16%	22%	202,500	6%	9%	10	12
South East	15%	21%	302,800	6%	8%	16	18
North East	19%	20%	61,300	6%	6%	5	4
West Midlands	14%	20%	196,400	5%	8%	10	12
North West	14%	19%	209,000	6%	7%	13	12
East Midlands	15%	18%	136,900	6%	7%	8	8
London	17%	17%	290,800	7%	7%	18	17
East of England	15%	17%	160,900	6%	7%	10	9
Yorkshire and the Humber	14%	17%	141,900	5%	6%	10	8

 highest absolute levels of skill gaps or greatest increase between 2007/2009

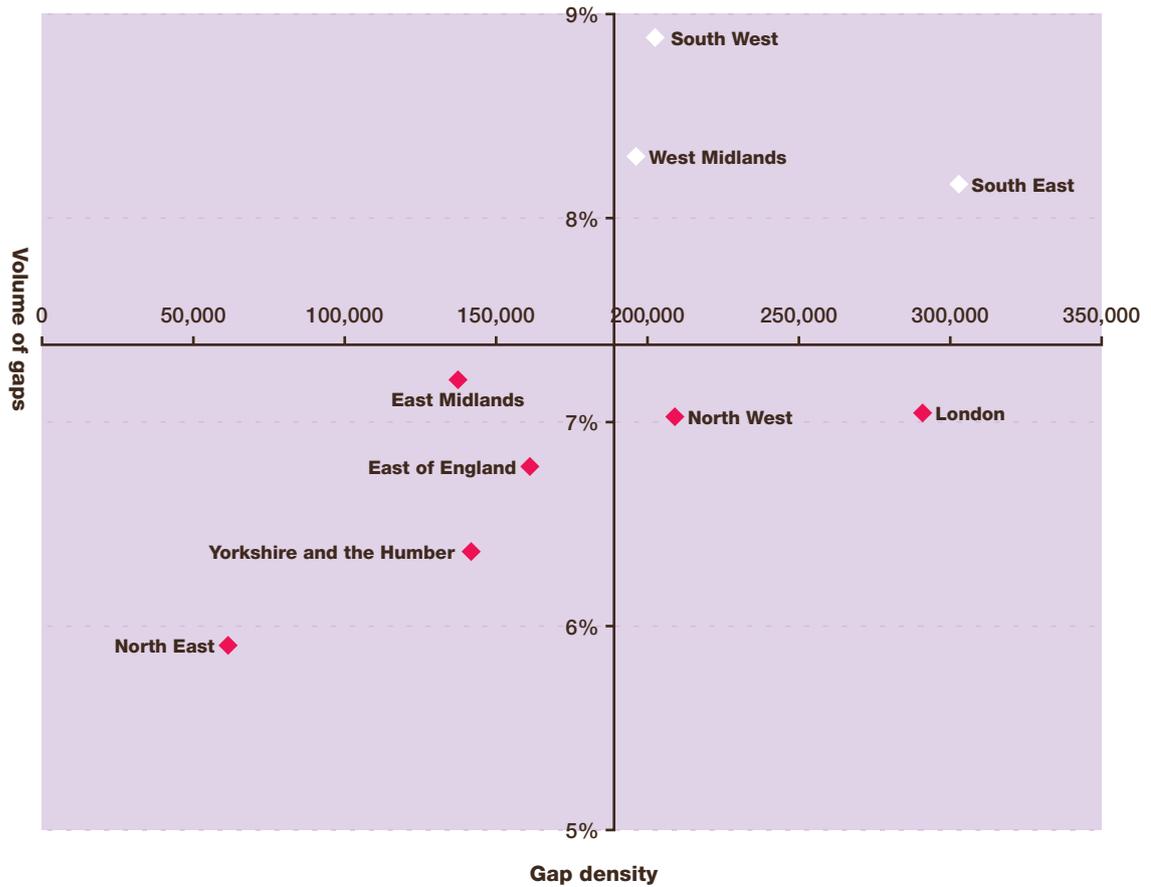
Base: First two columns all establishments, remainder all employment

Note: The number of employees not fully proficient has been rounded to the nearest 100

Source: National Employer Skills Survey, 2009

If we combine our measures of the ‘volume’ or extent of skill gaps with their ‘density’ (Figure 3.7) we can see that **the regions with the overall ‘worst’ skill gaps are the South East, South West and West Midlands**, while those least affected by skill gaps are the North East, Yorkshire and the Humber, the East of England and the East Midlands.

Figure 3.7: Skill gap density and volume of skill gaps by region 2009



Source: National Employer Skills Survey, 2009

What are the skills that are lacking amongst those not considered to be fully proficient in their jobs and, in particular, does this vary significantly across the regions? Nationally, we know that technical/practical skills, followed by customer handling, team working, oral communication and problem solving skills are the predominant skills lacking, followed by written communication and management skills. Table 3.26 looks at the nature of skill gaps by region.

Table 3.26: The nature of skill gaps by region

Column percentages	All	East of England	East Midlands	London	North East	North West	South East	South West	West Midlands	Yorkshire and the Humber
Unweighted base	158,759	13,176	10,722	26,200	7,685	16,664	29,095	22,975	21,585	10,457
Weighted base (000s)	1,369	134	93	225	51	156	259	175	168	109
	%	%	%	%	%	%	%	%	%	%
Skills lacking										
Technical and practical skills	64	63	61	60	56	64	68	66	65	60
Customer handling	51	50	46	62	55	51	45	49	47	54
Team working	50	53	55	59	49	56	42	43	44	51
Oral communication	46	51	48	57	51	53	37	37	36	49
Problem solving	46	51	50	53	52	52	38	38	43	46
Written communication	37	42	36	47	40	41	29	31	29	40
Management	34	33	33	49	37	31	32	29	32	30
General IT user	28	26	28	32	34	30	25	23	36	25
Literacy	24	26	23	31	30	29	17	18	21	26
Office administration	22	23	22	27	24	26	20	17	20	20
Numeracy	21	23	22	22	28	26	15	20	20	22
IT professional	17	13	13	21	26	16	15	17	25	10
Foreign languages	13	14	13	28	8	11	7	8	8	9

 highest incidences of each skill gap by region

Base: All skill gaps followed up

Note: Column percentages do not sum to 100% because of multiple responses

Source: National Employers Skills Survey, 2009

Technical and practical skill gaps are the most frequently reported in all regions (except in London), often by a considerable distance compared to other skill gaps (with the sole exception of the North East). A higher incidence of skill gaps across a wider range of skills are reported by London employers with customer handling topping the list, whilst in the North East this is almost as important as technical/practical skills. The levels of technical/practical skill gaps are highest in the South West, South East and West Midlands. Employer reports of literacy problems are highest in the North West, North East and London. Employers also report the highest incidence of numeracy skill gaps in the North East and North West. The North East and West Midlands more frequently report IT professional skill gaps, and this appears to reflect broader IT skill gaps in the West Midlands which also has the highest incidence of IT user skill gaps. London has a concentration of skill gaps in foreign languages, which are relatively low in other regions.

Further analysis of skill gaps at regional level by occupation is possible and is shown in Table 3.27.

Table 3.27: Distribution of skill gaps by occupation within region (and employment profile comparisons)

	Number of skill gaps (000s)		Managers	Professionals	Associate professionals	Administrative	Skilled trades	Personal service	Sales	Operatives	Elementary
Skill gaps (profile of employment)	1,702	%	14 (18)	9 (11)	7 (7)	13 (14)	8 (7)	9 (8)	18 (13)	7 (7)	17 (14)
East of England	161	%	14 (18)	6 (10)	8 (8)	14 (14)	8 (7)	9 (8)	18 (13)	5 (7)	20 (16)
East Midlands	137	%	12 (17)	9 (10)	5 (6)	14 (14)	7 (8)	8 (8)	16 (11)	12 (9)	18 (16)
London	291	%	15 (21)	13 (16)	10 (10)	14 (15)	3 (4)	5 (5)	20 (14)	4 (3)	16 (12)
North East	61	%	14 (16)	5 (10)	9 (9)	11 (14)	9 (7)	8 (8)	14 (11)	8 (9)	20 (14)
North West	209	%	13 (17)	6 (10)	8 (8)	13 (14)	11 (7)	8 (9)	19 (12)	6 (7)	17 (16)
South East	303	%	14 (19)	8 (10)	6 (7)	13 (13)	8 (8)	11 (9)	21 (15)	5 (6)	14 (13)
South West	203	%	12 (18)	9 (11)	5 (6)	9 (13)	10 (9)	9 (8)	18 (14)	7 (7)	20 (14)
West Midlands	196	%	14 (18)	9 (11)	6 (6)	12 (13)	9 (8)	9 (8)	16 (13)	10 (9)	15 (13)
Yorkshire and the Humber	142	%	14 (17)	8 (9)	5 (7)	15 (14)	9 (8)	10 (9)	16 (13)	8 (9)	16 (15)

■ share of skill gaps at least 2% above employment share for each occupation within region

■ share of skill gaps at least 4% below employment share for each occupation within region

Base: All skill gaps (in brackets all employment)

Note: Percentages sum to 100% in each row (subject to rounding)

Source: National Employer Skills Survey, 2009

The distribution of skill gaps by occupation is similar across regions with significant concentrations overall usually amongst sales and elementary staff in particular. Skill gaps in sales and elementary occupations are high across most regions compared to the proportions employed in those occupations, in contrast to low proportions of skill gaps among managers and professionals relative to their shares of employment. Other skill gaps are more spatially uneven with disproportionate shares among skilled trade occupations in the North East and North West and among personal services occupations in the South East.

Some regions experience relatively low shares of occupational skill gaps compared to their share of employment in these jobs. These include management and professional occupations in the Eastern region, professional and administrative occupations in the North East and administrative occupations in the South West.

To gain an insight into whether skill gaps are being addressed at the regional level, we look now at training activity. Both the NESS and LFS data show relatively little regional variation in the proportions of firms training and the proportion of individuals receiving training across the country (see Tables 3.28 and 3.29). Nonetheless, in terms of the proportions of employees receiving training, the proportions are highest in the North East and South West, and lowest in the East of England and in Yorkshire and the Humber.

Table 3.28: Percentage of employees received training in the last 4/13 weeks by region

	% last 4 weeks	% last 13 weeks
London	15.6	30.2
South East	16.6	31.6
East of England	14.4	27.8
South West	16.6	33.8
West Midlands	14.9	30.4
East Midlands	15.6	29.2
Yorkshire and the Humber	14	28.2
North West	15.2	29.1
North East	17.5	32.5

Source: Labour Force Survey data using UK Employment and Skills Almanac 2009 (<https://almanac09.ukces.org.uk>)

Table 3.29 shows little variation in the proportions of employers in different regions that provide training to their staff and little variation in both type of training offered and proportions of employees trained, though the proportion is highest in the South West and South East and lowest in Yorkshire and the Humber. There is also evidence to show that employers are becoming more selective in targeting their training, evident in the substantial decline in the proportions of employees training at least 90 per cent of their staff. This may reflect recessionary pressures on expenditure as targeting of training has been noted as an employer cost-cutting strategy in response to adverse economic conditions (Cox *et al*, 2009).

Table 3.29: Training activity by region

Row %	Base (weighted)	Base (unweighted)		Train at all 2007	Train at all 2009	Off-the-job training only 2007	Off-the-job training only 2009	On-the-job training only 2007	On-the-job training only 2009	On-the-job training 90%+ of staff 2007	Trainers training 90%+ of staff 2009	Trainers training <25% of staff 2007	Trainers training <25% of staff 2009
Overall	1,451,507	79,018	%	67	68	13	13	21	17	45	38	9	10
Eastern	165,008	8,454	%	66	66	14	13	18	17	42	37	9	10
East Midlands	120,774	7,612	%	68	66	15	16	23	15	44	34	10	11
London	231,199	12,077	%	67	66	12	13	20	17	46	38	8	11
North East	56,320	5,608	%	70	69	12	14	19	14	48	39	7	9
North West	180,327	8,838	%	68	68	12	12	20	17	47	40	8	10
South East	252,169	12,219	%	69	70	14	12	24	19	43	40	10	9
South West	162,978	8,454	%	68	71	14	12	23	18	44	39	9	10
West Midlands	147,130	8,047	%	65	68	14	12	23	17	44	39	11	11
Yorkshire and the Humber	135,602	7,709	%	66	65	12	14	18	13	48	35	8	11

regions with a decrease of at least 3% between 2007 and 2009 in proportions of employers providing only on-the-job training

regions with a decrease of at least 3% between 2007 and 2009 among proportions of employers where trainers train at least 90% of staff

regions with an increase of at least 2% between 2007 and 2009 in the proportions of firms training less than 25% of staff

Base: All employers

Source: National Employer Skills Survey, 2007 and 2009

The volume and density of skill gaps is highest in the South East, South West and West Midlands and lowest in the Eastern and North Eastern regions. The South West and West Midlands have also experienced largest growth in proportions of staff with skill gaps.

While technical and practical skill gaps are common across all regions, there are particular gaps in literacy and numeracy in the North West and North East, and of numeracy in the West Midlands and literacy in London. The poorer performance of these regions in terms of higher proportions of the working age population and workers without qualifications suggests that a skills mismatch may be evident through skill gaps in the workplace as a result.

Skill gaps compared to share of employment are generally lower among higher skilled management and professional occupations, and data in the previous section shows that at national levels these occupations generally receive higher levels of training. Incidence of training provision has remained fairly constant and with relatively little variation across all regions. What variation does exist does not explain patterns of skill mismatch. For example, levels of training are highest in the North East and South West according both to LFS and the NESS; however, the North East has a low density/volume of skill gaps, while the South West has high shares of both.

3.6 Underemployment: skills needed versus skills available

It may, however, be the case that the skills available, rather than being deficient, are more than sufficient, and people's skills may be being under-used. We can view the relationship between the skills we need and the skills we have available by comparing the overall supply of skills (as measured by qualifications) and the demand for skills, as measured by the jobs that require them. We do this here in three ways: (i) by drawing on international comparative evidence and (ii) by examining the *Skills at Work* research (Felstead *et al*, 2007), and (iii) by examining the destinations of graduates. We cover each in turn.

3.6.1 International comparative evidence

The international evidence on the nature and extent of skills mismatches was provided for the first time by the OECD (OECD, 2008), and this was discussed in detail in *Ambition 2020* (UKCES, 2009a). **This evidence examines the relationship between the high level skills available** (in terms of the proportion of the workforce with high level skills) **with the demand for them** (in terms of the proportion of the workforce in high skilled jobs). This provides an indication of the balance between the skills available and the skills required by the labour market and shows that:

- **overall, the UK does have more high skilled jobs than high skill people.** In the UK, some 30 per cent of 25-64 year olds have acquired a tertiary level education (compared to the 27% OECD average), whilst some 44 per cent of jobs can be thought of as high skill. So, we can say that, in the UK, there are roughly a third more (44% compared to 30%) high skilled jobs than high skilled workers, indicating an 'excess demand' for high skill workers rather than an excess supply;
- however, several countries in the OECD 30 have an even greater gap between demand and supply, and **several countries also have a higher proportion of skilled jobs than in the UK** (indeed, the UK ranks 13th on the latter indicator) looking at the difference between the proportion of skilled jobs and the proportion of skilled workers, **the UK ranks 20th out of 27 countries, exhibiting a relatively small gap compared to other countries between the skills needed and skills available**, i.e. *relatively* low levels of excess demand;
- **when we examine recent changes in skills demand and skills supply between 1998 and 2006, we can see that the UK growth in supply very much exceeds the growth in demand. Indeed, it does so by a factor of around six to one**, more than in any other country, bar three;
- the data also show that **the relative growth in demand in the UK is particularly low** – indeed, it is the slowest of any OECD country, bar two.

These combinations of (i) a relatively small initial ‘gap’ between demand and supply, (ii) a slow growth in demand/skilled jobs and (iii) a large gap between skills supply growth and skills demand growth, are a **possible set of ‘lead indicators’ of potential future imbalances between high level skills availability and skills demand. This could be seen to represent ‘over-skilling’ or ‘underemployment,’** depending on whether this is viewed as a challenge generated by too many people with too high a level of skills, or too few employers with too low a level of skill requirements.

3.6.2 UK evidence: *Skills at Work* research

A second set of evidence relates solely to the UK and draws on the *Skills at Work* research (Felstead *et al*, 2007), again which is discussed at length in *Ambition 2020* (UKCES, 2009a). We know from earlier chapters that skills supply has been growing, as has skills demand. This research provides evidence on the overall balance of the supply and demand for qualifications and how it has changed over time. Overall, it suggests that:

- **the supply of skills exceeds demand at all levels** (except at the ‘no qualifications’ level): i.e. there is a considerable excess of jobs for people with no qualifications;¹
- the balance between demand and supply has fluctuated over the years, but perhaps **the most significant feature of recent years and the current situation is the fall in excess supply of level 3 and the increase in excess supply at level 4 and above. The difference between the supply and demand for degrees is now well over one million, i.e. the supply of graduates is outpacing the growth of jobs that require them.**

This research compares people’s qualification levels with the qualifications someone would need to get the job they are doing, so we can see if people have a higher or lower level of qualification than is required, i.e. whether they are ‘over-qualified,’ ‘under-deployed’ and ‘under-utilising’ their skills. Low and/or declining levels would indicate both strong ‘matching’ of skills to jobs and limited over-qualification/underemployment/under-use of skills. High or rising levels would indicate weak matching and over-qualification/underemployment and under-use of skills.² The data show that:

- between 1986-1997, ‘over-qualification’ was relatively stable at around 30 per cent but, since then, it has risen markedly – by five percentage points since 2001. This means that two in every five workers are in jobs for which they are ‘over-qualified’. This trend has the greatest impact on those holding level 4+ qualifications – **the proportion of graduates over-qualified has increased by 50 per cent over the last 20 years, but three quarters of this has occurred within the last five years;**
- the level of ‘under-qualification’ (where people’s qualifications fall short of the level required to get the job they currently occupy) has declined in recent years and by four percentage points since 2001.

Overall then, the growth in supply of skills, as measured in this study, has outpaced the growth in demand for them or, put another way, **the demand for skills has lagged the increase in supply at a number of skill levels.** Such comparisons of the ‘skills of jobs’ with the ‘skills of people’ clearly raise the issue of whether it is ‘deficient demand’ for skills, rather than excessive availability of skills, that is the problem. The demand for, and supply of, skills can be misaligned because either is too low or too high. Indeed, they may even be in equilibrium, but at ‘too low’ a level to secure long-term prosperity. However, the relatively low levels of skills in the UK, when combined with the existence of only limited skill shortages/gaps and a potentially excessive supply of skills relative to demand, strongly imply a potential weakness in the demand for skills in the UK.

1. The latter phenomenon has grown consistently over the last 20 years because, although the number of jobs not requiring qualifications has fallen considerably, the number of people without qualifications fell even faster

2. Two caveats should, however, be attached to this assessment: (i) the results reflect people’s perception/judgement by job holders of the qualifications required to get the job; (ii) qualifications may be necessary for a job the person will do in the future

3.6.3 Graduate destinations

The recently published findings of the HESA (Higher Education Statistical Agency) longitudinal survey of the 2004/5 cohort of graduates (HESA, 2009) provides some insight into the destinations of graduates three-and-a-half years after graduation. **There are substantial variations in the employment rates of graduates in different subject areas, and in particular, in the proportion of those who are *in work*, that work in 'graduate' compared to 'non-graduate' occupations.** The employment of graduates in non-graduate occupations provides a proxy estimate of mismatch and underemployment. Just short of a quarter (23%) of full-time first degree graduates were working in non-graduate jobs, but this proportion is especially high in, for example, agriculture, communications, history/philosophy, and creative arts/design. The proportion of graduates in non-graduate jobs is especially low in medicine and allied subjects, planning, law and education.

3.7 Migration

Another potential measure of imbalance between the skills available and the skills needed is migration. Both migrants and employers will respond to situations where the latter is not effectively met by the former. Migrants may be attracted by employment opportunities, may fill skills shortages, or hard-to-fill vacancies, or may compete with indigenous workers. In some senses, then, migrant labour market participation reflects something of a 'mismatch' between the skills required by the labour market, and those available in the domestic labour force. This will be especially true of jobs held by migrants from within the EEA and those entering the UK from outside the EEA via the Points Based Migration system.

Here we focus in particular on those occupations and industries that have a high level of reliance on migrant labour. It should be noted that the definition of migrants used here is anyone that does not have the UK as their country of birth. This is one approach to measuring migration, and it is not the only way of doing so. It includes migrants that have been in the country for a long period of time as well as new migrants. Another approach to measurement is to focus on flows of migration, where the emphasis is placed on more recent migrants. In the next Audit we will examine migration intensity and reliance focusing on recent migration, and assess where intensity is increasing or diminishing. The term 'reliance' can have two meanings. It can refer to occupations or sectors which have a high proportion of migrants or a high level (absolute number) of migrant workers.

Those occupations which have a high proportion of employment accounted for by migrants (see Table 3.30), include a mix of higher and lower level occupations: elementary process plant occupations (29%), health professionals (28%), food preparation trades (26%), process operatives (25%) and research professionals (21%) are the top five 'migration intensive' occupations.

It is of interest to note that these occupations vary according to whether the migrant is from within the EEA or from outside the EEA. On the whole, non-EEA immigrants tend to be employed in relatively high level occupations – for example health professionals, health associate professionals, ICT professionals, and research professionals. EEA immigrants tend to be more heavily represented in lower level occupations: elementary process plant occupations, process operatives, elementary agricultural occupations, assemblers and routine operatives.

Table 3.30: Top 20 'migration intensive' occupations

All			EEA migrants			Non-EEA migrants		
SOC code	Occupation	% of employment occupied by all migrants	SOC code	Occupation	% of employment occupied by EEA migrants	SOC code	Occupation	% of employment occupied by non-EEA migrants
913	Elementary process plant occupations	29	913	Elementary process plant occupations	18	221	Health professionals	22
221	Health professionals	28	811	Process operatives	13	543	Food preparation trades	19
543	Food preparation trades	26	911	Elementary agricultural	8	321	Health associate professionals	16
811	Process operatives	25	813	Assemblers and routine operatives	8	213	Information and communication technology professionals	16
232	Research professionals	21	923	Elementary cleaning	8	232	Research professionals	16
122	Managers in hospitality	20	914	Elementary goods storage	7	924	Elementary security occupations	16
213	Information and communication technology professionals	20	211	Science professionals	7	122	Managers in hospitality and leisure services	15
211	Science professionals	20	341	Artistic and literary	7	211	Science professionals	13
923	Elementary cleaning	18	912	Elementary construction	6	611	Healthcare and related personal services	13
321	Health associate professionals	18	543	Food preparation trades	6	242	Business and statistical professionals	12
341	Artistic and literary	18	822	Mobile machine drivers	6	811	Process operatives	12
813	Assemblers and routine operatives	17	623	Housekeeping	6	351	Transport associate professionals	12
922	Elementary personal service	17	232	Research professionals	6	913	Elementary process plant occupations	12
623	Housekeeping	17	922	Elementary personal service	6	922	Elementary personal service occupations	11
351	Transport associate professionals	17	812	Plant and machine operatives	6	341	Artistic and literary occupations	11
914	Elementary goods storage	16	541	Textiles and garment trades	6	623	Housekeeping occupations	11
924	Elementary security	15	122	Managers in hospitality	6	923	Elementary cleaning occupations	11
611	Healthcare and related	15	621	Leisure and travel service	6	123	Managers in other service industries	10
621	Leisure and travel service	15	221	Health professionals	6	353	Business and finance associate professionals	10
242	Business and statistical professionals	14	355	Conservation associate professionals	5.6	821	Transport drivers and operatives	10

Source: UKCES analysis of LFS data, 2008 Q1 – Q4

Turning to those occupations with a high level of migrants (see Table 3.31), we can see those occupations which have a high absolute number of non-EEA immigrants working in them. Amongst the largest are: sales assistants and retail cashiers, elementary personal service occupations, managers, teachers, IT professionals, transport drivers and operatives, healthcare professionals and associate professionals. In total, the top 20 migrant occupations employ a total of 2.1 million migrants. The EEA migrants tend to be relatively more numerous in lower level occupations, though higher level occupations do also feature on the list.

Table 3.31: Top 20 migrant occupations

All			EEA migrants			Non-EEA migrants		
SOC code	Occupation	Level of employment occupied by all migrants (000s)	SOC code	Occupation	Level of employment occupied by EEA migrants (000s)	SOC code	Occupation	Level of employment occupied by non-EEA migrants (000s)
711	Sales assistants and retail cashiers	171	923	Elementary cleaning occupations	66	711	Sales assistants and retail cashiers	135
113	Functional managers	166	922	Elementary personal service occupations	66	611	Healthcare and related personal services	120
922	Elementary personal service occupations	161	113	Functional managers	59	321	Health associate professionals	109
611	Healthcare and related personal services	152	531	Construction trades	58	113	Functional managers	107
923	Elementary cleaning occupations	136	913	Elementary process plant	46	922	Elementary personal service occupations	95
321	Health associate professionals	130	231	Teaching professionals	46	821	Transport drivers and operatives	92
231	Teaching professionals	125	811	Process operatives	45	231	Teaching professionals	79
821	Transport drivers and operatives	124	711	Sales assistants and retail cashiers	36	213	Info and communication technology professionals	73
213	Info and communication technology professionals	98	914	Elementary goods storage	32	221	Health professionals	73
221	Health professionals	94	611	Healthcare and related personal services	32	923	Elementary cleaning occupations	69
531	Construction trades	91	821	Transport drivers and operatives	31	412	Administrative occupations: finance	61
543	Food preparation trades	86	612	Childcare and related personal services	27	543	Food preparation trades	61
412	Administrative occupations: finance	84	543	Food preparation trades	26	353	Business and finance associate professionals	54
811	Process operatives	83	353	Business and finance associate professionals	25	123	Managers in other service industries	50
353	Business and finance associate professionals	79	813	Assemblers and routine operatives	25	612	Childcare and related personal services	49
612	Childcare and related personal services	76	213	Info and communication technology professionals	25	242	Business and statistical professionals	48
913	Elementary process plant	75	122	Managers in hospitality	24	122	Managers in hospitality and leisure services	47
122	Managers in hospitality	71	415	Administrative: general	23	116	Managers in distribution, storage and retailing	46
123	Managers in other services	66	412	Administrative occupations: finance	22	924	Elementary security occupations	46
914	Elementary goods storage	66	321	Health associate professionals	20	421	Secretarial and related occupations	43
	All migrants employed in 'top 20' occupations	2,131		All EEA migrants employed in 'top 20' occupations	734		Non-EEA migrants employed in 'top 20' occupations	1,456

Source: UKCES analysis of LFS data, 2008 Q1 – Q4

In terms of 'migration intensive' sectors (see Table 3.32) a number have between a fifth and a quarter of their employment accounted for by migrants, most notably clothing, hotels and restaurants, recycling, food and drink, computing and transport. The figures also vary depending on whether we look at EEA/ extra EEA migrants. Reliance on migration in these sectors can be due to the nature of the occupations within them. For example, some occupations require seasonal work and therefore suffer from cyclical shortages, whilst others rely on specific global talent.

Table 3.32: Top 20 'migration intensive' sectors

All			EEA migrants			Non-EEA migrants		
SIC code	Sector	% of employment occupied by all migrants	SIC code	Sector	% of employment occupied by EEA migrants	SIC code	Sector	% of employment occupied by non-EEA migrants
18	Manufacture of wearing apparel: fur manufacture	28	15	Food and beverage manufacture	12	13	Mining of metal ores	24
13	Mining of metal ores	25	95	Private households with employees	10	18	Manufacture of wearing apparel: fur manufacture	21
55	Hotels and restaurants	23	62	Air transport	9	37	Recycling	19
37	Recycling	22	19	Leather and leather goods manufacture	8	55	Hotels and restaurants	16
15	Food and beverage manufacture	21	18	Manufacture of wearing apparel: fur manufacture	7	72	Computer and related activities	16
95	Private households with employees	21	55	Hotels and restaurants	7	14	Other mining and quarrying	13
72	Computer and related activities	19	25	Rubber and plastic products manufacture	6	60	Transport by land via pipeline	13
62	Air transport	18	63	Supporting and auxiliary transport activities (travel agencies)	6	17	Textile manufacture	12
63	Supporting and auxiliary transport activities (travel agencies)	17	61	Water transport	6	85	Health and social work	12
73	Research and development	15	24	Chemicals and chemical products manufacture	6	95	Private households with employees	11
17	Textile manufacture	15	20	Wood, straw, cork and wood products	6	65	Financial intermediaries (excluding insurance and pension funding)	11
60	Transport by land, pipeline	15	32	Radio, TV, communication	5	73	Research and development	11
19	Leather and leather goods manufacture	15	36	Furniture etc manufacture	5	74	Other business activities	11
74	Other business activities	15	29	Machinery equipment manufacture	5	63	Supporting and auxiliary transport activities (travel agencies)	10
61	Water transport	14	73	Research and development	5	15	Food and beverage manufacture	10
14	Other mining and quarrying	14	30	Office machinery, computers	5	62	Air transport	9
85	Health, social work	14	33	Medical and precision optical instruments manufacture	4	64	Post and tele-communications	9
65	Financial intermediaries (excluding insurance and pension funding)	14	01	Agriculture, hunting, etc.	4	70	Real estate activities	9
25	Rubber and plastic products manufacture	13	45	Construction	4	52	Retail trade (not motor vehicle)	9
31	Electrical machinery, equipment	13	51	Wholesale and commission trade	4	31	Electrical machinery, equipment	8

Source: UKCES analysis of LFS data, 2008 Q1 – Q4

In terms of absolute numbers (Table 3.33), we can see it is the health and social work sector (514,000) other business activities (359,000), the retail sector (339,000) and hotels and restaurants (311,000) where the largest numbers of migrants are employed.

Table 3.33: Top 20 migrant sectors

All			EEA migrants			Non-EEA migrants		
SIC code	Sector	Level of employment occupied by all migrants (000s)	SIC code	Occupation	Level of employment occupied by EEA migrants (000s)	SIC code	Sector	Level of employment occupied by non-EEA migrants (000s)
85	Health and social work	514	45	Construction	127	85	Health and social work	401
74	Other business activities	359	74	Other business activities	123	52	Retail trade	249
52	Retail trade	339	85	Health and social work	114	74	Other business activities	236
55	Hotels and restaurants	311	55	Hotels and restaurants	107	55	Hotels and restaurants	204
80	Education	252	52	Retail trade	90	80	Education	163
45	Construction	212	80	Education	89	75	Public administration and defence	117
75	Public admin and defence	162	15	Food and beverage manufacture	51	72	Computer and related activities	89
65	Financial intermediaries (excluding insurance and pension funding)	125	63	Supporting and auxiliary transport activities (travel agencies)	48	45	Construction	85
72	Computer, related activities	118	75	Public administration and defence	45	60	Transport by land via pipeline	82
63	Supporting and auxiliary transport activities (travel agencies)	110	65	Financial intermediaries (excluding insurance and pension funding)	45	65	Financial intermediaries (excluding insurance and pension funding)	80
60	Transport by land via pipeline	103	51	Wholesale trade and commission trade	35	63	Supporting and auxiliary transport activities (travel agencies)	63
51	Wholesale trade and commission trade	89	92	Recreational, cultural and sporting activities	31	92	Recreational, cultural, and sporting activities	56
15	Food and beverage manufacture	89	72	Computer and related activities	29	64	Post and telecommunications	54
92	Recreational, cultural, sporting activities	88	60	Transport by land via pipeline	22	51	Wholesale trade and commission trade	54
64	Post and telecommunications	70	29	Machine, equipment manufacture	21	70	Real estate activities	38
70	Real estate activities	53	93	Other service activities	18	15	Food and beverage manufacture	38
67	Other financial activities	49	67	Other financial activities	17	67	Other financial activities	31
29	Machine, equipment manufacture	47	24	Chemicals, chemical products	17	29	Machine, equipment manufacture	26
93	Other service activities	40	01	Agriculture, hunting, etc.	17	50	Sales of motor vehicles, fuel	23
50	Sales of motor vehicles, fuel	35	64	Post and telecommunications	16	22	Printing, publishing, recorded	22
	All migrants employed in 'top 20' sectors	3,164		All EEA migrants employed in 'top 20' sectors	1,060		Non-EEA migrants employed in 'top 20' sectors	2,111

Source: UKCES analysis of LFS data, 2008 Q1 – Q4

3.8 The scale and importance of different dimensions of mismatch

If we combine together all the six dimensions of mismatch we have discussed, we can gain an understanding of their relative scale and importance (see Figure 3.8).

Whilst **skill shortages are an important ‘pinch point’ in the system**, these are relatively insignificant in quantitative terms compared to other dimensions of mismatch. **Skill gaps need to be filled, underemployed workers need to be more gainfully employed, indigenous workers may need to be skilled up to fill some of the jobs currently taken by migrants, and the unemployed need to be up/re-skilled to take advantage of evolving job opportunities.**

The data analysed for the Audit show that:

- It is estimated that there are in the region of only 63,000 skill shortage vacancies in the economy. Far more significant are the 1.7 million employees who suffer from skill gaps, but collectively these suggest a skills deficiency in the region of 1.8 million. Both these estimates are taken from the National Employer Skills Survey, 2009 (Shury *et al*, 2010);
- The Labour Force Survey estimates that there are 2.1 million unemployed people. In addition to this we should add an estimated 2.8 million employees who are underemployed¹. Taken together, this means there are about 4.9 million people who are un- or underemployed in the workforce;
- On this basis, we estimate the number of fully-employed (i.e. those not suffering from skill gaps or believed to be over-qualified) to be in the region of 18.7 million out of an employed workforce of 23.1 million.

The diagram also shows the number of migrants currently employed. This is based on the widest definition of migration being (i) all non-UK born people currently employed and (ii) without any time limited on their date of entry. Of course, a proportion of these migrants could be underemployed or suffer from skill gaps in their current job.

Figure 3.8 Skill mismatches: key components



Note: Numbers shown are in 000s

3.9 Conclusions

In chapter two we concentrated mainly on employment: but what if employers are unable to, or have difficulty in, employing the people they need to because they are not available in sufficient numbers with the skills they require? What if people have the ‘wrong’ sorts of skills to be able to access job opportunities? And what, indeed, if the people already in work are either not fully proficient in their jobs or are over-qualified for them? These issues of skill mismatch have been the focus of this chapter.

‘Skill shortages’ are important because they constrain organisations from being able to meet market needs, opportunities or public service objectives, and are a prime signal of a ‘mismatch’ between supply and demand, between the skills available and skills required. However, as we have seen, the imbalances/mismatches in the labour market can also take a number of other forms and we need to look at these together to give a more complete picture of mismatch.

Overall, skill shortages are relatively small, totalling, we estimate, around 63,000 across the economy (Shury *et al*, 2010). Whilst this level in part reflects the recessionary conditions present when the NESS survey was conducted, even in 2007, prior to the recession, skill shortages were relatively small amounting to around 130,000.

Current skill shortages affect just three per cent of establishments, predominantly in small organisations – more than three in four arise where less than 25 staff are employed. Data from NESS show (Shury *et al*, 2010) as was also the case in 2007, the highest proportion of skill shortages are found in skilled trades (31%) and professional occupations (25%), though they are also above average in managerial, associate professional, and personal service occupations. **Their ‘density’ however, is greatest in associate professional/technical, skilled trades and personal service occupations. Indeed, nearly half of all skill shortage vacancies are in these three occupational groups.**

Sectorally, skill shortages predominate, in terms of absolute numbers, in health/social work, with more than a third being in just these two sectors. But, again, in terms of the density **they are most significant in agriculture; electricity, gas and water; and hotels/catering.** In occupational terms, the largest share of skill shortage vacancies is in associate professional/technical occupations. The second largest share is in skilled trades. Regionally, skill shortages are disproportionately concentrated in London and the East of England, but there is no necessary relationship between the level of skill shortages and the skills of a region’s workforce.

Recent work by the **Migration Advisory Committee (MAC)** uses a much wider range of measures of skill shortage, to establish a ‘shortage’ occupation list for use in the Government’s Tier 2 Points Based Migration system. This provides, though only for what the MAC defines as ‘skilled’ occupations, a more detailed and specific list of occupations, and indeed jobs, which exhibit shortage which could be used as a crucial intelligence tool in tackling skill shortages. **In sum, it covers a range of shortages in science/technology and engineering occupations, particularly in the healthcare and electricity sectors, as well as a shortage of education professionals in some areas, senior care workers, some fine arts occupations and skilled chefs.**

We have also shown that **the occupational characteristics and qualification levels of the unemployed differ substantially from those in work, and that this represents a significant mismatch between the skills of the former and those most required by employers.** Nonetheless, a significant minority of unemployed people do possess both higher level qualifications and occupational experience more associated with current labour market requirements.

Whilst skill shortages and unemployment represent skill deficiencies which arise in the ‘external’ labour market, skill gaps arise within the ‘internal’ labour markets of organisations.

Findings from NESS 2009 (Shury *et al*, 2010) show that skill gaps affect one in five employers – an increase of four percentage points since the 2007 survey. The proportion of the employed workforce estimated to exhibit a skill gap is around seven per cent or 1.7 million workers. It is a particularly important issue in larger establishments, and, whilst it is pervasive across sectors and occupations, it is particularly noticeable in sales and elementary occupations and in the manufacturing, electricity/gas/water, and hotels/catering sectors.

1. This is estimated from the work of Felstead and Green. It is derived by applying the proportion who are estimated to be ‘real over-qualified,’ that is have qualifications higher than those which are needed to get the job they currently hold and that they use very little or little of their skills in that present job

Technical/professional skills are the most common deficiency. The proportions are highest in financial services, education, manufacturing, mining/quarrying and agriculture. **In terms of generic skills, the most frequently reported deficiencies are customer handling, team working and oral communication skills.**

In regional terms, skill gaps are highest in the South East, South West and West Midlands.

The largest *increase* in skill gaps since 2007 has occurred in the South West and West Midlands. While the extent of deficiency in technical/practical skills varies little across the regions, literacy/numeracy issues disproportionately arise in the North West and North East, numeracy in the West Midlands and literacy in London.

Moreover, **there is some evidence of 'underemployment,' where some workers are over-qualified for the jobs that they are doing. Migration is also a significant feature of several occupational and sectoral labour markets.**

If we put all these aspects of mismatches together we can see how they stack up in terms of scale. **It is clear that we need to address both 'external' and 'internal' labour market mismatches as well as both demand and supply issues.**

Quantitatively, the issue is primarily one of un-used/under-utilised skills, associated with a **deficiency of demand**, rather than one of skill needs that are currently unmet. Nevertheless, *both* are important.

4.0

The drivers of change and their skills implications

4.1 Introduction

So much for the present. How **is the demand for skills likely to change as labour markets respond structural trends and developments in the coming years? What are the main forces stimulating change**, and what are their possible implications for skills?

This chapter provides an overview of the **major drivers of future demand for, and supply of, skills**. The analysis of drivers of future change follows a common framework covering political, economic, environmental, social, technological, and demographic change, and provides a review of key developments within each of the drivers. The purpose is to **indicate the nature and direction of major types of change, and provide a broad analysis of how they may influence skills demand and supply**.

This chapter is based on extensive work undertaken through the horizon scanning/scenario development study specially commissioned as part of the National Strategic Skills Audit research (SAMI, 2010). It also draws on a number of other studies (DCSF – *Beyond Current Horizons*; DCDC – *Global Strategic Trends*; NIC – *Global Trends 2025*; and HMT – *The UK Economy: Analysis of Long Term Performance and Strategic Challenges*), together with material drawn from sector skills assessment reports produced by SSCs. In addition to examining the likely direction and the nature of change this chapter provides indicative analysis of the impact of different drivers on skills, occupations and sectors where change is likely to be most pronounced. It also considers the extent to which drivers will impact on employment and skills within different scenarios of the future.

4.2 Main skills drivers

To gain a purchase on the future, we want to examine, in a systematic way, the main drivers of change that will impact on the labour market and jobs in the coming years. We categorise the drivers under seven headings of change and examine them in turn.

The categorisation used here is based on the work of Davies *et al* (2001). This work emerged from a detailed study conducted for the Performance and Innovation Unit of the Cabinet Office, which synthesised the findings of over 50 recent studies and grouped them into core sets of drivers. As such, it is probably the most systematic study of this type available. **These ‘seven drivers of change’ are presented diagrammatically in Figure 4.1**. It is the relationships between the drivers that are critical to determining impact. The dependencies mean that each may mitigate or reinforce each other’s impact, and it is therefore important to recognise these dynamics in analysing the trends in the demand for, and supply of, skills.

Figure 4.1: The major drivers of change



4.2.1 Summary of the key drivers

Regulation and multi-level governance: covering management of borders between states, threats to (inter)national security, changes in global power, national and international conflict, domestic regulation. Regulation can have an important influence on skills supply because it may affect labour supply through controlling entry to, and exit from, education and the labour market, and can influence skills demands through setting of either training, product or service standards.

Demographic and population change: covering the impact of global population change; relative changes between advanced, developing and transitional nations, changes in the age profile of populations, migration pressures, infertility and life expectancy. Demographic change can be an important influence on skills needs because it can affect labour supply through population change and location of different sources of labour, and population change in itself can lead to increases and decreases in consumer demand for different kinds of goods and services, leading to expansion and contraction in related job volumes.

Environmental change (whether due to natural causes or human agency): covering climate change, pollution, changes in demand levels for different types of energy; availability and use of water and food; development of cities versus rural areas; disease and deforestation. Environmental change may lead to skills needs as a result of government policy and investment to tackle climate change through stimulating the development of a low carbon economy.

Economics and globalisation: including rate of overall economic growth, distribution of wealth between individuals and nations, management practices and structure of organisations, nature of the workforce and international trade. Economic growth in developing economies may create pressure on the UK and England to move into higher value-added markets, which may lead to increasing demands for higher level skills in some jobs, and place demands on capacity to adapt to the requirements of emerging overseas markets.

Technological change (including new developments and new applications of existing technologies): covering development of biotechnology, nanotechnology and AI (Artificial Intelligence), digital communications and IT. The development of technologies may create demands for skills at higher levels in research and development (R&D), and at lower levels in manufacturing new products devised, while there may also be skills needs requirements in supporting consumers to use new technologies.

Changing values and identities: covering family structures, attitudes towards government, citizenship, education, religion. Changes in values and identities will include attitudes to work and may therefore affect labour supply through influencing choices about type and conditions of work.

Changing consumer demand: covering changing consumer choices and expectations about type and quality of products and services. The development of niche consumer markets, consumer preferences for tailored goods and services and rising consumer expectations about service quality may lead to skills needs within a variety of segments of the service sector.

4.3 The key drivers in detail

In this section, we discuss in more detail the nature of change associated with each of the factors, together with some indication of the skills implications that each of these drivers of change are likely to have.

4.3.1 Regulation and multi-level governance

- regulation will become more complicated and will increasingly involve a larger number of organisations at international levels to deal with risks and challenges that cannot be solved by single nations;
- ongoing sectoral regulation is likely to continue to drive up quality standards across industry which may result in demands for higher levels of skills or accreditation of skills;
- ongoing and increasing risk aversion, particularly in response to new technologies, may lead to public pressure on government to impose regulatory standards, resulting in higher levels of skills/training;
- planned national regulation will affect the supply of labour by directly or indirectly influencing the ages at which people enter or leave the labour market;
- planned public sector procurement regulation on levels of workforce competence may also drive up demand for skills.

International regulation for global problems

Regulation will be influenced by the range and complexity of national and international risks faced by nations (DCDC, 2007). Globalised communications, pervasive media scrutiny and cross-border development of sources of risks means consequences will increasingly be local, regional, national and supra-national/global. The recent global financial crisis illustrates the increasing interdependence between nations and significance of world trade for financial stability (HM Treasury/BERR, 2008). Many risks and challenges such as potential intra- and inter-national conflict caused by climate change and competition for scarce natural resources, are both complex and inter-linked. They cannot be solved by unilateral action, and require a co-ordinated multi-lateral approach. As a result, governments will increasingly be seeking international and co-operative solutions in their effort to safeguard national interest (Davies *et al*, 2007).

Existing or new collaborative institutions, philosophies and mechanisms will be required to cope with complex, inter-connected global and regional problems. Drivers of economic and social change may therefore come from unexpected sources beyond conventional national boundaries, and wider horizon scanning will become more important to businesses and governments. A number of sources identify concerns around international crime, in particular that which makes use of the internet for organising its activities, and the internet itself as a source of security risk from data theft (DCDC, 2007; Wilson, 2009). Attempting to regulate these spaces will be a key challenge for governments but may also open up increasing opportunities for organisations in the security sector (SAMI, 2010).

This shift towards greater international co-operation through the UN, the EU, the G20 and other international platforms and organisations such as the WTO, the World Bank and the OECD is contributing to the emergence of new multi-level governance structures and mechanisms. At European level, the Open Method of Co-ordination (OMC) and the Monitoring Committees of Structural Funds (based in each Member State) are well-known examples.

In relation to skills development, for example, the OMC on education and training has set the following five EU benchmarks for 2020: (i) at least 95 per cent of children between the age of four and beginning of compulsory primary education should participate in early childhood education; (ii) the share of low achieving 15-year olds in reading, maths and science should be less than 15 per cent; (iii) the share of early leavers from education and training should be less than 10 per cent; (iv) the share of 30-34 year olds with tertiary educational attainment should be at least 40 per cent; (v) an average of at least 15 per cent of adults should participate in lifelong learning activities.

Moreover, the new EU 2020 agenda will be important in relation to skills and jobs, and, in particular, the new emphasis being placed on skills in the *New Skills for New Jobs* agenda (European Commission, 2010).

The UK government's level of engagement with international co-operation on regulation depends to some extent on political choice. The scenarios used in this Audit illustrate that international co-ordination of regulation will be more likely under some trajectories of the UK's development than others.

National regulation may increase as a quality safeguard and risk management tool

Despite the growing importance of multi-level governance, national regulation still occupies an important position in the set of policy instruments affecting skill levels, and is a key determinant of training activity and required skills levels in a number of sectors including hospitality, food and drink manufacturing, energy generation and supply, financial services and social care. The financial services sector and social care sector along with others have been using the existence of regulation as one mechanism through which to raise overall levels of skills (Rogers *et al*, 2002). In the UK, a stricter regulatory regime is planned for financial services that should be fully in place by 2012 (see HM Treasury, 2009). Tighter regulations will require attainment of higher specific qualifications among the owners, managers and workers in the sectors concerned (Cedefop, 2009).

Compliance training has become directly important in its own right, and this trend is likely to continue. The main drivers of compliance training are external, including general and/or industry legislation, professional standards and quality standards such as ISO9001 and Six Sigma. For some employers (albeit a small minority) health and safety is the sole driver for training spend (Shury *et al*, 2010), while compliance with broader employment regulation has also grown in significance as regulation has expanded in this area. The development of sophisticated new technologies relating to medical technologies and biosciences, coupled with greater consumer concerns about personal risk and the rise of a litigious culture is likely to continue government scrutiny and regulation of emerging products and services in these and other fields – the rise of ‘credence goods’ (Hutton, 2009).

National regulation will affect quantity and skill levels of labour supply

Raising the state pension age in the UK by one year, and raising the age at which women are entitled to a state pension from 60 to 66 will lengthen possible working lives. It is also likely to increase the quantity and quality of skills supply, although this must be offset against the raising of the UK leaving age from education or training to 17 in 2013 and 18 in 2015. In the short-term, this may result in a drop in supply of young workers.

In the long-term, the relatively younger segments of today’s workforce will have higher levels of qualifications than the older age cohorts who are retiring from the labour market. At present, 53.5 million of those employed in the EU (15-74 years) have no or low qualifications, as opposed to 56.7 million with tertiary education and 107.4 million with medium qualifications (Eurostat, 2009). Crucially, the proportion of working age population with low educational attainments (closely linked to age) is decreasing across the EU. This, in turn, means that in future there will be a greater supply of workers with higher education levels. As a result, current forecasts point to the risk of elementary jobs being increasingly occupied by workers with mainly intermediate level qualifications (Cedefop, 2009).

Public procurement policy may increase employer demand for skills

There is increasing recognition that public sector procurement can have a significant influence on skill levels and qualifications through central and local government power as major contractors of public services and through the prioritisation of investment in services. Public procurement policies can have an impact on skill levels, training and innovation in contractor companies (Binks, 2006). In 2003, the DfES and the Office of Government Commerce (OGC) produced guidance to all government departments on how they should incorporate basic skills requirements into their procurement arrangements and new joint guidance was issued in 2009 by the Cabinet Office. Procurement may enhance skills at all levels and training clauses and contractual skill requirements can have an influence on intermediate and higher level skills as well as level 2 and basic skills (Binks, 2006). Suppliers may also increase their demand for intermediate and higher level skills in response to demand for innovative goods and services.

4.3.2 Demographic and population change

- The UK economy is characterised by an ageing population as opposed to the growing and younger populations of developing and emerging economies;
- future skills needs resulting from the needs of an ageing population may be high level ones, for example in biomedical occupations, or relatively low level ones in, for example personal care;
- policies to encourage immigration have been key tools in tackling skills deficits but may change in the wake of domestic skills surpluses following recession.

Population growth will continue in developing countries...

Contrasting demographic profiles will continue to be a key source of differentiation in skills supply. The global population is likely to grow from 6.9 billion to 8.5 billion people by 2035 (United Nations, 2009). According to the Development Concepts and Doctrine Centre’s (DCDC) major analysis of future global trends, the greatest population growth will occur in regions likely to face economic risks such as Sub-Saharan Africa, thus being likely to exacerbate the migration flows from these regions towards more

economically prosperous countries. The population in some countries with strong economic growth such as China, India and Brazil is expected to grow due to rising life expectancy and higher birth rates than in developed economies.

...and population ageing will continue in developed countries

In developed countries and regions such as the EU and the USA, significant population ageing will continue. For example, EU population ageing is expected to accelerate, and the overall EU-27 population will contract from 2025 onwards (Eurostat, 2009). The 80+ age group remains the fastest growing age group. It doubled in size in the period 1970-2000 and it will double again before 2030. By 2050, there will be one retired person for every two workers. Two factors account for this marked transition to a much older population: consistently low fertility rates and higher life expectancy. Harper (2009) argues that in the UK due to changing (female) aspirations concerning domestic life, emphasis on free choice, participation in the labour market, improved infant mortality and the increasing cost of child rearing to meet societal expectations, fertility rates will decline or at most remain stable over the next 10 years. Life expectancy has risen markedly over the twentieth century due to reduced infant mortality and deaths at an older age and it is possible that this will increase further. Birth rates, however, are likely to be much higher among socio-economically disadvantaged groups in the population, who tend to enter the workforce with lower levels of skills and qualifications (Dex, 2008), so this may also affect the quality of labour supply.

In the UK specifically demographic trends mean that 80 per cent of our 2020 workforce are now already in the workforce, and there will be a decline of nine per cent in the numbers of young people aged between 15 and 24 between 2010 and 2020.

Working lives will be longer as a result of population ageing, requiring more opportunities for lifelong learning

There are a number of implications for countries with changing population dynamics. These include shifts in demand for housing, transport and education, as well as the more commonly noted implications for health and social care. Ageing populations also create challenges arising from dependency ratios and sustainable pension provision. One consequence of ageing populations is reduced pension provision which will encourage labour market participation. This is occurring in the UK as a result of closure of final salary pension schemes, which, coupled with raising of the state pension age and equalisation of the age at which men and women are entitled to pensions, will lead to a need for individuals to earn money for a longer period of their lives. The implications centre around the need for gaining an adequate initial education to form a sound basis on which lifelong adult learning can take place, and the need to provide opportunities for adults to acquire skills at a number of stages throughout their working lives. Acquisition of skills amongst older workers will, where appropriate, need to keep pace with new technologies and ways of working.

Care and leisure needs of a growing elderly population offer business opportunities and may create demands for new and existing skills

An ageing population also presents business and employment opportunities that arise from meeting its varied needs (BERR, 2009). For example, the EU's Action Plan *Ageing Well in the Information Society* is seeking to support the creation of new business opportunities based on innovative, ICT-based products, services and systems for Europe's ageing population. Other areas for new business opportunities include the development of age-related drug treatments, disease prevention and health technologies, leisure activities relating to the preferences of older groups, personal care and assistance. These opportunities may create skills demands depending on the state of current and future labour supply in the relevant sectors and occupations. The levels and types of skills are likely to vary significantly from high level science and technology based skills in medical innovation and product generation to social skills in provision of personal care. It is likely, but not certain, that there will be a mixture of demand for new skills related to the development of specialist technologies and a need to apply existing skills to new technologies. Higher volumes of people with knowledge and understanding to support an expanding ageing population in the use of advanced technologies to assist independent living are likely to be needed.

The current ageing EU population creates both labour market replacement needs (as older workers leave the job market) and demand for personal, social and healthcare services for the elderly. An older population is likely to demand independent care at home, with evidence suggesting this demand could increase by one-third by 2020 (HMT/BERR, 2008). Due to falling fertility and birth rates, coupled with recruitment difficulty for some care occupations, countries are finding it challenging to staff these occupations through native populations. Greater labour market participation of women and changes to family structures such as the growth of single parent families means that at the other end of the life course, there are also increased demands for domestic and childcare services.

Migrant workers could be an ongoing source of labour, but recession may lead to pressures to preserve jobs for native workers

There is evidence that immigration has provided and could continue to provide a source of labour for all levels of skills in the jobs directly related to demographic change and in other sectors. However, EU countries attract fewer high skilled immigrants and more low skilled immigrants than the USA, Australia and Canada. This means that higher skilled vacancies may not be filled (EurActiv, 2008). At a global level, migration is expected to increase due to rising global inequality in living standards and environmental pressures. In 2008, three per cent of the world's population (about 175 million people) lived outside their country of origin, but by 2050 this number is expected to have risen to 230 million people (DCDC, 2007).

However, the skills implications of migration may shift in the wake of global recession as pressures to use migration to fill vacancies in tight labour markets are replaced by considerations of how sufficient jobs can be provided for native populations in different countries. Assessing future implications of migration requires some analysis to be made of the duration and intensity of the employment consequences of recession. Consideration should also be given to the impact of advancements in nations, such as China and India in terms of their potential for attracting talent.

4.3.3 Environmental change

- Climate change will affect habitation patterns and create a requirement to manage resource shortages;
- the development of city regions may affect the location of labour supply;
- increasing demands for energy create continuing pressure to provide sustainable sources and policy focus on supporting new industries such as technologies for renewable energy and changing energy production and consumption to create a 'green' economy;
- the novelty of the skills required to develop a low carbon economy and level of demand for them is unclear and will require government action to stimulate development of this market.

Climate change may affect habitation patterns, and create a requirement to manage resource shortages

Many nations are experiencing rapid environmental change, caused by ongoing climate change. This is increasing the frequency and intensity of extreme weather phenomena; altering regional weather patterns and resulting in rising sea levels and desertification (DCDC, 2007). The impact on food production, cultivation and animal husbandry will, in turn, affect various regions to different degrees, with people from the worst affected areas being forced to relocate. Climate change will increase pressure on water supplies and their associated industries, resulting in more water stressed regions (DCDC, 2007) and the possibility of rising food and energy prices (HM Treasury/BERR, 2009). Solutions for potential future shortages, such as food production in the longer term, will require new technologies (SAMI, 2010). Rising sea levels will result in continuing and increased threats to the habitability of coastal areas, which will be of particular concern to the long coastal regions of England and other UK nations. Overall, the risks of natural resource shortages create potential for growth in services relating to waste reduction and which support efficient management of resources (SAMI, 2010). Some of these may lead to changes in existing jobs, for example waste reduction in catering roles, while others may involve the creation of new jobs concerned with resource efficiency in large organisations or larger scale consultancy opportunities to business.

City regions may become increasingly important, shaping spatial labour supply

These developments will contribute to even greater urbanisation and concentration of populations in cities (DCDC, 2007). This may create opportunities for cities as engines of economic growth and recovery. Research highlights the particular economic benefits that can occur as a result of sectoral specialisation in particular localities. These include ‘spill over’ effects in social, intellectual and human capital, leading to ideas exchange and innovation, derived partly from the availability of large pools of skilled workers (HMT/BERR, 2008). Further drivers for the development of urban areas also come from climate change pressures as carbon emissions could be reduced by concentrating housing developments in areas accessible by public transport (HMT/BERR, 2008). This would influence the spatial supply of labour.

Increasing demands for energy create continuing pressure to provide sustainable sources

Climate change coupled with environmental degradation through pollution of water, land and air interacts with the demographic driver of sustained population growth and global economic growth. This is leading to higher levels of consumption and rapid modernisation and urbanisation causing intensive exploitation of, and aggressive competition for, material resources. As a result, demand for energy is likely to grow by more than half by 2035 (International Energy Agency, 2005). HM Treasury/BERR note that protecting and securing a reliable energy supply will be an important priority for the UK (2008). Climate change therefore not only affects environmental policy and technology, but is driving the creation of new sectors to generate renewable energy (Cedefop, 2009).

The potential limits of hydrocarbon resources coupled with the need to reduce carbon emissions and to further diversify energy sources due to political instability in some oil producing countries will also stimulate development of alternative forms of energy, such as bio fuel and hydrogen (DCDC, 2007). The European Commission plans to triple Europe’s energy research funding within the next decade to support the EU’s transition towards a low carbon and ‘green’ economy. The increase in energy-related research funding has clear skills and employment implications for the EU labour markets. For example, the scale of global environmental industries is expected to increase by 50 per cent within the next eight years (BIS, 2009a).

Volumes and types of new versus existing skills required to support a low carbon economy are uncertain

The outcomes of such sustained research efforts will be the development and introduction of new technologies and processes. Firstly, carbon capture and storage development will require new infrastructure including pipelines for transporting carbon dioxide and offshore storage locations, and work will also be needed to develop the UK’s electricity network (HMT/BERR, 2008; SAMI, 2010; PwC 2010a Energy & Utility Skills *et al*, 2009). This is likely to increase the demand for existing skills, rather than create demand for new skills.

Secondly, construction materials, methods and output are expected to change dramatically in the period to 2020. Intelligent sustainable low-energy green buildings may become the norm. However, the extent of the impact on skills demands is not clear. The Cabinet Office (2009) notes that every job will have to be a ‘green collar’ job, but the balance of change in skills demands between the application of existing skills to new technologies in existing jobs, the application of existing skills to new technologies in new jobs, or the development of entirely new skills for entirely new occupations is, as yet, unclear.

Development of low carbon industries requires initial government investment/regulation to create demand for skills in these areas

Studies of current demand for skills in low carbon industries suggest that demand is latent, unrecognised as yet by organisations, and likely to be driven by legislative change and government investment, in addition to the pursuit of cost savings and supply chain pressures (Pro Enviro, 2008). This is consistent with the recent proposals for investment in the sector made by the UK government (Cabinet Office, 2009).

4.3.4 Economics and globalisation

- The labour markets of emerging countries will shift in their nature, from ones which primarily supplied low skilled workers to ones which will increasingly present opportunities for UK exporters;
- developing economies may over time also reduce migrant labour supply by absorbing highly skilled workers in their own emerging industries;
- developments in ICT and logistics have facilitated the creation of global value chains, allowing firms to move low skill activities abroad to take advantage of lower labour costs, as well as leading to specialisation in goods and services;
- to compete in this environment the UK needs to focus on areas where it has a comparative advantage, such as high skill activities which exploit its strengths in research and innovation;
- the knowledge based economy is likely to be an area of growth;
- at the same time there will be continuing demand for low skill jobs in England;
- the ongoing consequences of the global financial crisis and instability in world economies will lead to a period of economic uncertainty for governments, organisations and individuals.

Developing economies present opportunities but the supply of migrant labour may change

Globalisation has been fuelled by the emergence of the BRIMICS countries – Brazil, Russia, India, Mexico, Indonesia, China, South Africa – as growing economic powers with large and, in most cases, young populations. Their growth rates prior to recession exceeded those of major Western economies, including the EU, the US and Japan. For example, in 2007 the growth rate of China and India were 11.9 per cent and nine per cent respectively, as opposed to that of the EU which was three per cent (US Central Intelligence Agency, 2009). In particular, within the next 40-50 years the GDP of the BRIC countries are expected to exceed those of the largest EU countries, the US and Japan (although BRIMICS countries may remain relatively poor in terms of per capita). Some reports draw particular attention to the growth of China as an economic power, since its annual increase in economic output makes the single largest contribution to world economic growth. This means that China may challenge the USA for economic supremacy in the 2020s (DCDC, 2007; SAMI, 2010). The scale of investment in countries such as China and India, including in higher education, may result in their labour market moving up the value chain. An example of this is China's huge investment in its transport infrastructure which is likely to result in design as well as manufacturing capabilities locating there, since suppliers often locate near their customers when transport costs for finished goods are high (SAMI, 2010).

The education, skills and innovation systems of BRIMICS countries vary in quality, which may present a window of opportunity to cement current advantage by developing long-term relationships, however at the same time developing economies are investing significantly in secondary and higher education. Globally, the number of graduates has doubled in the last 10 years (ESRC, 2008). Moreover, in many developing countries, economic prosperity has fuelled a massive expansion of the middle classes who are also investing in young people's education to provide a significant volume of highly skilled workers. Asia is already producing more engineers and physical scientists than Europe and North America combined (ESRC, 2008).

This supply of skills is enabling developing countries to compete not only on cost but also on the quality, skills, creativity and innovation capabilities of their human resources. As the economies of developing countries absorb these talent pools, advanced economies may have to compete in an expanding global labour market for workers including high quality graduates, scientists and researchers (Schlotter *et al*, 2008). This must be offset against any political instability, deficits in material resources or effects of climate change which may encourage migration from developing to developed countries.

UK firms have already taken advantage of the opportunities in developing economies; since 2002 UK exports to India and China have grown 14 per cent and 19 per cent a year respectively (BERR, 2009b). However, for firms operating in export markets where developing economies will be a significant customer there is a continued need to develop an understanding for how that country does business; how it can complement rather than necessarily compete; and how it can access enabling skills such as appropriate language skills and financial advice.

Developments in ICT and logistics have facilitated the creation of global value chains, allowing firms to move low skill activities abroad to take advantage of lower labour costs, as well as leading to specialisation in goods and services

Increased globalisation and trade liberalisation have significant implications for all nations. The current pace and scale of globalisation is unprecedented, due to the rapid emergence of ‘global value chains’ (OECD, 2007; BERR/DIUS, 2008). In these organisational networks, the process of generating goods and services is being segmented so that each stage can be carried out wherever the necessary skills and materials are available at the most competitive price.

Many UK firms have benefited from increased access to supplies of lower cost labour enabling them to shift low skill activity abroad, maintaining competitive advantage. In itself this creates demands for business support services delivered to single organisations which operate globally (Cabinet Office, 2009). These spatial patterns of relocation of production have also been enabled by the developments of ICTs (Wilson, 2009). This is leading to a process of increased specialisation upon which competitive advantage is founded, especially, for example, in technology production. The UK electronics industry has high levels of productivity and consists of numerous SMEs, with niche market capabilities (HM Treasury/BERR, 2009). A CBI survey predicts that in five years time, research and logistics/integration of product design will have grown significantly as sources of competitive advantage in UK manufacturing, while the importance of production and assembly will have decreased (CBI, 2007, cited in HM Treasury/BERR, 2008). Furthermore, there is likely to be ongoing and increasing cross-border collaboration in invention of products and services.

Focus on areas where there is comparative advantage, such as high skill activities which exploit strengths in innovation

The development of high level skills as a more global commodity will continue to change the competitive paradigm of both developed and developing economies in sectors which export globally. The competitive advantage of developed economies will increasingly be derived from capacity to stimulate innovation and productivity growth and foster organisational agility, rather than from a simple price/quality trade-off. The policy implications arising from the pressures of globalisation are for a need to promote innovation, creativity and entrepreneurship, including a greater emphasis on lifelong learning. Achieving global competitiveness is likely to require significant investment so governments may need to prioritise funding, given likely cost constraints on policies to support innovation.

The knowledge based economy is likely to be an area of growth

A further major dimension of economic change has been the shift in the structure of the UK economy from an agricultural and subsequently manufacturing focus to a service-based one. This has led to significant debate about the growth of the so-called ‘knowledge’ economy. For example, evidence shows that the UK derives a higher share of value added from knowledge-intensive services than other major OECD economies except the US (HM Treasury, 2008), and the scope of future technological innovations suggest this is likely to continue to expand. But the OECD defines knowledge-intensive services as ‘high growth’ services and the extent to which work in the modern service economy is really knowledge-based and demands high levels of skills has been questioned (Warhurst and Thompson, 2006). Demand in the ICT and R&D sectors for high levels of professional and technical knowledge may be relatively small compared to the level of skill/knowledge required in workers in the rest of these sectors and the rest of the economy. Other sources point to the possibility that leading centres for R&D may develop outside established locations, including China and South Korea, creating a shift in the locus of demand for labour (DCDC, 2007) and the potential for UK graduates to be attracted to such locations.

A significant proportion of new jobs created may be in existing low-skill service occupations

This raises a key policy question about relative emphasis between the objective of improved economic performance reflected in measures such as GDP and job creation. The supply of a small number of highly knowledgeable/skilled workers may be critical to broader economic prosperity across the economy. However, much of the major growth in the service sector over the past decade, as well as that predicted for the future, has been in retailing, leisure services covering tourism, hotels and catering, and personal services including care provision, much of which demands relatively low levels of skills (Wilson *et al*, 2008). Many of these services are non-internationally tradable because they are tied to a specific location and cannot be replaced by technologies. This suggests that patterns of domestic as well as international trade may be important factors in influencing absolute demand for levels and types of skills.

The ongoing consequences of the global financial crisis and instability in world economies will lead to a period of economic uncertainty for governments, organisations and individuals

The unprecedented effects of the global financial crisis will not be resolved quickly. For the UK government, reducing the public sector borrowing deficit is a high policy priority (HMT, 2009). There is, however, a high degree of uncertainty about future economic growth in the UK and overseas. There is some concern about further financial instability and possible severe fluctuations in currency valuations, especially for the US dollar (SAMI, 2010). In the UK, data reviewed in the horizon scanning study show that the Bank of England's predictions for economic growth to 2012 range from minus one to six per cent (SAMI, 2010). This means that for many organisations, there will be ongoing skills needs among senior managers to be competent in making flexible plans that can cope with uncertainty about product, service and/or labour demands.

4.3.5 Technological change

- ICT has had, and will continue to have, a major impact on creating employer choice in the location of work, enabling specialisation of production and in some areas creating demand for higher level skills;
- there are five major areas of technological change which will affect skills requirements in: medical and life sciences; nanotechnologies, electronics and new advanced materials; sectors which are affected by the development of low carbon economy; sectors making use of digital media; generic impact of improved ICTs;
- readiness to exploit the potential of new technology across the rest of the economy will create accelerated demands for creativity and entrepreneurship as well as management and leadership skills;
- there is potential for expansion of self-employment or small business development drawing on digital media and e-commerce in the creative and cultural sectors. This may lead to workers in craft industries requiring additional ICT skills;
- use of IT as a medium for enabling learning opens up opportunities and challenges for negotiating access to the most appropriate resources;
- IT security also poses opportunities and challenges for government, firms and individuals.

ICT has had, and will continue to have, a major impact on creating employer choice in the location of work, enabling specialisation of production and in some areas creating demand for higher level skills

Reviews of recent research in technological change have pointed to the dramatic impact that information and communication technologies have had on the location of work (Wilson, 2009). This ranges from easier transfer of information enabling companies to have greater freedom of choice in workplace location to enabling workers themselves to undertake tasks or whole jobs away from their nominal workplace. This may continue, thus enabling work to be shifted to the most appropriate skill base. It is a trend evident in the growth of off shoring, which to date, has attracted most attention through the outsourcing of lower skilled jobs from the UK to overseas, for example call centres. However, there is also evidence that higher skilled jobs including legal work and interpretation of health care tests, for example in radiology, are being transferred overseas on grounds of cost effectiveness (SAMI, 2010).

There are future product market opportunities arising from technological developments. ICT fuels globalisation by enabling easier exchange of information, contributing to the creation of distributed production chains and specialisation (HMT/BERR, 2008). Further, likely product market opportunities may be available in developing: security systems to identify and monitor risks; more sophisticated sensors and tracking devices to monitor physical phenomena; advanced materials and robotics as products in themselves as well as assisting in manufacturing processes (HMT/BERR, 2008).

Technological change has a direct impact on the demand for skills and workers with different levels of education. New technologies that improve the effectiveness of the production process are sometimes argued to be 'skill-biased' (Wilson, 2009) resulting in increased demand for highly-skilled/educated workers. There is also considerable evidence that adopting ICTs reduces the need for routine cognitive and manual tasks, while at the same time, increasing non-routine tasks that require higher skills to perform them (Autor *et al*, 2003).

There are five major areas of technological change which will affect skills requirements

These are in:

- medical and life sciences;
- use of nanotechnologies, electronics and new advanced materials across industrial sectors;
- sectors which are affected by the development of low carbon economy including manufacturing, engineering and construction;
- sectors making use of digital media;
- generic impact of improved ICTs across the whole economy.

Medical science is likely to lead to more sophisticated customised treatments and mechanical devices to improve quality of life.

Likely developments in biotechnology include drug customisation for individuals, further use of gene therapy and drugs to decelerate or reverse ageing, including those which improve memory. Other technical developments to improve quality of life might include bionic implants, more animal transplants, artificial sensors which can interact with the brain and prosthetics which function better than human limbs. Further progress is likely in stem cell and tissue engineering (DCDC, 2007). This may require knowledge (if not skills) development of individuals who are working in these fields. As these applications become more widespread, the number of occupations which have some exposure to people who are benefiting from them and may therefore need to modify products or services to meet individual needs is likely to increase, with potential impacts on skills demands. Any worker who interacts with a beneficiary of sophisticated devices to improve quality of life, especially in a care or personal customer service capacity, may need some knowledge of how they work, possibly leading to a difference in how they apply existing skills.

Growth in nanotechnology, electronics and new materials industries will lead to skills needs at high and intermediate levels.

Experts expect nanotechnology, electronics and the applications of new advanced materials to grow in economic importance across most industrial sectors. For example, nanotechnology sales in the global market were estimated at \$32 billion in 2005 and are expected to rise to \$2.6 trillion by 2014, accounting for 15 per cent of total world sales of consumer goods (Cedefop, 2009). At present, use of nanotechnology is mainly found in research and development occupations, including science and design engineering. Requirements for skills related to these technologies are also rising at intermediate skills levels for engineers and laboratory technicians, driven by increasing focus on the production of nano-products and associated work processes (Cedefop, 2009). A distinctive feature of nanotechnology is its interdisciplinary nature, hence the current focus on promoting inter-disciplinary activity in applied sciences and R&D. This is supported by an industry skills survey that reports knowledge of nanoscience for engineers to be relatively more important than knowledge of engineering concepts for nanoscience graduates and post-graduates (Institute of Nanotechnology, 2007). The same survey indicated that the three relatively important natural science competencies were knowledge of material science, nanobiology interface and nanoscale effects. Other relevant technical knowledge competences include fabrication and synthesis knowledge; characterisation tools and analysis; and knowledge of new materials and their properties; design methodologies for product development; and technical communication. There may also be expanded needs for workers at intermediate and lower skill levels to produce the technologies developed. Similar advances and skills implications arise from the development of new composites, meta-materials, polymers, plastic/printed electronics, silicon electronics and industrial biotechnology.

Sectors which are affected by the development of low carbon economy including manufacturing, engineering and construction.

Technologies related to the transition towards a low-carbon, energy-efficient and 'green' economy will also have an impact on employment and are likely to influence skills required. Such major change will occur in areas such as energy production, distribution and conservation; construction; food production; sustainable materials; manufacturing; transport/logistics. However, it is not clear whether individuals will be applying existing skills to new technologies in their existing occupations, will require new skills for their current roles or will be occupying entirely new roles with new skill sets.

Digital media and creative/cultural industries using e-commerce technology have growth potential.

Sectors making use of developments in digital media include creative and cultural industries, particularly broadcasting, as well as online gaming industries. In a related area, the growth of e-commerce technologies is affording small craft-based enterprises access to a global market place (Wilson, 2009). Several analyses conclude that the leading position of the UK broadcasting industry and the potential expansion of access to digital media has not yet been fully exploited, as well as the potential for growth across other sub-sectors within the creative and cultural sectors (Clifton *et al*, 2009; The Work Foundation and NESTA, 2007). This may be aided by improving ICT and digital literacy among workers in these sectors.

Generic impact of improved ICTs across the whole economy.

In addition to the direct impact of technological change on industries whose primary product or service relates to technological innovations, there are also implications for the rest of the economy. Analysts argue that above all, organisational readiness and agility to be able to take advantage of ICT innovations are likely to be the most important contributing factors to securing competitive advantage (e.g. Dixon, 2008). This is referred to as 'recombinant innovation' where existing technologies are exploited to create new business models (Hargadon, 2003). The skills implications of these relate at the level of those with decision-making responsibility to abilities to recognise and exploit the potential of ICTs as supporting or enabling technologies, with skills in management, leadership and entrepreneurship being required (Bosworth, 2009). For those working directly to embed and use new technologies, there may be continuing demand for generic skills, for example autonomy, initiative taking, problem solving, self-management, team working, flexibility/adaptability, (inter-cultural) communication and media literacy (Cedefop, 2009). Similarly, working in chains, networks and clusters creates new skill needs in co-operation on the basis of contracts and mutual trust. One set of 'skills' deemed particularly important by both policy makers and employers relates to innovation and creativity, which also puts a premium on 'systems thinking.' These skills needs are likely to be subject to continuing debate about how 'new' they are and some of the policy implications relate to how 'teachable' they are.

Technological change also influences the organisation of work across the economy among secondary users rather than primary developers, which affects the demand for different levels of skills. Technology can simultaneously create demands for higher skilled workers, while deskilling those in other roles, especially where managers have discretion to choose how to organise work to make use of new technology as longstanding research shows (Wilkinson, 1983). This can result in a mixture of a strict division of labour, bureaucratic control, hierarchical structures and mass production as well as more flexible forms of work organisation and structures.

Use of IT as a medium for enabling learning opens up opportunities and challenges for negotiating access to the most appropriate resources

The development of online training content and resources has been driven partly by the growth of user-generated content and navigation aids. In addition, there is a trend among some learning providers such as universities to make content freely available as part of their public service role (SAMI, 2010). Additionally, greater sophistication in IT applications such as webcams and other forms of online interactivity may advance the use of IT as a learning medium for a wider range of knowledge and skills (SAMI, 2010). The skills implications partly become ones of developing competence in selection of possible interventions. Government may have a key role to play in providing suitable information, advice and guidance and accreditation of content to help users choose between different forms of provision. Individuals who lack confidence and/or capability to access learning through IT may also need additional support to acquire minimum standards of competence to gain maximum benefit as digital learners.

IT security also poses opportunities and challenges for government, firms and individuals

As mentioned above, the growth of both e-commerce and the development of industries whose product is online or in virtual format raises questions about how best both to protect against data loss and also how best to secure revenue by protecting intellectual property rights. This is of particular concern to industries which are reliant upon online services such as digital media and the computer games industry (SAMI, 2010), but also among the economy as a whole due to changes such as the transition from hardware based servers to online servers through 'cloud' computing. There are growth opportunities for organisations specialising in data security, whose employees will need to be competent to address new threats to data protection as they emerge.

4.3.6 Changing values and identities

- Access to global influences on values will continue the trend for individuals to adopt multiple and virtual identities on a short-term basis;
- continued and growing individualisation of values may influence attitudes to work and working time;
- changes in values and identity are partly driven by demographic changes. These include shifting family structures, growth of single parent families and single person households and increased female participation in the labour market. This will contribute to a continuing demand for good quality child and elderly care provision;
- fragmentation and reconfiguration of values and identities across traditional lines of formation such as place of residence and nationality makes implications for the labour market difficult to predict. They are likely to have indirect as well as direct effects on skill demands;
- skills supply through the education system is a necessary but not sufficient condition to guarantee adequate supply of workers for particular jobs, as heightened individual expectations and aspirations will affect occupational choice, albeit mitigated by the effects of recession.

Access to global influences on values will continue the trend for individuals to adopt multiple and virtual identities on a short-term basis

The social dimension of change in the first half of this century is likely to be dominated by the impact of globalisation on culture, values, identity and beliefs (DCDC, 2007). Faced with the effects of globalisation, the spread of access to ICTs, and greater travel opportunities for many people, individual affiliation will extend beyond physical locality. The continuing effects of migration patterns will result in individuals holding multiple allegiances. Relationships and multiple identities can also be developed remotely, benefiting from the creation of virtual worlds through the internet. This development of multiple connections and common interests on a global plane will contribute to greater cultural plurality and complexity. It may also lead to greater fluidity in the evolution of identities and values. People may adopt values on a short-term basis and in relation to particular interests, rather than as enduring guides for behaviour. There is also evidence of a growing trend to secularism and for a significant minority this may seem threatening and induce them to resort to religious orthodoxy as a source of secure values (DCDC, 2007).

Individual rather than collective values are likely to increase in importance and may influence attitudes to work and working time

Individual loyalty to the state and its institutions may become dependent on perceptions of their capacity to meet personal interest and support allegiances of personal identity. Dex (2008) already notes a loss of deference in an educational context, which is also reflected in the political debate and campaign of the mid-2000s about how to cultivate 'respect' in society. This trend means that although national, cultural and ethnic origin will continue to be significant factors in determining identity they will be employed increasingly selectively, based on their utility in context and in relation to personal interest (DCDC, 2007). The increasing individualisation of values and emphasis on personal rather than collective goals may influence individual employment aspirations. This is supported again through developments in information technology. Heeks (2008) and Wilson (2009) note the rise of individual trading opportunities through the internet in the form of the growth of eBay and similar websites, which is facilitated by the availability of non-proprietary 'open source' software, make underpinning technology freely available.

Individualisation of personal interests and expectations of work may also be fuelled by a backlash against intensive patterns of working time. The prevalence and intensity of long working hours has increased in the UK, which is often compared unfavourably with some other EU countries. Research shows this has a negative impact on a variety of well-being measures including injuries and diseases caused by work-related stress (see Hogarth and Bosworth, 2009, for a review). In this context, pursuit of work options which offer greater personal control over working time, including self-employment, may increase in popularity.

New entrants to the labour market, often called 'digital natives,' have grown up with increasingly fast and comprehensive ICT systems including the internet and commentators argue that this may imbue them with a different set of expectations about human interaction and work. These are variously depicted as involving unfettered access to information, high levels of autonomy and personalised rapid responses to requests for support and information. It remains to be seen how far these expectations will affect working conventions and management styles. This trend of individualism is picked up in some of the possible scenarios for the UK in 2020 discussed later in this chapter (SAMI, 2010).

The rise in the numbers of single parent households and feminisation of the work force is likely to increase demands for domestic and care services

Changes in family structures combined with the increased female participation in the labour market are also factors contributing to changes in values and identities. Due to increased numbers of family breakdowns and a rise in the number of births outside marriage, the number of single parent households, mainly involving single mothers, is steadily growing (ESRC, 2006). At the same time, the number of working women is also increasing both in the EU and beyond. To sustain or increase this level of female participation, in particular to cope with the implications of demographic ageing, demand will increase for care for children and the elderly (also see section on demographic change).

Individualisation of attitudes to work may exacerbate current mismatches in skills supply, if insufficient numbers of people choose to enter roles including care work and STEM related occupations

The skills implications of these trends are diverse. Overall, changes in values and shifting formations of identities beyond existing trends are uncertain and difficult to predict. Their connections to trends in skills demands are both direct and indirect, which makes the consequences for the labour market more challenging to identify. A specific consideration of importance to skills supply is the changing nature of individual attitudes to work. This is important because skills supply is a necessary but not sole condition of adequate labour supply, since citizens can make choices about the type of job they wish to undertake.

Overell (2009) notes tensions and complexities in individual orientations to work. These are embodied in recent trends in career and occupational choices. Two examples will illustrate these tensions. First, the increasing employer demand for staff in social and personal care occupations has not been met with an adequate supply. Vacancies in these occupations are known to be difficult to fill, although the levels of qualifications and skills involved may not be particularly high or complex. Rather, evidence in this area points to the fundamental physically and emotionally demanding nature of the work, coupled with low pay as features which make these occupations relatively unattractive to some. Therefore, although Wilson (2009:7) notes that caring for others in general is one of the 'useful things to be done' that could provide job opportunities, at present it seems that a sufficient number of prospective workers are yet to be persuaded of the personal benefits of undertaking this work. Second, those with high levels of skills in STEM subjects often do not work in STEM specific occupations. DIUS (2009) found that just under half of those with STEM degrees worked in STEM occupations, although these carried an earnings premium. It is possible that some of this mismatch may be due to STEM employers not recruiting STEM graduates, and BIS is undertaking further research in the area. Concerns are often raised about supply of people with science 'A' levels, but analyses of supply since 1994 show little evidence of decline (and indeed some increase) in enrolment in science subjects apart from physics, although this does not equate to attainment (Hogarth *et al*, 2009). Rather, it seems that further questions around drivers of skills supply change need to be asked about the subsequent destinations of young people holding these qualifications. Analysing any mismatch between supply and demand for skill (in any occupation and sector) must take account of individual choice, capability and the market conditions for that occupation.

People may increasingly seek work which has a perceived social as well as economic function...

Literature identifies multiple purposes that individuals pursue through work covering: use of talents/skills, recognition and achievement; monetary compensation; interpersonal relationships and social/moral purpose (Morin, 2000, cited in Wilson, 2009). Recent trends have seen increased claims in the importance of work which has a societal function beyond generation of profits, along with some tendencies towards rejection of materialistic attitudes founded on capitalism (Wilson, 2009). This is accompanied by claims that individual choices of occupations and employer is being made on grounds of congruent values and ethics. Overell (2009:9) argues that the 'new emphasis that has occurred over recent years on meaning, identity and self-making in work is likely to become more intense rather than less.' Analysts draw attention to national risks of providing insufficient jobs or jobs of a quality which do not meet individual expectations, including vulnerability to extremist ideologies (DCDC, 2007).

...but recession may temper heightened individual expectations about quality of work and make people prioritise job security

This increased attention to personal choice and meaning has, however, risen in the context of a buoyant labour market. It must therefore be tempered by a recognition that the context for the next few years is one in which employment as an end in itself may, for some, take higher priority than in the previous decade. Consequently, individuals may therefore become either less selective about their preferred occupation, or equally, place greater emphasis on security of income that can be gained from work. They may consequently pay more attention to the employment prospects which are attached to the acquisition of different types of skills. Sustained negative experiences of job search among young people entering the labour market for the first time may colour their perceptions of the relative value of skills and training, especially among those most disaffected by learning if acquisition of skills does not lead to work (SAMI, 2010).

4.3.7 Changing consumer demand

- A continuing global rise in capitalism will generate new market opportunities elsewhere in the world but recession may limit consumer spending and consequently skills needs in the domestic market;
- diversification and fragmentation of consumer choice may lead to niche product and service development;
- skills related to designing, developing, producing, marketing and distributing environmentally friendly and energy efficient products and services will be increasingly sought;
- given the expansion of online commerce, there will be a need for media literacy, online sales and marketing, distribution/logistics management as well as remote customer management relationship skills among workers;
- the importance of good interpersonal, communication and customer-facing skills will grow from already high levels, especially in the face of consumers who are increasingly demanding and vocal.

A continuing global rise in capitalism will generate new market opportunities elsewhere in the world but recession may limit consumer spending and consequently skills needs in the domestic market

Capitalism will continue to be the main economic and cultural model for the aspirations of most of the world's population with individuals seeking to match the lifestyle of their Western counterparts (DCDC, 2007). Material expectations, underpinned by increasingly globalised communications, media access, and personal aspirations, are forecast to increase as a result of overall economic growth and higher standards of living across most of the world. HMT/BERR (2008) identifies growing demand for leisure and consumer goods among the rapidly expanding middle classes in India and China, which present ongoing export opportunities for UK firms. However, there may be variations from this general trend of uncertain duration due to the global financial crisis. In the UK, the immediate impact of the recession is reducing discretionary consumer spending (Brinkley, 2009), but this will not necessarily affect all consumables. Analysis of consumer spending in previous downturns suggests that people reduce spending in some areas and alter spending priorities between consumables (*ibid*). IPPR's recent analysis of the retail sector concludes that productivity gains have driven the expansion of this sector, based on use of technology, and predicts that this may continue, resulting in few jobs being created in the sector for seven years (Clifton *et al*, 2009). The commentary above demonstrates uncertainty regarding both the extent and type of growth in consumer spending and the impact on related sectors.

Diversification and fragmentation of consumer choice may lead to niche product and service development

Consumer demands are becoming more segmented due to economic disparity, ethnic diversity and age stratification that is fragmenting consumer choice and increasing product customisation (Accenture, 2004). One major trend here is the continuing growth of an ageing population with relatively high disposable incomes, spending more on leisure, culture and food (HMT/BERR, 2008). Other sectors which may encounter opportunities to meet the needs of an ageing population include financial services, where more services and financial planning support to assist individual transitions from working to non-working status may be needed, especially where they suffer an income drop as a result of inadequate pension provision (Financial Services Skills Council, 2009).

Diversifying lifestyles and individualisation mean that customers are demanding more individual or tailored products and services, for example tourism and leisure sectors (Cedefop, 2009). Some of this trend encompasses a desire to pursue healthy lifestyles. Consumer education is increasing as is flexible access to greater volumes of information through digital media. This shapes product choice, while for those with rising income levels, product/service quality and customer service are more important than just price/cost.

Ongoing trends in consumer preferences for ecologically benign products and services are likely to grow

In the last decade, consumers have also become much more environmentally conscious which is shaping product and service choice (WWF, 2006). The widespread use of ICTs and the internet, especially social media and networking and blogging, have given consumers opportunities to voice concerns and influence product development (Advertising Age, 2009). Overall, there is evidence from surveys and observations of retail markets that demonstrate consumer values are shifting at a deep level, with the majority of consumers now preferring products and services that are environmentally and socially responsible (WWF, 2006). Specifically, a recent survey of 9,000 consumers found that more purchased 'green' products in 2008 than in 2007, and a majority of respondents in all countries were willing to pay at least five per cent or more for them, especially those in the food and electronics and appliances categories (Boston Consulting Group, 2009). The kinds of products affected by these developing consumer preferences are those which are environmentally friendly and energy efficient including reusable grocery bags, hybrid cars, locally grown and organic food in stores, products and clothing made with recycled materials, 'green' buildings, eco-friendly packaging and energy-efficient electric appliances. Whether consumer demand for these types of products will remain strong in less prosperous financial circumstances remains to be seen.

Some new products and services can be delivered using existing skill sets, augmented with additional or improved skills for some roles

Not all the changes in consumer preferences will lead to changes in skills demands, since in some existing markets, existing skillsets can be used to deliver new products and services. For example, skills for designing, developing, producing, marketing and distributing environmentally friendly and energy efficient products and services may be no different from those required to develop and deliver existing ones. In the UK, a number of major sports events are scheduled over the next decade including the Olympics in 2012, and the rugby and cricket world cups. While the skills base to develop the infrastructure for the Olympics is largely in place, these events are likely to require large numbers of temporary workers in hotel, catering and tourism occupations. There is likely to be a sufficient labour supply to fulfil these roles, but there may still be additional skills needs within them, for example in customer service and foreign language competence.

However, in some areas, new occupations, possibly requiring new 'hybrid' combinations of skills may emerge. For example, in the tourism sector the need for more individualised services linked to particular lifestyles and age groups has given rise to travel designers to plan individual tourist products and services based on specific customer needs such as travel guides who can take some care responsibility for tourists with restricted mobility (Cedefop, 2009). Growth of ICTs and the expansion of e-commerce may also demand media literacy to undertake online sales and marketing, distribution/logistics management as well as remote customer relationship management skills among workers. Finally, the importance of good interpersonal, communication and customer-facing skills will remain high, especially to meet expectations of consumers who are increasingly more demanding and vocal in expressing their needs. Greater flexibility to adapt and customise products and services to individual customer needs may also be required.

4.4 The implications for skills and future scenarios

Table 4.1 summarises the likelihood of change under the seven categories of drivers and considers their implications for skills demands. For each driver, we identify the issue(s) arising, whether the impact is likely to increase/decrease, the scale of its impact, how it may affect the demand for, and supply of skills and an indication of the main sectors likely to be affected. It is stressed, of course, that these are qualitative, professional assessments which are open to debate, challenge and discussion as well as their specificity being subject to more detailed study. They nevertheless, especially when taken together, provide a powerful 'feel' for the dynamics of change, the likely potential directions of travel, and a broad indication of likely potential impacts.

Table 4.1: Implications of drivers for changes to skills demand and supply

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Regulation/multi-level governance					
Regulation at sectoral level of quality in products/services raising levels of competence/training	Current, ongoing	Likely to increase in impact, scale variable	Demand	Will raise demand	All
Regulation to minimise consumer risk will raise levels of competence/training	Current, ongoing	Likely to increase in response to consumer demand, scale uncertain?	Demand	Will raise demand	All
National regulation affecting age of labour market entry/exit will influence labour supply	New	Will increase in impact as regulations come into effect – initial impact stronger than long-term effects on labour supply	Supply	In the short-term demand may increase as a function of reduced supply, if bottlenecks in supply of younger workers occur. Regulation encouraging later departure from the labour market will increase labour supply but older workers will have retraining needs	All, but especially retail/hospitality
Stronger emphasis on skill levels/training provision as evaluation criterion in public sector procurement may increase skills requirements	New	Likely increase in impact, moderate to widespread in scale	Demand	Will raise demand	Public sector suppliers

Table 4.1: Implications of drivers for changes to skills demand and supply (continued)

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Demographic and population change					
Ageing population leads to expanded demand for some goods/services and job growth in those areas – likely to increase demand for high and low level skills depending on occupations affected	Ongoing	Increasing in impact and widespread in scale	Demand	May increase demand for a range of skills and job volumes, though not necessarily leading to demand for higher levels of skill	All but especially the care sector
Population ageing and static/declining birth rate may reduce supply of young people but increase supply of older workers in the labour market	Ongoing	Increasing in impact and widespread in scale	Supply	May increase skills demands: later departure from the labour market will increase labour supply but older workers will have retraining needs Demand may increase for those skills more commonly held by workers of/near to retirement age	All
Increased life expectancy and reduced pension provision may lead to longer working lives and greater need for re-skilling opportunities	New	Increasing in impact and widespread in scale	Demand and supply	Would raise skill demands for retraining	All
Higher education levels of younger versus older workers may raise skill levels of overall labour supply	Ongoing	Impact likely to increase, scale widespread	Supply	May reduce qualification-based skill needs if supply of young people is sufficient, but skills acquired through work experience will still be in strong demand	All
Higher birth rates among socio-economically disadvantaged groups may reduce skill levels of labour supply	New	Impact may increase, scale moderate?	Supply	Demand may increase as a function of reduced supply	All
Immigration will affect labour supply depending on government policy; tighter control on immigration likely to restrict supply of skills	Ongoing	Likely, including in impact due to recession, moderate to widespread in scale.	Supply	Immigration restrictions would raise demand for skills, but especially in manufacturing, financial services, agriculture, hospitality/catering, transport/communications	All

Table 4.1: Implications of drivers for changes to skills demand and supply (continued)

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Environmental change					
Climate change affecting habitation patterns – may increase labour supply from vulnerable parts of the world through migration	Ongoing	Impact likely to increase, scale uncertain	Supply	Impact on demand would be dependent on the area affected and migration restrictions	Sectors concentrated in vulnerable geographical areas, those affected by migration patterns, and those associated with being part of the solution
Growth of city regions concentrating spatial supply of labour	Ongoing	Impact and scale also increasing	Supply	May reduce demand in city regions but increase demand in less populated areas	Those disproportionately concentrated in rural areas: Agriculture/food production Tourism
Development of a low carbon economy may raise needs for STEM skills but nature/volume uncertain	New	Impact likely to increase but scale uncertain	Demand	May increase demand for highly specific skilled occupations and create demand for breadth of skills within a broader range of jobs	Primarily: Energy generation Engineering/construction All sectors to lesser extent
Economics and globalisation					
Developing economies may absorb sources of migrant labour, especially higher skill levels	Current, ongoing	Increase in impact, scale unknown	Supply	Demand may increase as a function of reduced supply	Those with greatest reliance on migrant labour: manufacturing, agriculture, hospitality, financial services, transport and communications
Need to build on strengths. Organisational agility and innovation is required for competitive advantage in export markets	Ongoing	Increase in impact, scale depends on size of export market	Demand	Increased demand for associated skills among managers	Manufacturing
Demand for high skill levels in knowledge-intensive, especially service economy	Ongoing	Increase in impact, but scale may be limited	Demand	Increased demand	Knowledge-based service industries
Expansion of low level skills demand for domestic service sector	Ongoing	Increase in impact, scale also likely to increase	Demand	Increase in breadth rather than level	Personal services

Table 4.1: Implications of drivers for changes to skills demand and supply (continued)

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Technological change					
Development of nanotechnology, plastic electronics and advanced materials will create new skills demands and possibly more jobs in R&D occupations, and production roles	Ongoing	Increase in impact; smaller scale for higher level than lower level skills	Demand	Increased demand	Manufacturing
E-commerce and digital media expansion leading to skills needs for creative industries	Ongoing	Increase in impact – scale uncertain	Demand	Increased demand	Small scale creative/cultural industries
Exploiting new technology across the economy will require entrepreneurship, management and leadership skills	Ongoing	Increase in impact and wide in scale	Demand	Increased demand	All

Table 4.1: Implications of drivers for changes to skills demand and supply (continued)

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Changing values and identities					
Individualisation of values will affect occupational and working time preferences, possibly stimulating increased interest in self-employment and preference for careers with stronger social purpose	Ongoing	Impact uncertain and with wide variations, scale likely to be widespread	Supply	May increase demand for skills in areas where supply is sub-optimal as a result of occupational choice or poor market conditions	All Self-employment Third and public sector
Increased feminisation of labour force and growth of single (usually female) parent families increase demand for domestic and care services	Ongoing	Impact and scale increasing	Supply and demand	May increase demand for a range of skills and job volumes, though not necessarily lead to demand for higher levels of skill	All but especially the care sector
Avoidance of careers in caring and STEM related occupations may result in continuing but larger skill shortages in these fields	Ongoing	Impact high, scale widespread in caring occupations, possibly smaller scale in STEM related occupations	Demand through supply	Demand may increase as a function of reduced supply	Care Engineering/ manufacturing, low carbon sectors
Recession may reduce career expectations and provoke greater interest in economic/job security	New	Impact uncertain, scale uncertain	Supply	May reduce demand in areas with previous skills shortages through a function of increased supply	All, especially public sector for job security (though job volume may decrease) Care sector may benefit

Table 4.1: Implications of drivers for changes to skills demand and supply (continued)

Nature of driver and impact on skills	Current, ongoing driver or new driver	Increase or decrease in a) impact b) scale of effects	Impact on supply of or demand for labour	Impact on demand for skills	Which sectors will be affected?
Changing consumer demand					
Expanding consumer markets in BRIMICS countries may present export opportunities with job creation potential	New	Impact moderate, scale moderate?	Demand	May increase demand	High value added manufacturing
Decline in domestic consumer demand due to recession may lead to oversupply of labour in retail and some production areas	New	Impact moderate, scale moderate?	Demand	May increase demand	High value added manufacturing
Fragmented and individualised consumer demand may require specialist niche knowledge among customer service roles	Ongoing	Impact diverse and increasing on a widespread scale	Demand	Increased demand for level of specialist knowledge	All
Consumer expectations of high quality customer service, possibly with specific needs related to for example foreign language skills for international sports tourism	Ongoing and increasing	Impact increasing, widespread scale	Demand	Increased demand	All, especially retail, hotels/catering
Demand for skills to undertake online sales and marketing, distribution/logistics management as well as remote customer management relationship skills	Ongoing and increasing	Impact increasing on a widespread scale	Demand	Increase in management skills and front line customer service skills	Retail, hospitality

Source: Analysis by Institute for Employment Studies, 2010

The list of drivers described and the content of Table 4.1 highlight the complexity of future thinking. However, a number of headline messages can be identified as probable changes.

There are a number of drivers that suggest an increased demand in skill levels, chiefly among higher skilled occupations. Higher skills are particularly needed among R&D staff, occupations in manufacturing and among managers to exploit technological and ICT innovations.

Demographic change and continued adjustment in the notion of 'family' will increase the need for front line personal service occupations including those in the care sector. It is also important to recognise that responding to an ageing population will require skills at all levels and across occupations, for example in the management of conditions associated with age and in responding to older people as a growing consumer group.

Occupational career choice may be important in determining supply to sectors with unmet skills needs. Government regulation over entry to, and exit from, the labour market and sources of labour supply may be important for sectors which rely on large shares of workers of particular ages or labour from domestic and migrant sources.

Finally, globalisation will provide both challenges and opportunities to the economy and it will become increasingly important to have an infrastructure and a labour supply that enables potential to be realised.

4.5 Implications of impact

We have already stressed the importance of not viewing each driver in isolation but rather as a set of interdependent trends; similarly the impact of drivers will vary according to the socio/political/economic environment. The potential variability in possible impact of some of the drivers on skills is captured in the horizon scanning and future scenarios development work commissioned as part of this Audit (SAMI, 2010). SAMI's work draws on the Foresight Futures Vision 2020 scenarios developed for the then DTI (DTI, 2002). The scenarios are not predictive forecasts, rather they are depictions of alternative possible futures, plausible 'stories' of how the world may look in the future and intended to inform policy decision-making by illustrating what society might look like under different trajectories of development.

It should be noted that these scenarios are grounded in two 'axes': a) the degree of influence from policy and regulation at local, national and international levels, sometimes referred to as 'systems of governance' and b) the degree of individualisation of personal values, which we can refer to as 'social values.' These scenarios therefore give relatively less weight to other drivers of skills supply and demand that we have examined here, but the timescale for the Audit precluded the development of customised scenarios. A brief overview of the alternative scenarios is given in Figure 4.2.

Figure 4.2: Three scenarios for 2020

- The **'World Markets'** scenario – individual aspirations thrive in a global economy sustained by international co-operation – reflects a world driven by aspirations of personal independence, personal and corporate wealth and mobility, to the exclusion of wider social goals; a belief in the continued efficacy of integrated global markets; and internationally co-ordinated policy, light regulation and a philosophy of 'minimal government.' In the original DTI foresight scenario, it identified likely fast growing sectors as health/leisure; media/information; financial services; bio-nanotechnology.
- Under **'National Enterprise'** – individuals and governments seek autonomy and independence – people aspire to personal independence and material wealth, embracing liberalised national markets to secure national self reliance and security; but political and cultural institutions are strengthened to buttress national autonomy in a more fragmented world and international co-operation is limited. In the original foresight scenario, fast growing sectors were identified as private health/education; domestic and personal services; tourism; retail; and defence.
- In **'Global Sustainability'** – a caring world where individuals value community and look to government for welfare and sustainability – people aspire to high levels of welfare within communities characterised by shared values, more equal distribution of opportunities and a sound environment; they believe these objectives are best achieved through active public policy and international co-operation; and markets are regulated to encourage competition. In the original foresight scenario, fast growing sectors were identified as education/training; large systems engineering; new and renewable energy; information services.

For more detail, see SAMI, 2010

It should not be assumed that these three scenarios are equally likely nor are they exclusive. The eventual outcome may comprise a 'blend' from each of them, or they may combine to form another 'scenario.' The scenario approach alerts us to the uncertainty inherent in the future, yet makes it more explicit.

4.5.1 Common trends in skills drivers and demands across scenarios

In their analysis of the scenarios, SAMI (2010) identify that some drivers will be common in their nature and likely impact under all three visions of the future.

- **Globalisation drivers** affecting the location of manufacturing are likely to have a pervasive effect, coupled with the use of ICT which will enable increasing flexibility in the location of production and work for individuals as well as organisations.
- **Technology drivers** are likely to be very significant in both presenting opportunities for commercialisation and exploitation which will demand greater skills among managers in all sectors of the economy. However, the types of technological innovation which will have most impact are extremely difficult to predict, suggesting that a broader common policy objective may be required of fostering capacity to exploit innovations. The availability of training and learning materials and environments which can be accessed online will feature in all of the scenarios. Design, media and engineering innovations have the potential to continue as strengths of the national economy under all scenarios, and a generalised demand for higher level skills may occur as the source of competitive advantage for UK firms that move to higher value-added markets.
- **Demographic drivers** appear to be somewhat more predictable than other factors as they are based on ongoing long-term trends. This means that greater certainty can be attached to the need to confront socio-economic challenges and skills demands arising from these developments including the provision of care services and the possibilities arising for servicing an older consumer population.

4.5.2 Key differences in implications for skills demand between scenarios

The key differences between the scenarios relate to the degree of government intervention, and the significance of this intervention is of greater importance for some sectors than others. Sectors which are exposed to world markets such as manufacturing are likely to face intense competition under the 'world markets' scenario with high rewards for global success and severe penalties for failure. Manufacturing also experiences challenges under the national enterprise scenario as investment to support international competitiveness is limited.

A 'national enterprise' scenario is likely to take a more concerted approach to regulating the supply of labour through migration policy and also to regulate product standards and qualification levels directly where these affect goods and services that are perceived as having high consumer risk. This could lead to higher demands for skills in financial, property and healthcare services, although expansion in job volumes in property and financial services is unlikely due to overall constraints on growth.

The effects of demographic change that will alter skills supply are likely to be left to play out through natural competitive adjustment of the labour market in the 'world market' scenario with skill shortages addressed by the mobility of high skilled people, while more interventionist approaches are likely under 'national enterprise' which will restrict access to migrant labour and also potentially encourage skilled workers to leave the UK due to a lack of attractive work. The UK would therefore need to be more self-reliant and able to ensure that the education and training system produces a labour force with balanced skills. The 'world market' scenario therefore is most likely to lead to a polarisation of skills demands in an hour glass economy. Regulatory intervention under 'global sustainability' would be made in conjunction with wider groups of countries.

The low carbon economy and associated skills needs are likely to develop most fully under the 'global sustainability scenario,' as it will be a key policy concern for government. In this scenario there will be significant government investment in the area, which will create skills demands in energy generation, building services, engineering and advanced manufacturing enterprises, and a broader array of resource and waste management skills needs across the wider economy. Technological innovations will be harnessed with a particular emphasis on energy efficiency.

The second dimension of each of the scenarios relates to individualism of personal values. The most communitarian orientation occurs under the 'global sustainability scenario.' This is likely to offer a greater number of second chances to those who need support to maximise their potential through learning interventions throughout the life course. Under 'world markets,' individualism is paramount, and it is in this scenario that individuals will have greatest responsibility for personal investment in education and possibly where personal investment may make the most difference to life chances. This scenario also places heavy responsibility on individuals to make rational choices about the most economically advantageous labour market opportunities and will see intense competition both among organisations for the best recruits and among individuals for the best jobs. Values which shape career choices differ strongly between 'global sustainability' and 'world markets' scenarios. In the latter world, status matters much more strongly and, combined with less regulatory protection for terms and conditions of employment, could shape labour supply to more or less desirable occupations according to quality of working life. 'World markets' will generate a tier of personal service roles required to support wealthier citizens and these will constitute a major form of employment for the rest of the labour market, with expectations of high quality customer service among consumers.

4.6 Conclusions

How is the demand for skills likely to change as labour markets change in response to structural trends and developments in the coming years? In this chapter, we have gained an insight into the likely direction, type and nature of change and how these may affect employment and skills by identifying seven key drivers of change.

The drivers and scenarios demonstrate the high degree of uncertainty and risk attached to predicting the future and in doing so provide a useful reminder as to why the Audit is not a planning document but rather a source of intelligence that can support decision-making. It is important to recognise the interdependencies between each of the drivers, as they may reinforce, or mitigate, each others' impact over time. Such dynamics inevitably mean that future trends and 'end states' depend on the (changing) behaviour of all the actors – individuals, employers, providers, government (as further demonstrated in the scenarios). Nonetheless, an understanding of the drivers, the forces that are shaping our present and will define our future, gives us greater insight into how skill needs in England are most likely to change in the coming years. Our examination of the implications of the seven drivers of change for skills demands (i.e. whether they are likely to increase, the scale of impact, and an indication of the sectors most likely to be affected), shows that in headline terms, the general trend is for increased demand in skill levels, chiefly amongst higher skilled occupations.

An understanding of these dynamics/processes alongside our more technical forecasting of employment can add real value to our understanding our future skill needs, and where the potential for the emergence or continuation of skill deficiencies might arise in the future.

5.0

Key sectors and their skills needs

5.1 Introduction

This chapter draws together the major sources of evidence on current and likely future sectors of economic and jobs growth, together with the evidence on the skill deficiencies that these sectors currently face, and those that they could face in the future. The evidence base comprises:

- the **Working Futures projections** of occupational and sectoral change to 2017;
- a **purpose-built model** to identify economically significant sectors potentially constrained by skill deficits;
- an **examination of the skill needs of the sectors identified so far by Government as potential priorities** for future jobs and growth;
- **insights from the sector skills assessments on commissioned for this Audit**, (completed by SSCs, clusters of SSCs and other experts), which leads to the identification of potential priority sectors in terms of strategic skills needs.

5.2 The core scenario: evidence from *Working Futures*

The core scenario upon which the initial commentary about future skills demand is based is taken from *Working Futures 2007-17* (Wilson *et al*, 2008). The econometric models upon which these predictions are based is robust and well tested.

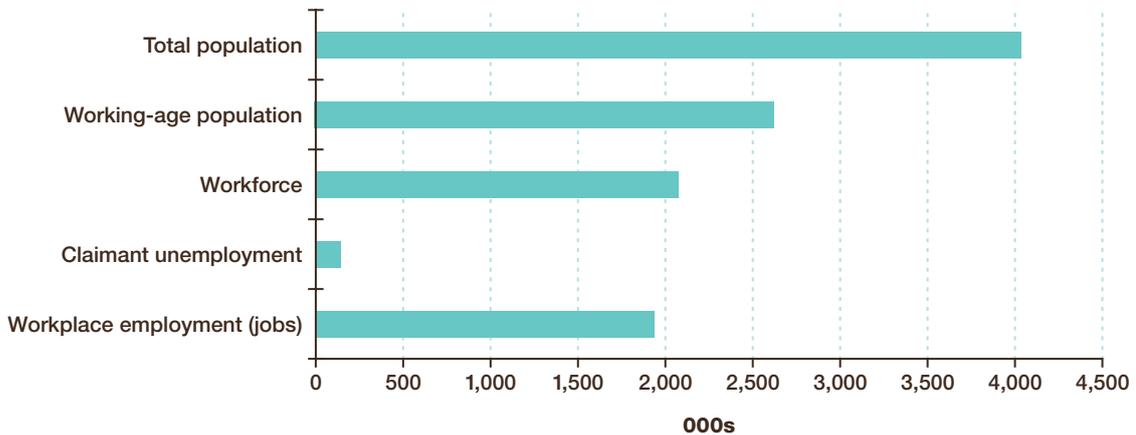
However, they also rely on extrapolating future demand based on historical long-term trends. This makes them less able to capture the impact of exogenous shocks which produce discontinuous change, so for example, the effects of the current recession are not accommodated within these forecasts. However, it is important not to conflate structural trends and cyclical movements, and to recognise that recoveries from previous recessions have seen employment and the structure of the economy resume broadly their previous paths relatively quickly. Whilst the relative magnitude of change across sectors is likely to remain, it may, however, be the case that some 'rebalancing' of the economy takes place, with financial services, construction and parts of the public sector growing less than expected (although that said, growth is expected in these sectors from mid 2010 onwards). It is in this area where qualitative scenario-based assessments of major national or global change, or where more recent, (although possibly less robust) sectoral and regional forecasts also can add value. Further, the *Working Futures* forecasts use a standard sector classification, and are therefore unable to identify emerging sectors. In addition, it should be noted that all data is not publicly available for England, and so for consistency data is presented at the UK level.

Essentially, the approach to this part of the Audit **consists of considering the projections made in *Working Futures* and assessing the nature and likelihood of any deviations from the proposed trends**. When combined with an understanding of the drivers of change (as outlined in chapter four), their potential impact, and the implications of the different scenarios, this can provide us with a **rounded view of likely developments in jobs and skill needs**.

What is the projected overall employment change?

Figure 5.1 shows projected employment change for the UK between 2007 and 2017, drawing on data from *Working Futures 2007-2017*. It shows an **expansion in both jobs and the size of the potential workforce**. It estimates a **net growth in jobs in the UK of around 1.9 million**, while the workforce is expected to grow by a little more, resulting in a small increase in unemployment.

Figure 5.1: Changes in key labour market indicators for the UK, 2007-17 (000s)



Source: *Working Futures 2007-2017* using CE/IER estimates, CE projections MDM C81F9A (revision 900), Chapter 2 Tables_Charts.xls, (Figures 2.1-2.6)

While **the current recession has had an effect on the demand for labour**, total current employment is 24,381,000 (November 2009), 365,000 lower than in November 2008. Whilst we still expect an expansion in the demand for labour in the longer-term, the recession may mean that both the pattern and strength of demand may be somewhat different from that identified in the *Working Futures* projections. However, as noted above, the experience of previous recessions is that the structural changes occurring can be over-estimated, with economies returning to broad, long term, structural patterns of growth in the recovery periods and beyond. It is more likely that **the absolute growth in jobs, however, will be constrained**.

The UK Commission will, for the 2011 National Strategic Skills Audit, undertake an updated set of employment projections, taking account of the impact of the recession.

Projected employment change by sector

Within the overall projections for employment growth, there is significant sectoral variation. Table 5.1 shows how this varies by industry group.

Table 5.1: Projections of employment by 25 industry groups, absolute levels and changes (000s)

	Levels			Changes		
	2007	2012	2017	2007-2012	2012-2017	2007-2017
Agriculture, etc.	453	398	353	-55	-45	-100
Mining, quarrying and utilities	180	165	150	-15	-15	-30
Food, drink and tobacco	429	418	402	-11	-17	-27
Textiles and clothing	137	110	94	-26	-17	-43
Wood, paper and publishing	509	480	467	-29	-13	-42
Chemicals and non-metal minerals	540	501	456	-40	-44	-84
Metal and metal goods	421	389	361	-32	-29	-61
Engineering	615	552	487	-63	-65	-128
Transport equipment	326	304	276	-22	-28	-50
Manufacturing n.e.s. and recycling	204	203	208	-1	4	4
Construction	2,187	2,285	2,361	98	76	175
Distribution relating to motors	644	654	663	11	9	19
Wholesale distribution n.e.s.	1,275	1,302	1,324	26	22	48
Retailing distribution n.e.s.	3,142	3,239	3,356	97	117	214
Hotels and catering	1,989	2,100	2,200	111	100	211
Transport and storage	1,346	1,370	1,406	23	37	60
Post and telecommunications	484	473	468	-12	-4	-16
Banking and insurance	1,107	1,160	1,196	53	36	89
Professional services	863	868	879	4	11	16
Computing and related services	581	629	706	48	77	125
Other business services	4,020	4,472	4,903	452	431	883
Public administration and defence	1,543	1,530	1,532	-13	2	-11
Education	2,553	2,617	2,662	64	45	109
Health and social work	3,684	3,902	4,079	218	177	395
Miscellaneous services	2,001	2,080	2,194	78	115	193
Total	31,234	32,200	33,184	966	984	1,949

Note: Because of their small size in terms of total employment, mining, quarrying, utilities and wood, paper and publishing have been combined for most of the reporting. Separate results are presented where data are sufficiently robust, as is the case here

The abbreviation n.e.s. stands for 'not elsewhere specified'

■ sectors where employment is expected to fall by at least 100,000

■ sectors where employment is expected to rise by at least 200,000

Source: Working Futures 2007-2017 using CE/IER estimates, CE projections MDM C81F9A (revision 900), 25UK.xls, (Table 3.4a)

Overall, **employment expansion is expected in 14 industries, whilst employment is expected to contract in 11 industries.** The **major growth industries in terms of jobs** are:

- **other business services** which accounts for over one-third of the increase in employment with more than 800,000 new jobs expected to come from this sector;
- **health and social work**, with employment expected to rise by almost 400,000;
- **retailing**, with a growth of over 200,000;
- **hotels/catering**, with a growth of over 200,000.

Note that these represent a mix of relatively high and relatively low skill sectors.

These growth industries all already account for a large share of UK employment (over 40%).

Any current skills shortages within these sectors may be exacerbated by future expansion and have a limiting impact on growth. **It is important to know, therefore, which sectors are both (a) the most significant in terms of their contribution to the economy; and (b) those which suffer most from skill deficiencies.** It may then be possible or desirable to focus to some greater degree on these parts of the labour market in order both to reduce the most significant skill deficiencies in the economy, and to remove an important barrier to the development of jobs in these sectors. This does not imply that the sole focus of action should be on such sectors, but merely that these are likely to be important sectors. Furthermore, this analysis should be placed alongside the additional analysis later in this chapter.

These projections are also broadly consistent with the implications of the major drivers in skills demands discussed in the previous chapter. Health and social care employment, in particular, may expand significantly beyond long run trends, as a result of the ageing population, while the potential continued growth of e-commerce may increase the significance (but change the structure of) retail distribution.

Sectors predicted to experience significant decline in employment are generally in manufacturing and include engineering, agriculture, chemicals/non-metal minerals, metals and metal goods.

Post and telecommunications as well as public administration and defence are also expected to experience a decline in the numbers employed. This may well be intensified by public sector spending cuts, which are likely in the coming period in order to reduce the size of the fiscal deficit that has grown considerably during the recession.

5.3 Significant sectors potentially constrained by skill deficits: a model

To identify significant sectors constrained by skills deficits, we have developed **a model which both assesses the economic significance of a sector and the extent to which it suffers from skills deficits.**

5.3.1 Defining the economic significance measures

To identify the economic significance of a sector, a measure has been developed which captures the performance of each sector in the UK economy across the **two key dimensions of the economy: productivity and employment.** Sectors can be defined as economically significant because of their level or growth in terms of productivity. Analysis from *Working Futures* shows that the three sectors with the highest levels of productivity are currently electricity, gas and water; real estate; and financial services. However, productivity is not the only criteria of economic significance. The level and growth of employment is also important. Here, the analysis shows that business services; health and social care; and retail are the sectors with the highest employment levels.

In order to measure economic significance, we combine the **two key dimensions of productivity and employment into one overall measure.** We combine both the *levels* of productivity and employment, which signify their contribution to the current volume of output, with *changes* in productivity and employment which signify their contribution to economic *growth*, the growth in output.

The **productivity indicator** used consists of two measures derived from *Working Futures 2007-2017*:

- labour productivity in 2007 (based on the proportion of GDP attributable to a sector divided by the sector's proportion of total employment);
- the growth in labour productivity between 2002 and 2007.

The **employment indicator** consists of two measures derived from the *Working Futures 2007-2017* and the Labour Force Survey:

- employment levels in 2009;
- the growth or decline in employment between 2002 and 2007.

5.3.2 Defining the skills deficit measures

To identify skill deficiency, the **skills measures** we use consider two forms of skills deficit:

- reported skills deficits;
- occupation/qualification deficits.

Reported skills deficit

This consists of two indicators based on data from the National Employer Skills Survey 2009. These are:

- the average number of reported **skill shortage vacancies** (i.e. vacancies that employers find hard-to-fill due to a lack of suitable qualified, skilled or experienced applicants) per 1,000 employees in each sector;
- the proportion of employees that the employer believes are not fully proficient at their job, i.e. the **extent of skill gaps**.

Occupational qualification deficits

Reported skills shortage and gap indicators may overlook situations where employers are unaware of a skills deficit, or where employers alter job design, competition strategies or product and service ranges to accommodate skills deficits even if they are 'sub-optimal' for organisational performance. Employers may therefore experience a 'hidden' or latent skills deficit. There are no direct measures of such skills deficits, but we calculate a proxy indicator based on the adequacy of qualification level relative to the level of occupation (although we recognise that qualifications are not perfect measures of skills and there is not a perfect alignment of qualification levels and occupational level). The three measures used cover:

- the proportion of managers and professional workers qualified to a minimum level of level 4 or above;
- the proportion of associate professionals or technicians qualified to a minimum of level 3 or above;
- the proportion of all other workers with level 2 or above qualifications.

Each measure is weighted according to the occupational distribution of the sector. For example, if managers and professionals accounted for 30 per cent of all jobs in a particular sector then the weight for the relevant measure in that sector would be 0.30.

The use of these indicators has an additional value, as they are closely associated with the Government's skill targets for 2011 and 2020 and with the assessment of progress towards world class skills as assessed annually by the UK Commission for Employment and Skills in its *Ambition 2020* report (see UKCES, 2009a).

5.3.3 Which are the current key sectors?

We report below the relative ranking of sectors based on the calculation of overall measures for both economic significance and skills deficits.¹ It is worth noting that a sector could have a high relative position if it scored highly on one of the measures. For example, a high ranking in the economic significance measure can be because of high productivity performance or employment (or indeed both). However, in the analysis we show only the results of the overall measures. Appendix 2 provides more detail for those that require it, ranking the sectors separately on the productivity and employment measures.

Sectoral economic significance measure

The sectors scoring highest on economic significance are primarily in private sector service activities: financial services, business services, renting and real estate and computing activities. The lowest scoring are textiles manufacture, publishing and printing, other manufacturing (i.e. that not elsewhere specified), agriculture and wood and paper manufacture.

Skills deficit measure

The sectors which display the greatest 'skills deficit' on the overall measure are hospitality; transport manufacture; agriculture, textiles; and computing. The hospitality sector has the highest skills deficit measure overall (and, indeed, has a very high score across both the reported skills deficit and occupational qualifications deficit indicators). The high overall score for transport equipment manufacture derives primarily from its reported skills deficit indicator, while textiles and agriculture have high rankings largely because of their occupational/qualifications deficits.

1. For each measure the sectors are ordered on a scale (from 0 to 1). The lowest is given the score of 0 and the highest is given the score of 1. The remaining sectors are positioned proportionately to their score on the measure between 0 and 1 and then aggregated to produce a composite score (again between 0 and 1). This approach gives a more appropriate representation of the differences between sectors than alternative approaches such as ranking, as it enables recognition of the different degrees of 'distance' between the values.

Table 5.2: Sectoral economic significance and skill deficiency measures: the sectors ranked

Highest scoring sectors (most significant first)	Economic significance	Skills deficits
1	Financial services	Hospitality
2	Business services	Transport equipment manufacture
3	Renting and real estate	Agriculture
4	Computing	Textiles manufacture
5	Health and social care	Computing
6	Retail	Vehicle maintenance, etc.
7	Post and telecoms	Food and drink manufacture
8	Electricity, gas and water	Retail
9	Construction	Wood and paper manufacture
10	Transport equipment manufacture	Construction
11	Hospitality	Miscellaneous services
12	Transport	Electricity, gas and water
13	Chemicals	Health and social care
14	Wholesale	Wholesale trade
15	Machinery, etc.	Mining and quarrying
16	Education	Printing and publishing
17	Miscellaneous services	Metals manufacture
18	Public administration	Machinery manufacture
19	Mining and quarrying	Other manufacturing
20	Food and drink manufacture	Transport
21	Vehicle maintenance	Chemicals
22	Metals manufacture	Renting and real estate
23	Textiles manufacture	Financial services
24	Publishing and printing	Post and telecoms
25	Other manufacturing	Business services
26	Agriculture	Education
27	Wood and paper manufacture	Public administration

Source: Institute for Employment Studies

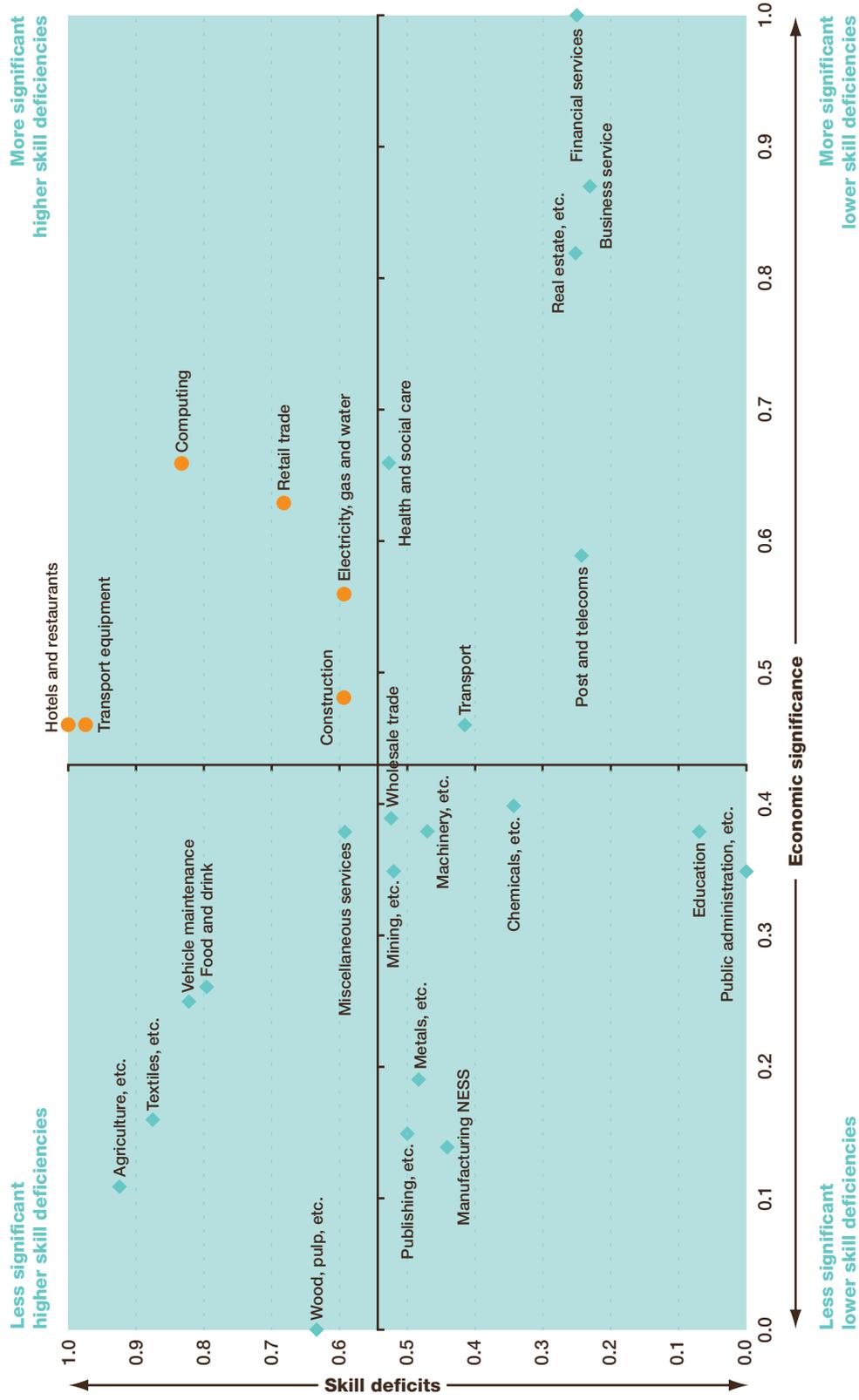
It is important to note that this type of analysis is constrained by use of the Standard Industrial Classification (SIC) system. At this level of disaggregation, it is sometimes difficult to separately identify important sectors of the economy, as they are either ‘hidden’ within a larger SIC code, or actually straddle a number of different SIC sectors. It is important therefore to see this analysis in the context of the evidence presented later in this chapter.

5.3.4 A sector priority matrix

The key sectors – based on combining the economic significance and skills deficit measures, are identified in Figure 5.2. **The sectors which currently have the highest relative economic significance while also being constrained by the highest level of skill deficits** (i.e. those in the top right quadrant) are **computing, retail, electricity, gas and water, construction, hospitality and transport equipment manufacture**. **Sectors such as financial services and business services are of considerable economic significance but currently have relatively few skills deficits.**

Sectors in the top left quadrant experience significant skills issues but are of less economic significance.

Figure 5.2: A sector priority matrix – current



Source: Institute for Employment Studies

5.4 Identifying future economically significant sectors with potential skills issues

While it is important to identify economically significant sectors which are currently constrained by skill deficits, **it is also valuable**, but more difficult still, **to identify those sectors which are expected to be economically important in the future and which are likely to face skills constraints**. In order to do so, we use the same broad framework as before using different data.

In terms of future economic significance, we again look at productivity and employment:

- **Future labour productivity** is based on two measures:
 - projected labour productivity in 2017;
 - labour productivity in 2007 and the productivity forecast for each sector between the two periods 2007 to 2012, and 2012 to 2017.
- **Future employment** based on:
 - projected levels of employment within each sector in 2017;
 - the average change in employment forecast for the sector between the two periods 2007 to 2012, and 2012 to 2017.

On the skills deficit side there are, of course, no available data on future skill shortages, skill gaps or sectorally-specific forecasts of qualifications levels. So, a future-oriented model needs to look elsewhere.

Future skills deficits and mismatches are at risk of occurring where the need for new employees is greatest, as in principle it is most likely to outstrip supply and to be quantitatively more important to the economy and labour market. It is clear from both *Working Futures* and future 'insights' offered by the sector-based skills assessments, that the demand to replace people who leave (for example through retirement) existing jobs is the key dimension of **future demand for labour**. Projections of this 'replacement demand' for labour are available from *Working Futures*, and have been used here as a proxy measure for skills requirements. This is more of a measure of **demand for employment** than skills, but does provide an indication of where skills constraints are most likely to occur due to the volume of demand for people to take the place of existing experienced employees. It differs from the measure of employment used on the economic significance side of the model, being based on **replacement demand** rather than net actual growth in jobs.

5.4.1 A future-oriented sector priority matrix

On this basis of future economic significance, the key sectors are those associated with the digital economy: telecommunications (which also includes postal services) and computing followed by business services, renting and real estate and financial services. On the skills demand side, the key sectors are a mix of public and private sector services: health and social care; business services; retailing, education and hospitality (see Table 5.3).

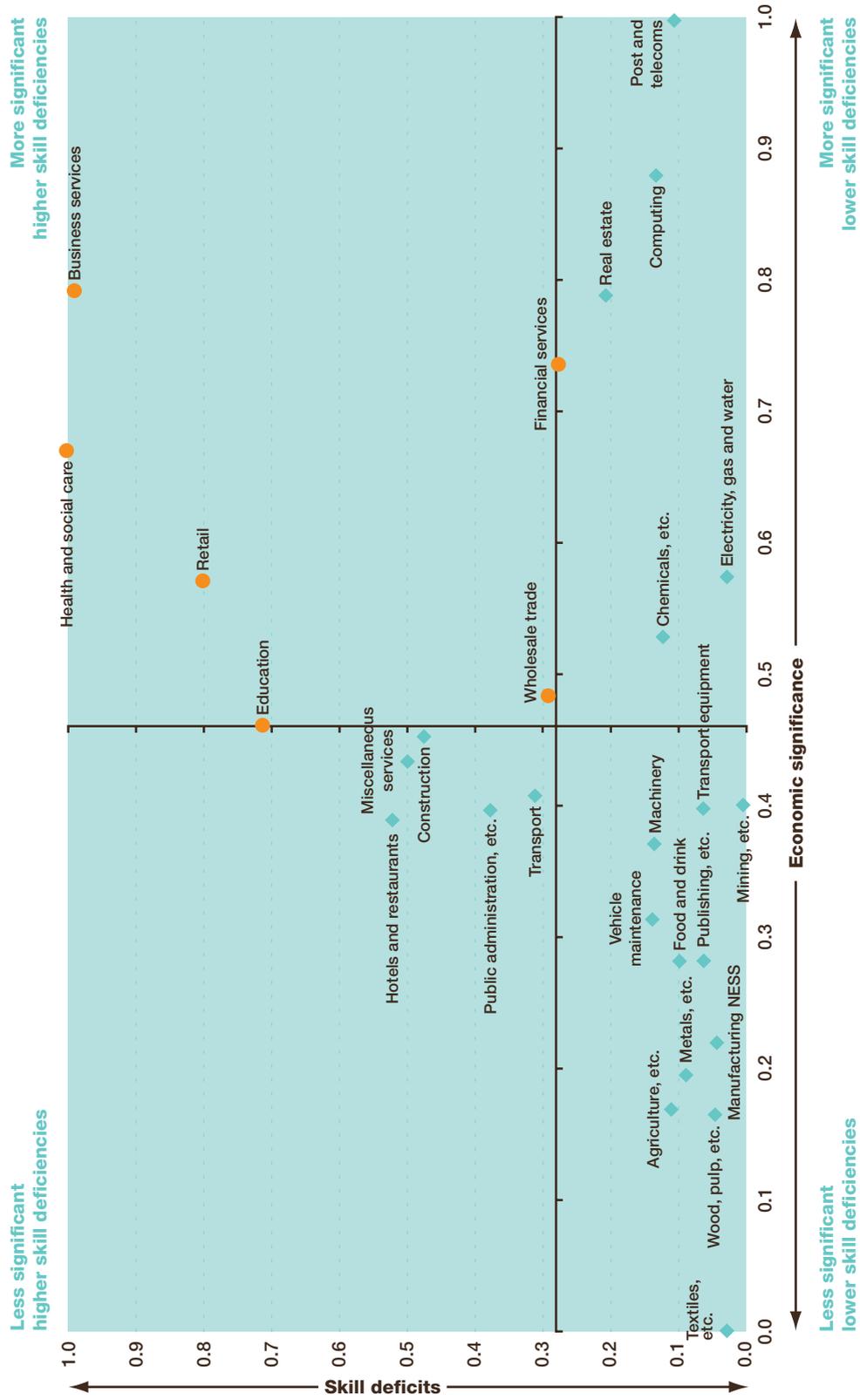
Table 5.3: Future sectoral economic significance and skills deficiencies: the sectors ranked

Highest scoring sectors (most significant first/highest replacement demand first)	Overall economic significance	Replacement labour demand
1	Post and telecoms	Health and social care
2	Computing	Business services
3	Business services	Retail
4	Renting and real estate	Education
5	Financial services	Hospitality
6	Health and social care	Miscellaneous services
7	Electricity, gas and water	Construction
8	Retail	Public administration
9	Chemicals, etc.	Transport
10	Wholesale	Wholesale trade
11	Education	Financial services
12	Construction	Renting and real estate
13	Miscellaneous services	Vehicle maintenance
14	Transport	Machinery manufacture
15	Mining and quarrying	Computing
16	Transport equipment manufacture	Chemicals, etc.
17	Public administration	Agriculture
18	Hospitality	Post and telecoms
19	Machinery manufacture	Food and drink manufacture
20	Vehicle maintenance, etc.	Metals, etc.
21	Printing and publishing	Transport equipment manufacture
22	Food and drink manufacture	Printing and publishing
23	Other manufacturing	Wood and paper manufacture
24	Metals, etc.	Other manufacturing
25	Agriculture	Textiles manufacture
26	Wood and paper manufacture	Electricity, gas and water
27	Textiles manufacture	Mining and quarrying

Source: Institute for Employment Studies

When combined into the matrix (Figure 5.3), we can see that **both business services and health and social care display both the highest economic significance and are expected to have the highest replacement demand for jobs**. The retail sector also appears in this quadrant. Financial services, education and wholesaling are just outside of this quadrant.

Figure 5.3: A sector priority matrix – future



Source: Institute for Employment Studies

There will always be limitations to a 'data-driven' approach such as the one we have used here. The reality is that any data used are historical in nature (even forecasts for growth are based on projections of historical data, and incapable of identifying radical or unexpected changes). In addition, standard classification systems do not adjust fast enough to reflect change in the real economy and cannot identify 'emerging industries.' For these reasons, it is also important to use additional sources of evidence, including qualitative data. Use of a range of sources allows for a more rounded interpretation, and it is to this evidence we now turn.

5.5 *New Industry, New Jobs: 'emerging sectors'*

Recent publications from government have expressed commitment to identifying and developing a number of key sectors within the broader context of industrial activism (BERR, 2009; BIS, 2009b).

The first of these publications, *New Industry, New Jobs* (BERR, 2009) (abbreviated to NINJ from now on in this section of the report), identified a series of industrial areas as ones of potential economic expansion, which would also offer expanded job opportunities including: advanced manufacturing, low carbon economy, digital economy, life sciences and pharmaceuticals, professional and financial services, and engineering/construction. These were in part based on analysis undertaken within BIS to seek to identify parts of the economy with substantial future potential for growth.

We will work with BIS in preparation for the 2011 Audit to develop this work, and connect it to our work on identifying sectors of economic significance and skill need.

The size, value and maturity of the NINJ sectors varies, but what is clear is that there is a degree of **interdependence between them**, with several featuring in the supply chain for other NINJ sectors, or forming parts of larger sectors. It is also clear that there are also a number of commonalities between them in skill needs. This is a point worth emphasising, as the interdependence of these sectors, and their **interdependence with other sectors in the wider economy means that any economic growth in these sectors will be felt more widely. In other words, they are catalysts for growth.** We have undertaken, as part of the Audit, to pay particular attention to these so-called 'emerging' sectors and **we have examined the skill needs of these six sectors in some detail.**

A number of SSCs worked in collaboration to assess the potential employment significance and skills demands within these sectors. This work has been supplemented by three reports externally contracted to experts: one undertaken by the Institute for Employment Research (Hogarth *et al*, 2010) on the bio-medical sector; and two undertaken by PwC on the low carbon energy generation and on the financial services sector (PwC, 2010a, 2010b). Below we summarise the key findings from these reports.

The issues are discussed in much greater detail in the reports which are available along with the Audit at: <http://www.ukces.org.uk/our-work/research-and-policy/national-strategic-skills-audit>

It is also worth noting that the European Commission has recently conducted 18 sectoral studies on an EU-wide basis which seek to identify emerging skill needs. These reports contain a considerable amount of information that helps us to understand emerging skill needs in a range of sectors: <http://ec.europa.eu/social/main.jsp?catId=784&langId=en>

5.5.1 Low carbon economy

The environmental imperative to migrate the UK away from high to low carbon energy generation and to more efficient means of energy consumption offers substantial economic opportunities (Energy & Utility Skills *et al*, 2009). Within this sector, a distinction can be made between low carbon energy generation, and the more efficient use of energy in the economy. Wind, marine, micro generation, nuclear and carbon capture and storage comprise the low carbon energy generation sector, all of which, (except nuclear), are in the early stages of development and implementation. All sectors of the economy will need to consider how they consume energy more efficiently in their activities.

The UK has an enviable advantage in the race to develop a low carbon economy, especially where energy generation from renewable sources is concerned. Abundant wind and marine resources and potential sites for carbon capture and storage (CCS) present opportunities to create a market leading position for the UK in the global development and implementation of these technologies. Other technologies such as nuclear power and micro generation also present opportunities to contribute to the UK's sustainable energy mix and, in the case of the latter, create additional employment. Besides energy generation, the adoption of energy saving practices and technology across the economy will help move it to a low carbon footing and bring cost savings for users. However, realising these opportunities depends greatly on current and future intervention by government to shape and stimulate the market, on employers recognising the business benefits of adoption and on the availability of appropriately skilled workers.

Evidence suggests that the forecast decline in employment in traditional carbon-based energy generation and the nuclear industry can be more than off-set by growth in low carbon energy sources. In their report on the sector, PwC (2010a) estimate that the low carbon energy generation sector today employs 29,500 people and may create between 3,000 and 41,000 additional direct jobs, depending upon the level of innovation and government intervention. This is because demand among consumers has not, as yet, been sufficient to stimulate a sufficient level of private investment to expand the scale of the sector significantly. The appeal of low carbon products and services to private consumers and businesses will be dependent on major cost savings compared to conventional resources (Pro Enviro, 2007; PwC, 2010a; Energy & Utility Skills *et al*, 2009).

The estimate above is somewhat lower than other estimates of current employment in the sector. Innovas (2009), in a report commissioned by BERR, estimate the wind sub sector alone currently employs 88,000 people, although this figure includes supply chain activity. Nevertheless, employment growth of 40,000 or more would exceed anticipated reductions of employment in the energy and utility sector of around 30,000 jobs (Wilson *et al*, 2008).

Employment in the low carbon energy generation sector is dispersed across the UK, but, apart from micro generation, tends to be located in less populated or remote areas. This poses substantial engineering challenges to implementing the technology and connecting it to the national grid. Existing expertise in the oil and gas industries and the electricity industry could, however, be drawn upon to help overcome these barriers. There is a concern that manufacturing capability in the wind and marine sub-sectors is, at present, insufficient to meet potential future demand, should this materialise (PwC, 2010a). With several sub sectors in their nascent stages research and development is the focus of activity and concomitant skills needs are reported with the sector as a whole characterised by a dependence on STEM skills. The sector also has an ageing workforce generally but especially so in the nuclear sub sector. Management and leadership skills are also widely reported as lacking across the wind, nuclear and micro generation sub sectors but less so in marine and CCS because of their stage of development.

The brightest and most immediate prospects for developing renewable energy appear to lie with the wind industry. The UK has some of the strongest wind speeds in Europe, and its off-shore wind resource means it is expected to have the largest off-shore market in the world by 2020 along with the world's largest off-shore wind farm in the Thames Gateway. Currently providing around 4,000 jobs the wind sub sector has the potential to create up to 40,000 jobs in the most optimistic future scenario for the low carbon energy generation sector in 2020, equivalent to almost two thirds of all low carbon energy generation employment in that scenario. Current skills needs include project and business development managers, electrical engineers, turbine technicians, geologists, aeronautical engineers mostly qualified to level 4 and above but with demand at level 3 too (Energy & Utility Skills *et al*, 2009). In future these needs are likely to remain but become more pressing within the expansion in employment.

Currently in a very nascent state with minimal employment, marine power generation and carbon capture and storage industries represent prospects for economic growth in the long-term, post 2020, and the creation of several thousand jobs each if they are encouraged to develop to their full potential (PwC, 2010a). The UK's potential marine energy resource represents 50 per cent of Europe's wave energy capacity and 35 per cent of its tidal resources (PwC, 2010a). The UK has within its boundaries the potential to store hundreds of years of CO₂ from fossil fuel power stations and, with the exception of Norway, has more storage space than the rest of Northern Europe combined. This creates the potential for the UK to sell licenses to other European countries to store their CO₂ emissions which, in turn could generate revenue and several thousand jobs. The marine sub sector is highly reliant on STEM skills at a high level, including civil engineers, electrical engineers, mechanical engineers and structural engineers (PwC, 2010a; Energy & Utility Skills *et al*, 2009). Off-shore engineering skills and knowledge of depleted oil and gas fields from that industry in the UK will be invaluable to the development of the CCS industry along with maths, physics and economics skills (PwC, 2010a).

Approximately 24,000 jobs are provided directly by the nuclear industry (Energy & Utility Skills *et al*, 2009; PwC, 2010a) with around a further 20,000 provided by the industry's supply chain. Of direct employment, 12,000 are estimated to be involved in decommissioning current nuclear plants that are reaching the end of their operational lives. As plants are decommissioned overall employment levels are expected to fall but will be cushioned by the commissioning of new nuclear plants by the end of the decade. Just how far employment levels fall will be determined by the number of new commissions.

In general, the nuclear workforce is more highly skilled (to level 3 or 4) and a greater proportion of the workforce is engaged in professional and technical roles than the UK average. However, the sub sector is currently lacking one-third of the workforce it requires qualified to levels 2 and 3, but has a surplus at level 1 (Cogent, 2009). The problems posed by the ageing workforce in the energy generation sector are particularly acute here with 70 per cent of the current workforce expected to retire by 2025. This will create the need to replace large numbers of highly skilled and experienced staff. Cogent (2009) estimates the industry will need to recruit around 1,000 new graduates and apprentices each year to fill the skills gaps it is facing as a result.

Micro generation is the generation of low carbon heat and electricity at the point of demand and includes solar, small scale wind turbines and combined heat and power systems among others. The design, installation and maintenance of micro generation technologies is currently being implemented by individuals within the building services engineering sector, who hold the relevant underpinning knowledge, in terms of system design, integration and health and safety. This draws heavily on electrical trades, plumbing, heating, ventilation and air conditioning skills sets. This pattern is unlikely to change over the next decade, but from an estimated 1,000 jobs now the sub-sector could, in the most optimistic scenario for the low carbon sector, provide nearly 10,000 jobs (PwC, 2010a). The outlook for micro generation jobs is heavily dependent on the response by consumers to government initiatives such as the Renewable Heat Incentive and Feed in Tariffs whereby electricity companies buy renewable energy from such sources.

Across the economy as a whole there is a need to move to the low carbon production of goods and services. To a great extent this concerns using more energy efficient forms of production or using alternative sources of power. Similar to the microgeneration sub-sector, the adoption of low energy technologies or alternative sources of power is expected to mean that prospects for job creation will be more limited.

Demand for skills will, nevertheless, be created from the 'greening' of existing jobs. From simply changing the way existing activities are carried out such as greener, more fuel-efficient ways of driving in the logistics sector (Skills for Logistics, 2009) to the scientific and technical skills needed to design, evaluate, monitor systems of energy use in manufacturing (Energy and Utility Skills *et al*, 2009) new ways of working will necessitate the re-skilling and up-skilling of jobs. Table 5.4 illustrates some of the possibilities. The ability to identify and apply developments in technology is likely to be key in achieving business process improvements, thereby highlighting again the importance of STEM-related skills.

Table 5.4: The 'greening' of existing jobs

Current job >	Core training requirement >	Additional low carbon skill requirement >	New low carbon job
Electrician	Apprenticeship, BTEC or NVQ/SVQ	Working on roofs; installation of solar PV panels	Solar PV fitter
Offshore oil and gas maintenance technician	Apprenticeship, BTEC or NVQ/SVQ	Offshore wind technology	Offshore wind technician
Aerospace technician	Apprenticeship, BTEC or NVQ/SVQ	Technology-specific knowledge	Wind turbine technician
Architect	Undergraduate degree, masters degree and paid work experience	Energy efficiency and zero carbon knowledge	Low carbon architect
City trader	Undergraduate degree	Carbon literacy, understanding of carbon trading schemes	Carbon trader
Facilities manager	No specific qualification required	Sustainability and energy management issues	Low carbon facilities manager

Source: IPPR (2009) in *Energy & Utility Skills et al, 2009*

Whilst STEM related skills feature heavily in the skills required in the sector there are also needs for generic skills (PwC, 2010a); such as management and leadership, technology transfer skills in applying existing and new developments to the low carbon sector and vice versa, general business acumen and entrepreneurial skills. There may also be a need, particularly within the carbon capture and storage sub-sector for professional services advice such as legal and financial services and climate change economists.

Reflecting the importance of the issues raised in other sectors in relation to establishing a low carbon economy, a cross-government Low Carbon Skills Strategy (LCSS) consultation document will be published alongside the Budget in 2010. This will be preceded by a round of consultation.

5.5.2 Advanced manufacturing

Based on the Government's Advanced Manufacturing Strategy combined with analysis from sector experts, six specialist sub-sectors have been identified as the major elements of the potential growth within advanced manufacturing, and are likely to generate significant value in the future.

Each sub-sector is discussed in turn with an overview of current and future skills needs provided across advanced manufacturing as a whole. Further analysis is provided in the advanced manufacturing cluster report (Semta *et al*, 2009) on which the discussion below is based. However, suffice to say here that common across all the sub-sectors is intense research and development activity creating a need for high and intermediate level STEM skills and the ability to commercialise innovations. Each of the sub-sectors also stands to make a contribution to the low carbon economy either in its own right or as part of the low carbon sector supply chain. Furthermore, many of the sub-sectors will form vital parts of the supply chain for other sectors in the economy, not least the digital economy and the life sciences sector. For many of the sectors, precise labour market information is not available because of their nascent state.

The **aerospace** sub sector supplies three main markets: civil, defence and space (civil and defence). Each area also provides servicing activities including maintenance, repair and overhaul (MRO). According to A/D/S (the trade body advancing UK aerospace, defence and security), UK aerospace has a 25 per cent share of the global market and has the second largest share behind the US. The UK faces global competition from other EU countries for high value aerospace research and development, the market for which was valued at £2.9bn in 2007. The role of information technology, lightweight composites, low operation and maintenance costs, and environmental factors such as pollution and noise are all shaping the design and manufacture process in the sector. In addition, the sub-sector is highly regulated with stringent safety and quality stipulations.

In 2008, there were 600 UK aerospace employers, employing 112,000 people and generating £22.3 billion in turnover (ONS, 2008b). Average salaries are more than a third higher than those for manufacturing as a whole reflecting the competition for highly skilled staff. Most staff (54%) occupy managerial, professional or technical roles and the proportion of these has grown from 41 per cent over the last decade. Aerospace is a major customer of the wider manufacturing and service sectors that form the indirect supply chain.

Based on a forecasting model used by Semta, there will be a net requirement for 8,000 new entrants to the aerospace industry (1,600 people per annum) over the next five years in aerospace in management and technical occupations in England. Demand is expected for 1,600 managers, 1,900 professionals, 1,300 technicians, 1,600 craft workers and 1,500 operators. To meet replacement demand requirements for highly skilled workers (NVQ L4+) aerospace will need an annual supply of almost 400 people (100 managers, 140 professionals/scientists and 140 technicians) for the next five years (Semta *et al*, 2009).

Silicon electronics is part of the overall electronics sector in which the UK has considerable strengths in design and software. Attracted by the industry-university collaborations in research and design the UK hosts around 40 per cent of Europe's silicon design companies and revenue making it a global centre for innovation and design. Silicon technology has seen the normally brittle silicon chips develop into a wafer thin and highly flexible product capable of being used, for example, in brain implants, inserted in to latex gloves or used as compact antennae for aircraft. Silicon technology is the basis of solar panels, a source of renewable energy (see micro generation in the low carbon sector). With 36 per cent of the sector's workforce qualified to level 4+, the sector is better qualified than the average for other engineering sectors in England (26%).

Plastic/printed electronics uses inks made of semi-conductive organic polymers to print very thin electrical circuits on flexible or rigid surfaces. Clearly this has advantages of being lightweight, thin and applicable to wide range of surfaces and materials. Examples include; clothing or medical equipment such as tissue dressings with built-in sensors; energy efficient lighting; very thin, flexible display equipment, for example, shelf labels; wafer thin batteries and; electronic paper. The sector also stands to make a contribution to the low carbon economy through the development of solar panels suitable for industrial or domestic applications. The sector is at a very early stage of development and estimates of its size, workforce demography and economic value are difficult to obtain but, in time, it could replace silicon electronics (above).

As one would expect, the sub-sector draws heavily on STEM-related skills and trades such as electronic engineering, optics and nanotechnology, printing and ink technology, materials science, chemistry and physics. Particularly important are the ability to combine industrial and graphic design skills to work across disciplines of electronics, printing and materials. However, many of the production processes being used in the sector are without precedent and require the development of completely new skills which will need to be constantly refreshed to keep pace with technological developments.

To date, the main market for **industrial biotechnology** has been the pharmaceutical sector where biotechnology has enabled the creation of synthetic insulin and blood clotting agents. More recently biotechnology has been applied to the chemical industry to manufacture bio fuels from arable crops, bio pesticides and industrial cleaning agents. The use of water based chemistries and bio fuels can also play an important role in the move to a more sustainable economy. Within the food industry, biotechnology is being applied to reduce waste in transit and maximise health benefits for consumers. Whilst the end market for many of these products already exists, biotechnology is changing the way in which they are created. So, with the uncertainties increasing over the security of supply of energy and materials and regulatory pressure increasing to reduce CO₂ emissions research and development is important to realising its benefits. Biotechnology has not yet reached its full potential but the UK market is already valued at £1.8 billion, equivalent to less than five per cent of the UK chemicals market. Growth of five-eleven per cent per annum is forecast which could create a market value of £4-12 billion by 2025 (up to 20% of UK chemical sales) with the global market estimated at £150-350 billion (Arthur D Little, 2009).

Whilst the use of biotechnology is well established within the pharmaceutical industry, its use in the chemical and food sectors is still in its infancy and as such there is a requirement for high level research and development personnel in these areas to develop new skill sets. Reflecting this, the Biology and Bioscience Research Council has provided funding for research in biotechnology. Technical based occupations comprise 70 per cent of the workforce and their age profile indicates a substantial replacement demand in the future.

Composites are a mixture of two or more discrete materials combined to give superior properties of low density, high strength, low maintenance, malleability and resistance to corrosion. Such characteristics give reduced production times and costs, and increased performance over a longer lifetime. Furthermore, there are significant energy savings in production and operation. They offer the potential to replace metals in many applications for instance; aircraft tails, wings, fuselages, propellers (the Boeing 787 is composed largely of composites); wind turbine blades; boat hulls; bicycle frames and racing car bodies and; storage tanks. As such, their manufacture forms part of the supply chain for numerous other sectors.

According to BIS (2009c), the value of the composite market in the construction and automotive sectors is at least £20 billion, while the value of the UK wind turbine market alone is in excess of £5 billion. Composites is the highest value-adding part of the polymer and plastics sector which has an annual turnover of just less than £20 billion and a GVA of £7.3 billion. In recognition of its value, Government is providing £64 million over an eight year period to the sub-sector to support research and development and is developing a Composite Strategy for the UK (BIS, 2009d).

The sub-sector needs researchers, innovators, technologists, designers and highly-skilled processing technicians with skills in the areas of manufacture, assembly, disposal and MRO to ensure adoption of the technology and remain at the forefront of developments and world demand. In common with other constituent sub-sectors of the advanced manufacturing sector, the speed at which technology is developing necessitates the almost continual up-skilling of the workforce.

Nanotechnology has a wide range of applications through the miniaturisation of systems at the molecular or atomic level which creates the potential to embed electronic or mechanical systems into very small dimensions. For example, nanotechnology has the potential to be embedded into a range of commercial materials and clothing in 'smart' textiles. This could include creating materials that cope with spillages through super absorbency, provide antimicrobial, anti-mosquito, heat or water protection, enable electrically conductive textile materials, used in health monitoring garments, by the military for inconspicuous communication tools, and for fashion items, i.e. iPod jackets or mp3 players integrated into snowboarding equipment.

Key markets for nanotechnology include electronics, life sciences/medical, automotive, aerospace, chemicals, polymers and pharmaceuticals, and ICT/digital although, despite the hype, products could be five to 10 years away from market. Therefore, the ability to commercialise innovations will be fundamental to the success of the industry. Global competition is intense especially from Japan, South Korea and the US. China is now entering the market by investing \$12 billion¹ in research and development. This is not surprising given that a conservative estimate puts the value of the global market at \$81 billion.²

A study identified five key areas where the use of nanotechnology would be beneficial to achieving a low carbon economy³ with reductions in greenhouse gas emissions estimated to be between two per cent and 20 per cent by 2050. These consist of fuel additives to increase efficiency, solar cells, the hydrogen economy, batteries and insulation.

STEM and research skills at levels 4 and 5 are essential for the advanced manufacturing sector, combined with multidisciplinary experience which draws on natural sciences and engineering. In addition an understanding of intellectual property and new product development will be required. Whilst sector activity is primarily focused on research and development, manufacturing is increasing and this requires a highly skilled body of technicians capable of running complex equipment. The need for technicians will increase as more production comes on line in the future along with management and commercialisation skills.

1. Guardian Newspaper article March 2009 www.guardian.co.uk/technology/2009/mar/26/nanotechnology-china/print

2. Nanoposts 2008 report, Nanomaterials and Markets 2008-2015.

3. Environmentally Beneficial Nanotechnologies: Barriers and Opportunities, 2007.

The advanced manufacturing cluster report, (Semta *et al*, 2009) draws the following conclusions across the above industries in relation to skills needs:

- high-level technical skills represent the most important element of skills demand. Flows of STEM graduates, post-graduates and post-doctoral researchers, with an understanding of the specific technology or of the underlying sciences,¹ remain central and need to be monitored as products come to market;
- the wide range of application areas for most of these technologies means that, for effective and creative exploitation, expertise in the technology itself needs to be augmented by knowledge and understanding of the various application areas, requiring a multidisciplinary approach;
- while high-level technical skills are central to the development of new technologies, effective exploitation and commercialisation of emerging technologies requires capable and competent technical support staff;
- effective and fast commercialisation of new technologies also requires expertise beyond an adequate supply of technical skills. This should include skills in intellectual property (IP) management, new product and process development and implementation, production and manufacturing engineering, and marketing.

5.5.3 Engineering construction

The engineering construction industry plays a vital role in creating the industrial infrastructure for the UK, and is therefore central to the success of other NINJ priority sectors and, more generally, the UK as a modern economy. It contributes by creating the infrastructure for other sectors such as power generation from fossil, renewable and nuclear sources, oil exploration, downstream oil and gas, petrochemical processing and pharmaceutical manufacture, steel, metal, cement, glass, paper, food, brewing and distillation, water and sewage treatment and other essential areas. It will therefore play an essential supporting role in the future of the UK's manufacturing sector designing and delivering low carbon processing plants for the pharmaceutical, chemical and biotechnology sectors, and also emerging industries of carbon capture and storage, wind and marine energy generation.

The sector is the largest of its kind in Europe, and is second only to the US in size. Domestically, the £16 billion sector provides approximately 1.5 per cent of UK GDP (ConstructionSkills *et al*, 2009) and 0.4 per cent of GVA (Gibson, 2009). The Gibson Review (2009) noted that productivity in the sector is very variable and, for some projects, lagged similar projects in the US by 11 per cent and Europe by five per cent. Productivity and efficiency are, therefore, of some concern within the UK industry, and may pose risks to its future competitiveness and ability to secure repeat work from clients, requiring better planning, processes and workforce management.

In 2008, the sector employed just under 75,000 in the UK (ConstructionSkills *et al*, 2009). The workforce comprises business managers, project managers, engineers, scientists, and construction workers. Many have highly specialised skills, for example, in a particular chemical process, cost and programme control or offshore welding. The Gibson Review concluded that, supported by the levy, the technical skills of the workforce are as good as those in other countries reflecting the quality of training provided.

The engineering construction industry is projected to need a further 44,400 employees to replace retirees and meet expected demand within the next decade, of which only 6,588 jobs will be below the level of skilled craft workers (ConstructionSkills *et al*, 2009). The largest share of these jobs will be required in the power generation sub-sector which is also acknowledged in the low carbon sector above. In terms of occupation, the largest shares of new jobs will be required in engineering design and project engineering (11,293), which broadly corresponds to associate professional roles, and skilled craft/technician roles (13,843).

1. Current flows through HE courses on plastic electronics, industrial biotechnology, composites, and nanotechnology are comparatively small; volumes through aerospace and electronic engineering much larger. The underlying bodies of knowledge of importance to these technologies come from physics, chemistry, biological sciences, and materials (science and engineering).

The critical roles for the sector now and in future, are:

- **Planners:** people responsible for organising new developments. These roles will consider the social, economic and environmental impact of developments, but will also involve close working with government and the public.
- **Project and programme design:** people who convert an engineering specification into a plan of work and a bill of materials and impacts where and when work will occur.
- **Project and programme management:** people who control the build activity and cost to ensure the plant is brought on stream, within planned time and budget and safely.
- **Chartered engineers:** suitably qualified and experienced staff who can create safe and productive designs for a range of sectors.
- **Scientists:** suitably qualified specialists who can deal, for example, with the science underpinning the design of a nuclear plant or can scale the laboratory approach by making a new drug to a production sized facility.
- **Site and construction managers:** people who can lead teams responsible for a technically difficult job in a challenging and potentially hazardous environment.
- **Safety specialists:** safety case writers who can assess and mitigate risks associated with the industry; safety managers who can create procedures that maintain welfare that do not impede production and safety inspectors who can monitor safety procedures are followed.

Clearly this creates a need to sustain the flow of STEM graduates in to the sector along with apprentices and other individuals, perhaps from other sectors, with the appropriate skills to fill technical level roles.

5.5.4 Financial and professional services

The financial and professional services sector has been a major engine of growth for UK the economy in the 21st Century. London is a premier global financial centre, the UK's accountancy and legal services are world leaders, and the sector provides opportunities for some of the best graduate talent from the UK and abroad (Skills for Justice *et al*, 2009).

However, the sector has been adversely affected by the global recession, none more so than the financial services sub-sector. The financial services sub-sector is more important to the UK economy than it is to the economies of other countries as measured through the ratio between financial assets and GDP (PwC, 2010b). The adverse effects of the financial crisis on the financial services sub-sector have therefore had a disproportionate affect on the UK economy. The recession has also had negative consequences for the sub-sectors characterised by engineering, construction and legal related activities where some major privately-funded construction and engineering projects have been suspended and all occupations related to property design, development and transactions have been suffered major job losses.

The professional and financial services sector currently employs 2.1 million people of which 61 per cent (c1-1.2 million) are employed in financial services, 18 per cent (c391,000 jobs) in architectural and engineering services, 11 per cent (c245,000) in housing and property, and 10 per cent (c212,000) in legal services (Skills for Justice *et al*, 2009, based on LFS data). Legal services in the UK provided services worth nearly £11 billion and generated a surplus of £2.46 billion in exports. Private architectural practices in the UK are estimated to have earned £4.16 billion in 2008 and the accountancy profession generated an export surplus of more than £1 billion in 2007 (Skills for Justice *et al*, 2009).

The professional and financial services cluster report (Skills for Justice *et al*, 2009) identifies ongoing and future shortages in the broader professional services sub-sectors. Generally, there will be an increasing need across the decade for environmental related skills particularly among engineers and planners. Clearly this will vary according to each sub-sector, but sustainable development experts are required in housing and property and knowledge of zero carbon building design and retrofitting required in the architectural and engineering sub-sectors.

In the legal services sub-sector there will be a need to up-skill paralegals in transactional work along with enhanced procurement and tendering skills required in response to the introduction of market based Legal Aid procurement. In the housing and property sub-sector there is expected to be a demand for valuation experts and surveyors.

For professionals working in the construction sector, employment growth is anticipated to resume from 2010 onwards with a rise of 2.9 per cent between 2009 and 2013 (Construction Skills Network blueprint cited in Skills for Justice *et al*, 2009). Much of this growth will remain dependent upon continued public sector investment in major projects. Some of this is already committed, such as the Olympic Games construction projects, however, others may be subject to cuts due to constraints on public sector spending.

The 1-1.2 million employed in the financial services sub-sector represents approximately four per cent of all UK employment and eight per cent of total UK output, and it creates around £100,000 of Gross Value Added per employee which is more than double the UK average (PwC, 2010b). Most employment in financial services is concentrated among retail banking and insurance, although wholesale banking and insurance activities are most productive (PwC, 2010b). Employment is split roughly 70/30 per cent across retail and wholesale, but overall has declined quickly by an estimated five-10 per cent since its peak in 2007 before the financial crisis (PwC, 2010b). The sub-sector's workforce is well qualified with 44 per cent qualified to level 4 and above, and primarily located in London and the South East (Skills for Justice *et al*, 2009).

Future scenarios for the financial services sub-sector suggest that at best there will be a five per cent increase in employment in financial services by 2020, while under a worst case scenario, there may be a 25 per cent reduction in employment PwC (2010b). Other more optimistic evidence such as employment forecasts by Oxford Economics concludes that employment levels in financial services in London are not expected to reach pre-recession levels again until some point between 2015 and 2019 (Skills for Justice *et al*, 2009). This does not mean, however, that the financial services sector will not experience skills shortages as regulation, globalisation and consumer demand are expected to be the primary drivers that shape the future of the sub-sector and its skills needs.

The growing supremacy of financial markets elsewhere in the world and the effects of a tighter regulatory regime as recommended by the Turner Review (Turner, 2009) may make the City of London somewhat less significant as a financial centre (PwC, 2010b; Skills for Justice *et al*, 2009; SAMI, 2010). This could result in the axis of financial trading shifting to a number of Asian cities with consequent reduction in jobs as institutions shift their operations to the new locations. Combined with advancing technology, globalisation has allowed financial services businesses to disperse their activities globally, and this is expected to continue with significant portions of back office staff being exported. The sub-sector has, and is likely to benefit in the future from globalisation through areas such as Islamic finance and sovereign wealth funds.

Whatever the level of regulation imposed by government, there is likely to be greater emphasis on risk management among financial institutions increasing demand for accountants and actuaries which are already in short supply. Aligned with this will be the need for reporting and compliance roles at administrative and managerial levels (PwC, 2010b). In detail, there will increasing needs for the following roles are anticipated in the future: actuaries, specialist underwriters, compliance staff, risk managers, capital modellers, accountants (all at level 5); retail bank managers at level 4; claims professionals, IT and legal staff at level 3 and; sales and customer service roles at levels 1-3.

An increasing emphasis on product knowledge and advice, and customer handling skills is also anticipated. The Retail Distribution Review is likely to stipulate the need for Independent financial advisers to hold level 4 qualifications, thereby creating the need to up-skill the existing workforce. The need to up-skill advisers is reinforced by the Thorensen Review which recommended that generic financial advice be provided by the third sector (Thorensen, 2009). As more simple basic banking transactions are carried out on-line or by phone those staff engaging with customers will need to be prepared for more complex customer inquiries and requests.

Across the entire financial and professional services sector there is a common, generic need for management skills as well as more detailed and specific generic needs. For example, in the financial services sub-sector the generic skills that are currently required and are expected to become more important are management and leadership, industry and product knowledge, IT skills, literacy and numeracy skills and complex mathematic and statistical skills. Increasing knowledge of green issues and how they affect the sub-sector through carbon trading etc is likely to be required. There is also a need across the professional services sub-sectors for a broad range of management related skills such as finance and risk management, business management and commercial awareness and project management along with partnership working skills among professionals.

5.5.5 Digital economy

The digital sector makes a significant contribution to the economy and harnessing its potential will be key to the UK's future competitiveness and prosperity. It provides high levels of value added, and employs 2.5 million people (approximately one in 11 of the working population), many of which are highly skilled. The digital economy cluster report (e-skills UK *et al*, 2009) is drawn upon here to illustrate the value of the sector and its current and future skills needs.

It comprises two broad components: technology and content activities. Technology provides the infrastructure and platforms through which content is delivered. Content industries include creative media covering: film, animation, commercials, pop promos, corporate production, facilities and interactive media, advertising, music and design. Both technology and content components will need to respond effectively to the opportunities and threats posed by globalisation and advances in digital technology. Both will need increasingly high levels of skills and greater technical capability and both will require business, creative and interpersonal skills.

The technology component alone employs 1.57 million people and contributes 8.4 per cent of UK GVA (£71 billion) (e-skills UK *et al*, 2009). More widely, estimates suggest that 55 per cent of UK GVA comes from technology-intensive sectors in the economy. Growth in technology occupations within the component over the past 10 years has been twice the average for the whole economy.

Employers in the technology component are currently reporting a need for programming and technical support roles and technology management roles. Within the existing workforce, skills gaps affect over three quarters of technology professionals and relate to IT programme management, supplier management and service management and delivery at senior levels.

In the most pessimistic future scenario for the digital sector, the technology workforce is predicted to grow at 1.2 per cent per year until 2020, an average of four times the rate of the rest of the economy. When expansion and replacement demand are combined, around 550,000 new technology professionals are predicted to be needed in total over the next five years. This represents an average of 110,500 jobs each year which will need to be filled by people moving into technology professional roles, of which 20 per cent will come from new entrants from education, and the rest will come from the existing working age population highlighting the importance of employer provided training. Strongest growth is predicted in software professional occupations with a growth rate of two per cent per annum leading to an increase of 66,800 jobs by 2018.

The content component in the UK is the largest producer of radio and TV content in Europe, has the third largest filmed entertainment market globally and has the largest publishing industry in Europe. It is also renowned for its music output and creativity. Exports from this sub-sector total £7 billion per year and it employs 930,000 people.

Predicting growth in content-related employment is much harder, in part because of the negative effects of the recession. Predictions from NESTA in 2009 estimated that by 2013, the creative component would employ 1.3 million people (e-skills UK *et al*, 2009). Using the baseline employment figure of 930,000 in content production cited earlier, this would represent almost 400,000 additional jobs, of which approximately 130,000 could be related to digital media employment.

Despite the attractiveness of the content component and a long term over supply of potential new entrants, there remains a shortage of skills in the following areas; the ability to produce multi-platform content; the monetisation of content; broadcast engineering skills and; visualisation. Digital multi-skilling, giving the ability to work from content creation and production to meta-data management, on any platform is also important.

The digital economy is pervasive changing every sector of the economy and individuals' behaviour outside of the workplace but its full impact remains latent. In the wider economy, employers and employees that understand how technology can be applied strategically, and practically to their work and are capable enough to realise its benefits can be more innovative, productive and competitive. Nowhere is this more evident than in the US where around 80 per cent of its productivity advantage (8.5%) over the UK is due to better use of digital technology. Analyses suggest that continued adoption and exploitation of ICT could generate an additional £35 billion of GVA to the UK economy over the next five to seven years, but this is dependent upon full commercial exploitation of ICT to improve productivity in non-IT sectors, especially among small firms, something the UK does not have a strong track record of achieving.

Thus, skills and employment implications are carried across other parts of the economy. Today, 36 per cent of development needs for IT user skills is at 'advanced' or higher level or higher (level 3 plus) but in three years time more than half (53%) will be at this level. In addition there will also be a need for increased volumes of skills development at lower levels for workers who do not currently use digital technology at work. Generically, individuals' require IT user skills to interact socially, to seek and secure employment and to engage with public and marketed services.

5.5.6 Life sciences

The UK is a global centre of excellence in the life sciences sector. Comprising the pharmaceutical, medical technology and medical biotechnology sub-sectors. It is of significant economic value to the UK economy. In 2006, these industries had an annual turnover of £15.68 billion, with a Gross Value Added (GVA) of £7.45 billion, representing an average GVA per employee of £109,000 compared to the UK average of £31,419 (Cogent *et al*, 2009).

Until the financial crisis, output growth in the pharmaceutical sub-sector had outpaced growth in the whole economy for most of the last 40 years. GVA per employee in the sub-sector was £121,000 in 2007 rising from £68,000 in 1998; a nominal increase of 77 per cent (BIS, 2010). Whilst more erratic, growth in medical technologies output has more or less followed the growth of the whole economy (Hogarth *et al*, 2010) and GVA per employee increased nearly 40 per cent between 1998 and 2007, from £35,000 to £49,000 (BIS, 2010).

The sector is very R&D intensive with investment often exceeding sales. It is the largest investor in R&D in the UK, spending almost £8 billion in 2007, and of the top 25 R&D investors globally, eight are pharmaceuticals companies (Cogent *et al*, 2009). Two companies, Astra Zeneca and GlaxoSmithKline account for almost 90 per cent of UK R&D spend in the sector (Hogarth *et al*, 2010). The industry continues to invest in R&D in the UK because of its strong offer which provides access to top quality research in the life sciences and related disciplines, the supply of premium graduates from higher education and access to research and teaching hospitals. However, competition from the US, Europe and Asia will intensify in the future.

A precise employment figure for the overall life sciences sector is difficult to achieve. Hogarth *et al*, (2010) use a number of sources to estimate employment falling between 92,000-130,000 jobs. Taking a mid-point of approximately 110,000 for the UK would equate to 95,000 jobs in England. BIS (2010) have also provided an estimate of 100,000 workers for the sector in 2007.

Estimates of employment for the constituent sub sectors in the UK are as follows; 70-75,000 jobs in pharmaceuticals, 40-60,000 jobs in medical technologies (Hogarth *et al*, 2010). This is supported by BIS (2010) with estimates of 67,000 and 45,000 people employed in each sub-sector respectively. Estimates of the numbers employed in medical technologies vary, due to differences between figures derived from ABI and LFS sources, based on medical equipment not always being the primary activity of firms operating in the sub-sector (Hogarth *et al*, 2010). BIS (2010) also estimate that 24,000 people are employed in the medical biotechnology sub-sector but it is likely that there is some overlap of employment with the pharmaceutical sub-sector (Hogarth *et al*, 2010).

Occupational employment in the sector largely reflects the pattern for the UK except that machine and transport operatives are represented in the sector to a greater extent. This is the result of a significant amount of manufacturing activity in the sector, particularly the medical technology sub-sector. Employment in the pharmaceutical sub-sector is characterised by a division between very large and small organisations, contrary to the medical technologies sector where medium sized firms predominate. Geographically, pharmaceutical employment is primarily located in the East of England, with a notable presence in the North West. Medical technology employment is mostly found in the South East of England.

The overall forecast for the life sciences sector is, at best, one of stable employment levels (Hogarth *et al*, 2010; Cogent *et al*, 2009) but there is some variation in predicted employment levels and demand for skills between different sub-sectors. The life sciences cluster report (2009) highlights an ageing workforce as a leading to significant replacement demand and as much as one third of the workforce in pharmaceutical and medical technology may retire over the next 15 years (Hogarth *et al*, 2010). Combined with the pace of technological change and development this is likely to create significant workforce development needs. The emphasis in the sector on R&D is reflected in its current and future skills needs. In general across the economy, there will be increasing demand for graduates and postgraduates in engineering and biological sciences and employers in the sector may, therefore,

face heightened competition for highly qualified staff. However, in the medical technologies sub-sector all occupations are expected to experience contraction over the same period.

Medical technology has been experiencing a gentle decline in employment for several decades and this is expected to continue due to the off-shoring of mass market production, which may not be offset by the development of niche, higher value added manufacturing. Replacement demand will remain significant though creating the need for high level skills which keep pace with changing technology. Skills supply from the education system is anticipated to be adequate to meet demands of this sub-sector which are likely to include those related to neuro informatics, virtual laboratories, bio-informatics, bio-processing, e-health, remote devices and diagnostics, nanotechnology, maximising the benefit of advanced genetic research techniques. Skilled trades and machine operatives are also essential to the manufacture of medical products and those allied to engineering are often ones in which recruitment problems are common.

The pharmaceutical and medical biotechnical sub-sectors are reliant on higher level skills for its research and development activities and on a significant competent and technical workforce for its manufacturing activities. Currently the following skills are in short supply at graduate and postgraduate levels: biological skills (in vivo and in vitro research skills, toxicology, pathology, biochemists, pharmacists, clinical pharmacology, translation medicine, pharmacokinetics/ADME); chemistry (spectroscopy, analytical chemistry, synthetic chemistry); physics (biomedical imaging); mathematics and statistics; health economics; engineering (mostly chemical but also instrument engineering and process control at graduate and intermediate levels). Many of these needs will remain in the future only much higher levels of skill will be required from postgraduate scientists in biological and physical sciences. These may be required in small numbers but with very specialist skills they will be critical to the sub-sector's future. Overall, levels of supply at graduate level are anticipated to be sufficient, providing the sub-sector continues to be able to attract those with appropriate qualifications.

However, there is greater concern about recruitment at associate professional and skilled trade levels, with a shortage of up to 5,000 engineering and craft technicians to fill replacement demand in the pharmaceutical and medical biotechnology sub-sectors. This is a current problem which may be contributing to new graduates in parts of the sector undertaking task and roles which do not make full use of their skills (Cogent *et al*, 2009; Semta, 2009; Hogarth *et al*, 2010).

The skills demands within these sectors often include high level skills in research and development functions, with lower level skill demands in routine manufacturing production roles, but in the future this skills mix is likely to be higher, wider and require a more inter-disciplinary approach. Technical occupations will require a higher proportion of graduate skills and professional occupations are increasingly likely to need postgraduate level skills.

Generic skills in each sub-sector are expected to be similar and include: leadership and management (managing across multi-disciplinary, geographically dispersed teams; lean management styles; negotiation and procurement skills when dealing with customer such as the NHS), communication, basic computing, medical devices regulation, numeracy, literacy and scientific skills more generally.

There are opportunities for some manufacturing companies, which may have latent capacity, to expand and diversify into medical technologies because they are already producing goods for other markets using similar materials. However, there may be a range of barriers related to management capability and inclination to diversify and there is a risk that such opportunities may be missed (Hogarth *et al*, 2010).

5.6 Other key sectors

Drawing on the work of the SSCs, additional analysis by government (see BERR, 2009) and our assessment of sector economic significance and skill deficiencies, **it is possible to also identify a number of other sectors which are both particularly important economically, and which exhibit significant skill deficiencies.** We cover four such sectors briefly below:

5.6.1 The creative sector

This sector involves companies in advertising; architecture; publishing; radio and TV; design; film; music; software and computer services; computer games (interactive leisure); designer fashion; crafts; performing arts; and the arts and antique market.¹ The common themes in this diverse 'sector' are the focus on creativity for business success, communication and customer focus.

The creative industries' current contribution to the economy can be estimated at around six per cent of GVA or around £60 billion per annum (Skillset, 2009; Cultural & Creative Skills, 2009). They employ around 1.5 million people in around 150,000 companies. This employment is predominantly in a very small number of large companies and even more so, (1) in a very large number of 'micro' enterprises employing less than 10 people and (2) by a large number of sole traders/freelancers. This gives the sector a particular dynamic.

Jobs are predominantly concentrated in associate professional and technical roles accounting for 43 per cent of all employment and managerial and professional jobs which account for a further 11 per cent. The key drivers of change include globalisation, the growth of digitalisation, the development of user led content and market fragmentation.

Current skills issues include recruitment into the sector where there is an over-supply of potential entrants but mismatch between their skills and those the sector needs, particularly with regard to production skills, intellectual property knowledge, commercial acumen (e.g. enabling the monetisation of content), broadcast engineering, visual effect skills (where there is a strong global recruitment element) and managerial leadership. Many of the skills required are highly industry specific and specialised. Also, important are issues around retention and the underemployment of women and minority ethnic communities. The workforce is also predominantly young.

The main skill gaps within the existing workforce relate to working with, and exploiting, digital technological advances and business skills generally and management/leadership in particular. Higher and further education provision often provide insufficient specialism and commercial awareness.

As for the future and the considerable changes being brought about by the digital revolution, the following are of particular importance:

- **Multi-skilling:** an understanding of different technologies and their impact on content development, products and digital workflow as well as new approaches to working in cross functional creative/technical teams.
- **Multi-platform skills:** the creative and technical skills to develop and produce creative content for distribution across all potential platforms, and the ability to understand and exploit technological advances.
- **Management, leadership, business and entrepreneurial skills:** hybrid skills combining effective leadership with innovation, creativity and understanding of technology, and the analytical skills to understand audience interests and translate it into business intelligence.
- **IP and monetisation of content:** understanding of intellectual property legislation to protect from piracy, and exploiting intellectual property internationally to take full advantage of emerging markets – with particular focus on the ability to deal with illegal downloading and copyright infringement.
- **Archiving:** archiving of digital content being an area which is attracting increased attention as a challenging issue for the future.
- **Sales and marketing:** being particularly important in commercial radio and graphic design. There needs to be particular attention paid to freelancers in all this, on whom so much of the creative sector depends.

The effects of the recession may shape medium-term trends in consumer demand for 'experiential services' including live music, theatre and other entertainment events (Hutton, 2009 cited in BIS, 2009c). Some reports suggest that the creative and cultural sector may be well placed to ride out the recession. Analysis suggests that consumers are still spending on film, music and theatre events and that growth in the sector is outperforming others (Creative & Cultural Skills, 2009). Indeed, analysis of the sector's performance following the 1990s recession showed that the cultural sector performed better than the sectoral average, benefiting from the weak pound (Creative & Cultural Skills, 2009).

1. These sectors were first formalised as creative industries by the DCMS Creative Industries Taskforce and published in the Creative Industries Mapping Documents in 1998 and 2001.

5.6.2 The care sector

The previous chapter noted that as a result of further feminisation of the labour force, demand for childcare may increase. This will be in addition to large recent expansion in the care sector. UK employment in childcare occupations increased by almost 40 per cent in the last decade to 840,000 (BIS, 2009b).

At the same time, the effects of the ageing population will result in an increase in demand for health and social care provision. BIS (2009) cites data from Skills for Care (2008) which estimate that this may create an extra 1.1 million jobs in this sector by 2025. There is some suggestion that existing estimates of workforce requirements in the care sector may be insufficient. Skills for Care and Development (2009) comment that maintaining the 2008 workforce to service user ratio will require approximately 75,000 workers more than the 128,000 projected by *Working Futures* giving an additional 203,000 in total by 2017 or 1.5 per cent average employment growth per year. This SSC notes that these projections also assume no change in the current level of services or productivity which would influence level of employment. The level and sources of investment that would fund such expansion are also unclear. Like the healthcare sector, although service demand is expected to rise, public expenditure constraint in the coming years may limit employment growth (Brinkley 2009b, Hogarth *et al*, 2010; Cogent *et al*, 2009). Conversely, there may be short-term skills needs in supporting elderly service users to commission their own care and to interface with telecare systems and automated technologies, which in the long-term would actually reduce the level of input required from human support.

5.6.3 The retail sector

The retail sector employs 2.8 million people, accounts for approximately eight per cent of UK GVA and the industry is heavily concentrated among large employers, with two-thirds of the workforce employed in 75 organisations (Skillsmart Retail, 2009). The dominant occupations within the sector are sales/customer service roles. Although projections from *Working Futures* show demand for employment in the retail sector included 214,000 new retail jobs as a result of expansion demand between 2007-2017 and a further 1.2 million jobs as a result of people leaving the sector, demand may be lower than that predicted on the basis of past trends (Skillsmart Retail, 2009). Clifton *et al*, (2009) argue that lower domestic consumer spending (partially compensated for by increased tourism on the back of a low exchange rate); increased productivity and the net effect of e-commerce are likely to limit the employment expansion in retail and related sectors (including hospitality). Skillsmart Retail (2009) note that 27 new shopping centres and retail park developments across the UK were planned between 2009 and 2014. However, the economic downturn has resulted in one-third of developments being suspended, with only six completed so far.

5.6.4 The tourism, hospitality and leisure sector

Tourism and associated hospitality industries contribute over eight per cent of the UK's GDP and employ 2.6 million people in the UK (BIS, 2009b). *Working Futures* predicts combined replacement and expansion demand for jobs to lead to requirements for at least a further million additional workers in the sector by 2017, chiefly in managerial and elementary positions (People 1st, 2009). Not all of these jobs may be permanent. Demand for some jobs may be created by fixed-term sporting events including the Olympics, the Ryder Cup, and world cup competitions in cricket, rugby union and rugby league, although these events may create an employment legacy by boosting numbers of overseas visitors which could sustain demand. Analysis of skills needs for some of these events suggest skill gaps rather than labour shortages will be of most concern. There is likely to be a sufficient supply of labour to undertake the key roles required (Bevan and Cowling, 2007; People 1st, 2009) but in order to secure beneficial legacy effects, concerns remain about the capacity of the workforce to deliver outstanding levels of customer service that will encourage repeat visits to the UK from the lucrative overseas tourist market.

Like the retail sector, the tourism, leisure and hospitality industries are suffering from the impact of recession, but the impact is mixed. For example, rises in trade are widely reported among businesses serving the domestic holiday market as a result of the unfavourable exchange rate for UK consumers, but some businesses supporting overseas leisure travel are seeing negative effects. Other establishments in the hospitality sector such as pubs are contracting in number, but this trend predates the onset of recession and is partly attributable to prohibition of smoking in public places.

The ageing of the population and potentially high spending power of some sections of this group suggests there may be considerable potential to tailor leisure services to older people, for example around fitness and active ageing policies (Skills Active, 2009).

Given the significance and skill deficiencies in these sectors, it is our intention in the 2011 Audit to undertake more detailed work on these four sector 'clusters' just as we did with the six Government identified ones in this 2010 Audit.

5.7 The regional picture

We saw in chapter two, distribution of sectoral employment across England, which gives different regions greater or lesser existing platforms on which to develop sectors which will be important for future economic and job growth. This short section identifies some of the main regional dimensions of the 10 sectors outlined above.

5.7.1 Low carbon economy

The low carbon economy presents primary and secondary opportunities for economic and job growth, with attendant skills needs. Primary opportunities are in emerging industries directly related to the sector. In a number of cases the operation of these facilities will be location specific, for example marine power and wind power. For example, the South West has been named as a low carbon economic area for wave/tidal power, a marine test centre has been established in Northumberland and one is planned for Cornwall (PwC, 2010a). The nuclear industry is heavily concentrated in the North West with over half the workforce of over 12,000 people based in the region and there are suggestions that recruitment for some of remote sites away from urban labour markets may be difficult (Energy & Utility Skills *et al*, 2009). However, the potential secondary development of low carbon dimensions to the economy is much broader across a range of industries including building services and maintenance, food and clothing manufacture and transport/distribution, which have a far less regionally specific footprint. The secondary low carbon economy therefore presents economic opportunities for a wider range of regions.

5.7.2 Advanced manufacturing

Because advanced manufacturing covers diverse specialist industries, regional expertise and growth potential is distributed across a number of English regions. Aerospace activity is regionally concentrated in the North West, South West, East Midlands and South East where it makes major contributions to employment, value added, clustering of research and development networks and attracting foreign inward investment (Semta *et al*, 2009).

Silicon electronics is covered by the SIC code for the manufacture of electronic valves and tubes and other electronic components including semiconductors. Here existing industry and employment is greatest in England in the East of England, the South West and the South East. Firms are concentrated in these areas due to longstanding sectoral expertise which enables them to attract other companies (e.g. start-ups) to congregate in the area (Semta *et al*, 2009). The government has been stimulating regional economic development through investing in a research centre in silicon electronics design in the South West.

Chemical production is distributed throughout the UK but there are four major chemicals clusters in England, in the North West, the North East, and Yorkshire and the Humber regions.

The polymer industry is a major part of the supply chain network supporting national capacity in these sectors. It is often found clustered in regions with such manufacturing capacity, such as the East and West Midlands.

Lastly, like the related pharmaceutical and life sciences industries, industrial biotechnology firms are distributed throughout the regions, clustered around the presence of HE institutions whose innovations the industry exploits and commercialises.

5.7.3 Engineering/construction

The demands for this industry are distributed across the nation, with a current concentration of activity in major projects commissioned in the South East. There is some uncertainty about levels of public and private investment which are likely to be available for the sector in the short to medium term due to recession, which makes it difficult to predict where skills demands will develop.

5.7.4 Financial and professional services

Much of the employment in this industry is concentrated in specific locations. A quarter of all cluster employees are London-based, and 55 per cent are based in just three regions – London, the South East and the East of England (Skills for Justice *et al*, 2009). These areas also present opportunities for higher skilled employment because head offices are commonly sited there. Construction related professional service employment is predicted to be strongest in the South East (Construction Skills Network Blueprint, 2009). The financial services sector appears likely to provide a reduced volume of economic growth compared to its performance over the past decade.

Overall, it is important to note that a number of the sectors with the greatest economic and employment potential are concentrated in London and the South East. We consider the skills implications of this regionalisation in the next chapter. In economic terms, this raises policy questions about how best to support regional economic development. The greatest potential for economic development in other regions of the UK appear to come from retail, creative and cultural, advanced manufacturing, life sciences/pharmaceuticals and care sectors.

5.7.5 Digital economy

The development of the primary digital economy has been focussed on London and the South East, partly due to links with the creative content industries. In terms of employment, 24 per cent of the 88 per cent of the creative and cultural UK workforce which is based in England is located in these regions (Creative & Cultural Skills, 2009). These two regions share 44 per cent of digital technology businesses in the UK together with around one-third of digital technology professionals/IT users (e-skills UK, 2009a). Occupational growth is anticipated to be highest in Yorkshire and the Humber at 1.5 per cent per year and lowest in the West Midlands at 0.8 per cent per year over the next decade. More broadly, the potential productivity gain from IT exploitation over next five to seven years is likely to be greatest in London and the South East (estimated at £5.4 billion GVA) (e-skills UK, 2009a). However, exploitation of the digital economy is by virtue of the technology involved, less dependent on geographical location than some other sectors. Skilled human capital is one of the major drivers of growth in the industry, and there is potential for sectoral exploitation across all the English regions.

5.7.6 Life sciences and pharmaceuticals

The pharmaceuticals industry is highly concentrated in the South East, the North West, and the East of England which employ, respectively, 24 per cent, 21 per cent and 12 per cent of the total workforce (Cogent *et al*, 2009). The same regions are also important for the medical technologies sector in addition to the Midlands. These regions also have a high density of discovery/venture companies and higher education providers of suitably qualified graduates. This kind of clustering pattern in the location of bioscience companies is fairly common across the world as the sector is often reliant upon the commercialisation of HE research to generate new products and innovations. Medical and biotechnologies industries are similarly clustered in the 'golden triangle,' around Cambridge, Oxford and London and the East of England, the Midlands and the North West. There have been notable efforts to stimulate the development of life science based enterprises in other regions including the North East.

5.7.7 The creative sector

Geographically, the greatest concentration of jobs is found in London, with a significant presence also in the South East and the North West.

Opportunities for cultural activities which are not related to sporting events with a fixed location may present opportunities for a broader range of regions. London's dominance as a centre of cultural and creative leisure opportunities is undiminished, but there is evidence of a broader regional contribution to the sector's economic and employment growth. This is in form of success of regional theatre, live music and annual arts/music based festivals and the resilience of the creative and cultural leisure sector during recession suggests further opportunities for regional exploitation.

5.7.8 The care sector

The care sectors for both children and older people's services have some of the broadest potential for pan-regional expansion, given demand for these services is diffused across England and geographical proximity for service delivery is relatively more important than for some of the other sectors. Older people's services may have some potential for concentration in regions with an ageing population including the South West and coastal areas.

5.7.9 The retail sector

While the retail sector is relatively evenly spread across England, opportunities for development are usually associated with urban areas, particularly where major retail centres can be established. There may also be links between opportunities to develop the retail economy and demographic patterns of consumer demand for those goods and services which demand face-to-face interactions. Therefore, those regions of England which have an older population such as the South West and coastal areas with higher socio-economic profiles may wish to stimulate regional businesses which cater for older, affluent consumers with purchasing power. Equally, the further development of online commerce presents opportunities for regions and sub-regions with a less dominant physical retail presence to expand trading activities.

5.7.10 Tourism, hospitality, and leisure

The SSC sector skills assessment produced by People 1st shows that employment in industries which predominately cater for tourists (business or leisure) tends to be concentrated in London, the North West and the South West of England (People 1st, 2009). Outside the capital, tourist attractions could include major regional cities as well as rural areas. In the short-term, the focus of much regional economic potential for tourism in both revenue generation and job growth is likely to be focussed on locations which will host major sporting events throughout the decade, including London, Weymouth, Manchester (for the Olympics), London, Manchester, Newcastle, Liverpool, Leeds, Coventry, Leicester, Gloucester and Southampton (Rugby World Cup).

5.8 Towards 'priority sectors'

Synthesising the material and messages from the different sources of information discussed here is tricky, and interpretations need to be made with caution. The issues of forecasts, footprints and timescales as well as the inherent uncertainty about the future, about emerging sectors and the impact of the drivers of change through time, all make a solid assessment difficult.

Nonetheless, an indicative comparison of magnitude of likely employment demand in different sectors is shown in Table 5.4. The *Working Futures* and priority sectors models rely on numerical projections of the level and projected level of employment growth. The final columns list the *New Industry, New Jobs* emerging sectors and other priority sectors discussed above.

Table 5.5: Sectors of significant jobs growth

Sectors with highest forecast employment growth (from Working Futures)	Economically significant sectors potentially constrained by skill deficits		Government emerging sectors (from New Industries, New Jobs and Jobs)	Materials from sector assessments	
	Current	Future			
Business services	Computing	Business services		Creative Social care	
Health and social work	Hospitality	Health/social care		Retail	
Retailing	Transport equipment manufacture	Retailing		Tourism/hospitality/leisure	
Hotels/catering	Retailing	Education	Digital economy [#]		
	Utilities	Financial services	Financial/professional services		
	Construction	Wholesale distribution	Low carbon		Advanced manufacturing*
			Life sciences		Engineering construction

[#] projections only available to 2013

* figures only available for aerospace sub-sector

Source: Analysis by Institute for Employment Studies, 2010

There are some striking similarities between the different approaches to identifying 'priority sectors'. **The three sectors with perhaps the greatest potential for employment growth are care, retail and tourism/hospitality/leisure.** A further three sectors also appear likely to be important. **The emerging digital sector – based at least in part on the computing and telecommunications sectors – is widely considered to have the potential to be perhaps the major driver of the economy over the next 10 years** both in its own right, and through the transformational properties of the goods and services it produces. The digital sector is likely to have significant employment expansion demands too, albeit based on shorter-term forecasts. Financial and professional/business services has substantial labour demands, but the analysis suggests that the effects of recession and globalisation may be more profound than other parts of the economy, potentially limiting job creation in this sector over the short to medium-term, although both are still likely to be important economically.

The remaining sectors of **pharmaceuticals and life sciences, advanced engineering, low carbon and engineering construction are currently relatively small in terms of the numbers of people they employ.** This means that even significant growth rates are unlikely to generate very large numbers of jobs and skill requirements compared to the sectors above. **The skills are, however, likely to be specific and impact heavily on productivity, competitiveness and growth prospects.** The first three are based on new technologies, many of which have potential to be significant economically and in employment terms but that potential is difficult to predict with any certainty. However, its realisation crucially depends on the availability of sufficient skills. Efforts to generate a more environmentally sustainable economy are likely to pervade every sector with consequent changes to the way goods are produced and services are provided, as well as new goods and services themselves, but the impact is likely to affect existing jobs rather than create new ones. The forecasts for the new jobs exclusively on what can be described as the 'low carbon sector' (centred on carbon-free energy production) are relatively modest, though environmentally crucial. The engineering construction sector is likely to remain relatively small in employment terms but will be strategically vital to the regeneration of the energy sector and the delivery of other major infrastructure projects.

This assessment **highlights the importance of a few large sectors to future employment, but should not detract from the importance of sectors with smaller job creation potential to the economy.** Some of the data presented illustrates that **the GVA per employee in the smaller high technology sectors can be substantial. We should also be alert to the consequences of skills shortages which may relate to very small numbers of jobs, but could potentially constrain growth in an entire industry.** The next chapter seeks to identify some of these risks by highlighting skills shortages and skill gaps at *occupational* levels within sectors.

5.9 Conclusions

This chapter has looked at sectors of potential strategic importance in terms of jobs and skills.

We first looked at likely growth sectors in terms of jobs and then sought to identify key sectors in terms of both economic significance and skill needs, now and in the future. We also drew attention to the six key sectors identified by Government as of potential particular significance for the future and we identified a further four of interest.

Over the next few years, employment expansion is expected in a range of sectors – including business services which alone accounts for more than one third of expected total jobs growth; health and social work is also expected to grow significantly, as is retail and hotels/catering. We undertook an initial assessment to identify significant sectors of the economy which are also potentially constrained by skill deficiencies both now and in the future.

Taking the *current* situation first, we found that sectors which exhibit both the greatest economic significance and greatest skill deficiency are computing, retail, electricity, gas and water, construction, hospitality, and the manufacture of transport equipment. Health and social care are also high on this list.

In terms of the *future*, the sectors which combine growing significance and future skill needs are business services, health and social care, and retail. Education, financial services and wholesale distribution are also significant.

The quantitative assessment we have undertaken is valuable and offers insight into the key sectors that merit attention in terms of action on skills. **However, it is important to remember that this assessment is based on quantitative analysis of existing sectors only, and that qualitative data also offers valuable insights, particularly into new or ‘emerging’ sectors. We will work with BIS so that, in the 2011 National Strategic Skills Audit, we develop this work further and draw on the work BIS has undertaken to identify sectors of growth potential for the UK, including where the UK has a competitive advantage.**

In *New Industry, New Jobs* (BERR, 2009), the Government identified a number of sectors as ones of potential economic expansion and job opportunity and we have **paid particular attention to these sectors and have examined their skill needs in detail. The emerging sectors are:**

- low carbon;
- advanced manufacturing;
- engineering construction;
- financial and professional services;
- digital economy;
- life sciences and pharmaceuticals.

Drawing on the work of the SSCs, who have all also produced summary reports on their sectors for this Audit, together with our work above on 'key' sectors, and perusal of Government documents (BIS 2009b) related to *New Industry, New Jobs*, **we have also identified four other sectors which offer economic and jobs potential but are currently or potentially constrained by skill deficiencies. Consequently, we also briefly reviewed their situations in the report. These sectors are:**

- **Creative**
- **Care**
- **Retail**
- **Tourism, hospitality and leisure**

For both the 'six' and the 'four,' we briefly reviewed the regional dimension. **In chapter six we also set out the key skills issues faced by all sectors as identified by the relevant SSCs.**

We will, in the 2011 Skills Audit, undertake more detailed work on the four sectors identified in the list above. We may also identify further sectors that repay more detailed study, emerging out of our work with BIS mentioned above.

However, we now turn our attention to an examination of the **occupational areas** where skills demand and potential mismatches are likely to be most significant.

6.0

Key future occupational skills needs

6.1 Introduction

As with the previous chapter, this chapter takes the *Working Futures* projections as its starting point, and then supplements these with findings from the sector skills assessment reports produced by SSCs, and externally commissioned work on sectors of particular policy interest. In this chapter, however, attention is turned to look in more detail at likely **future occupational skill needs within and across sectors**.

6.2 What are the likely patterns of occupational change?

Table 6.1 shows the projected demand for workers in different occupational categories in absolute numbers and their share of the workforce.

Table 6.1: Predicted changes in employment by occupational categories: major groups.
United Kingdom: all industry sectors

Employment levels (000s)	2007	2012	2017	2007	2012	2017	2007-17
	Absolute numbers (000s)			% shares			Net changes (000s)
Managers and senior officials	4,828	5,254	5,700	15.5	16.3	17.2	872
Professional occupations	4,091	4,406	4,733	13.1	13.7	14.3	643
Associate professional and technical	4,472	4,793	5,126	14.3	14.9	15.4	654
Administrative and secretarial	3,715	3,525	3,319	11.9	10.9	10.0	-396
Skilled trades occupations	3,404	3,296	3,178	10.9	10.2	9.6	-226
Personal service occupations	2,482	2,700	2,925	7.9	8.4	8.8	443
Sales and customer service occupations	2,418	2,470	2,522	7.7	7.7	7.6	104
Machine and transport operatives	2,290	2,234	2,173	7.3	6.9	6.5	-117
Elementary occupations	3,536	3,523	3,507	11.3	10.9	10.6	-29
Total	31,234	32,200	33,184	100.0	100.0	100.0	1,949

 largest net increases in employment within occupations

 largest net decreases in employment within occupations

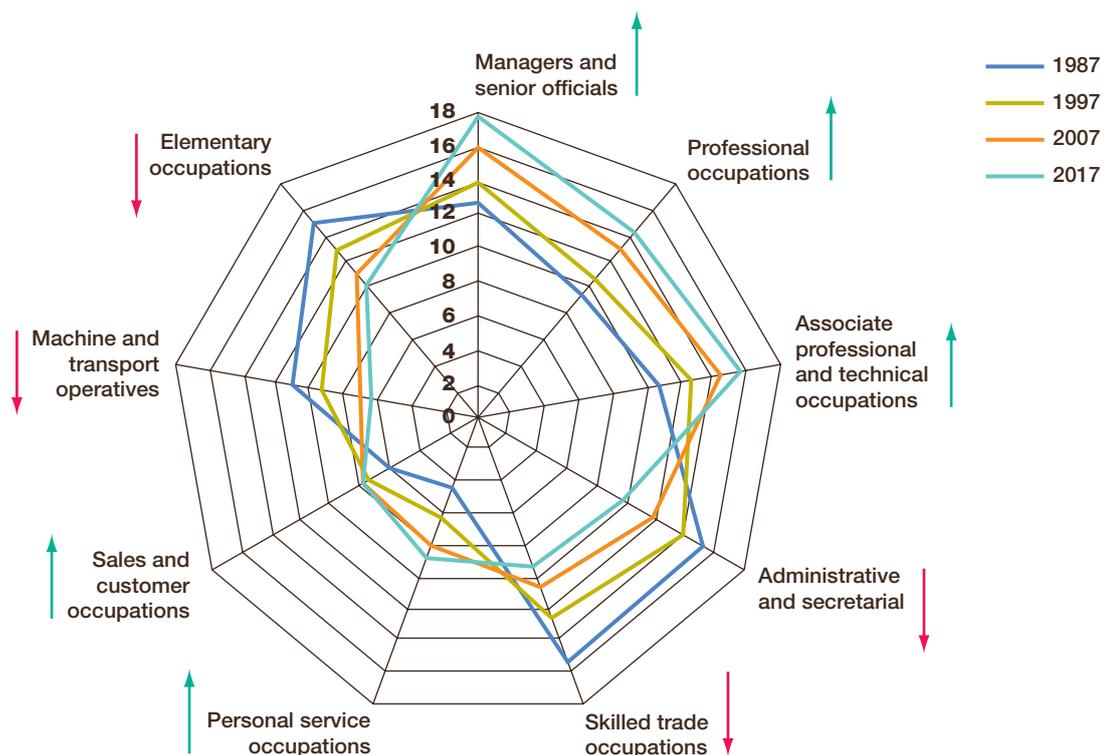
Source: *Working Futures 2007-17*, using CE/IER estimates and CE projections

Figure 6.1 shows that the greatest expansion of jobs is expected to be in higher skilled occupations, covering managers, associate professionals and professionals. Indeed, the growth in these three groups is equivalent to more than the whole of net employment growth. From accounting for 43 per cent of all jobs today, these three occupations are expected to account for 47 per cent by 2017 – a growth of some 2,170,000 jobs. Whilst substantial growth is expected among personal service occupations by around 440,000 jobs, there is expected to be a considerable decline in employment levels of ‘mid-level’ occupations: with the sharpest contraction anticipated in administrative and secretarial roles (nearly 400,000) and in skilled craft trades by more than 225,000.

Regarding lower level occupations there is a mixed picture: Sales and customer service occupations are anticipated to grow by around 100,000, but there is an expected decline in machine and transport operatives (117,000) and in elementary occupations (29,000). Despite these declines, however, **it is expected that there will remain substantial employment in lower level (relatively unskilled) occupations. By 2017 it is expected that over eight million jobs will still exist in the bottom three occupations, comprising a quarter of all jobs.**

If we take a longer term view (see Figure 6.1) both of the past and the future, we can see the long term structural changes in occupational structure very clearly. The substantial growth in managerial, professional and associate professional/technical occupations is marked, as is the substantial growth in the personal service occupations. The decline in administrative/secretarial and skilled trades are also clear. Such changes are paralleled in European labour markets more generally (Cedefop, 2010b).

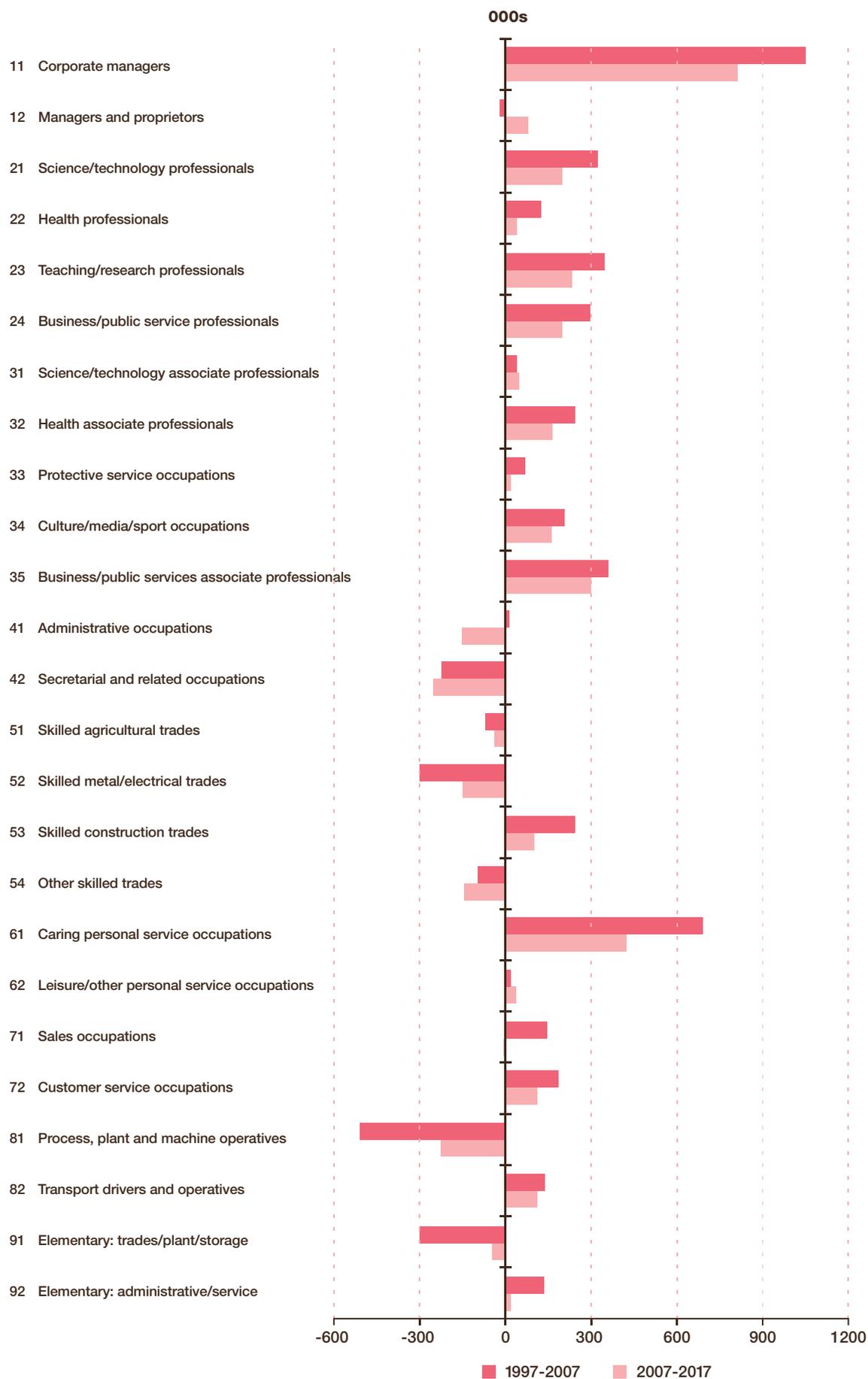
Figure 6.1: Changes in occupational structure in England 1987-2017



Source: Based on data from Working Futures 2007-2017

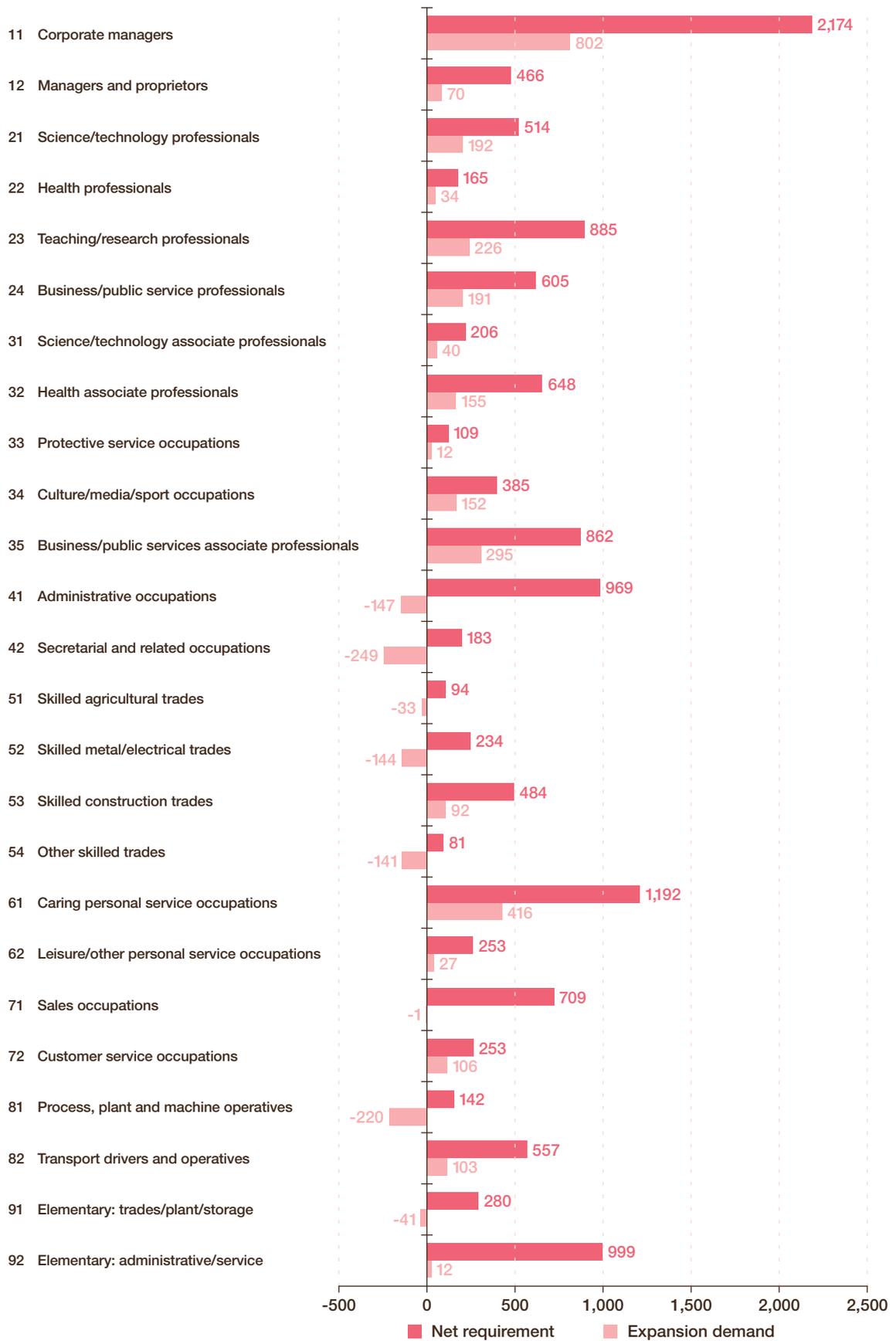
Figure 6.2 provides a greater degree of granularity to this analysis, and compares the expected change in the coming years with recent years. However, such changes are aggregate growth (and contraction) figures. They do not take full account of total job requirements because opportunities arise as current jobholders retire. Figure 6.3 thus shows **both the anticipated additional ‘expansion demand’ and the net requirements of occupations which also includes replacement demand.**

Figure 6.2: Changes in occupational employment structure by sub-major groups, 1997-2017



Source: Working Futures 2001-17, using CE/IER estimates, CE projections MDM C81F9A (revision 900), AllUK.xls (Figure 4.1.2)

Figure 6.3: Net requirements by SOC 2000 sub-major groups, 2007-2017



Source: Working Futures 2007-2017

Overall, the net requirement is for more than 13 million job openings, only 1.9 million of which is new, structural demand. The vast bulk (over 11.5 million) is for replacement demand. The overall requirement is equivalent to 43 per cent of current total employment. In some occupations, replacement demand is particularly high even if there is no new growth in the occupation (e.g. in skilled building trades). Taking account of replacement demand is critically important as it represents jobs where skill replacement will be required. **The two occupational groups with the largest volumes of replacement demand are corporate managers and caring personal service occupations.**

In sum, the data show that:

- **corporate managers** account for both the main source of overall expansion and the main growth source in the management sub-group. Among professionals, relatively high demand is predicted for all groups, and is especially strong for teaching/research and science/technology;
- **associate professional growth** is predicted in business services, health care and among culture, media/sports occupations;
- **decline is predicted in skilled trades** related to printing and textiles. The overall net increases in demand in other skilled trades derive from replacement demand, except construction, where some growth is possible;
- **care work** accounts for most of the expansion in personal service roles and the second largest increase in jobs of all sub-groups;
- within **sales and customer services**, the source of expansion is in customer care rather than direct sales roles and transport workers account for job growth in the transport and machine operatives group;
- **elementary occupations** reflect an industrial split between a decline in manufacturing/production employment and expansion in low-skilled service work.

6.3 What are the likely future changes in occupations within industrial sectors?

Our discussion so far has focused on occupations in the economy as a whole, but how does this pattern of occupational change vary across different sectors?

Table 6.2 provides details of likely change in demand for specific occupations within different sectors. Particular attention is drawn to those 'occupation/industry' groups which may be of special importance i.e. where the level or future growth of the sector and/or occupation is especially large. This enables us to indicate the significant concentrations of potential jobs growth.

Table 6.2: Occupational change across the 27 industries. Sub-major groups

	11	12	21	22	23	24	31	32	33	34	35	41	42	51	52	53	54	61	62	71	72	81	82	91	92
Agriculture, etc.							-	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mining and quarrying			-				-	-	+			-		-				+				-			
Food, drink and tobacco		+										-	-					-	-	-		-			
Textiles and clothing					-			-	-		-	-	-					-	-	-	-	-	-	-	-
Wood and paper products			-				-	-				-	-					-	-	-	-	-	-	-	-
Publishing and printing				+	+					+		-	-			+	-			-		-			-
Chemicals and non-metal minerals										-		-	-					-				-			-
Metal and metal goods										-	+			-	-			-				-			-
Engineering							-	-	-			-	-	-	-			-				-			-
Transport equipment										-				-	-			-				-			-
Manufacturing n.e.s. and recycling		+		+							+			-				-	+			-	+		-
Electricity, gas and water					-					-				-	-	-		-	+	-			-		-
Construction	+	+			+						+	+		-				-	+			+			+
Distribution relating to motors														-				+				+			
Wholesale distribution n.e.s.						+								-				+				+			
Retailing distribution n.e.s.	+		+	+	+	+				+	+	+		-				-	+				+		
Hotels and catering			+	+	+		+	+	+		+	+		+				+				+	+	+	+
Transport and storage								+	+									-	+			+			
Post and telecommunications																		-	-	+		+	+	-	
Banking and insurance	+		+	+	+	+	+	+	+	+				-				+	-	+	+	+	+	+	+
Professional services																		-	+			+			
Computing and related services	+		+	+	+	+					+	+		-	+			+				+	+	+	+
Other business services	+		+	+	+	+	+	+			+	+		-				+	-	+	+	+	+	+	+
Public administration and defence														-				-	+				-		
Education														-	-			-							-
Health and social work	+		+	+	+									-				-				-			-
Miscellaneous services	+				+	+					+	+						-				+			

■ level of employment in 2007 and/or 2017 is 100,000 or greater

+ growth in employment between 2007 and 2017 is forecast to be 20% or greater

- growth in employment between 2007 and 2017 is forecast to be -20% or less

■ growth in employment in the sector or the occupation between 2007 and 2017 is forecast to be 10% or greater

■ growth in employment in the sector or the occupation between 2007 and 2017 is forecast to be -10% or less

The abbreviation n.e.s. stands for 'not elsewhere specified'

Source: Working Futures 2007-2017 using CE/IER estimates, CE projections MDM C81F9A (revision 900), SicSocChartColour.xls

Key to occupation codes (column headings)

11 Corporate managers

21 Science/technology professionals

23 Teaching/research professionals

31 Science/technology associate professionals

33 Protective service occupations

35 Business/public service associate professionals

42 Secretarial and related occupations

52 Skilled metal/electronic trades

54 Other skilled trades

62 Leisure/other personal service

72 Customer service occupations

12 Managers and proprietors

22 Health professionals

24 Business/public service professionals

32 Health associate professionals

34 Culture/media/sport occupations

41 Administrative occupations

51 Skilled agricultural trades

53 Skilled construction trades

61 Caring personal service occupations

71 Sales occupations

81 Process, plant/machine operators

The likely areas of most significant future occupational change are summarised in Table 6.3 below. These incorporate in turn:

- a) **high growth occupations in large sectors with expanding employment:** where the occupations are likely to experience growth of at least 10 per cent in sectors with employment growth of over 10 per cent, and where the sector employs at least 100,000 people;
- b) **high growth occupations in sectors with expanding employment:** where the occupations are likely to experience growth of at least 10 per cent, and growth in employment in the sector or the occupation is forecast to be 10 per cent or greater;
- c) **high growth occupations in large sectors:** where the occupations are likely to experience growth of at least 10 per cent in sectors employing at least 100,000 people;
- d) **high growth occupations across multiple sectors:** where the occupations are predicted to experience growth of at least 20 per cent.

Table 6.3: High growth occupations by sector

High growth occupations in large sectors with expanding employment	High growth occupations in sectors with expanding employment
<ul style="list-style-type: none"> • Corporate managers and science and technology professionals in computing and related services and other business services. • Corporate managers in the health and social work sector. • Business and public service professionals, associate professionals, health associate professionals, culture/media/sport occupations, caring/personal service occupations and customer service occupations in other business services. 	<ul style="list-style-type: none"> • Teaching and research professionals and business/public service professionals in hotels and catering. • Teaching and research professionals and business/public service professionals in computing and related services. • Culture/media/sport occupations and business/public service associate professionals in hotels and catering. • Culture/media/sport occupations and business/public service associate professionals in computing and related services. • Personal service/caring occupations in hotels and catering and computing and related services. • Customer service occupations in hotels and catering and computing and related services.
High growth occupations in large sectors	High growth occupations in multiple sectors
<ul style="list-style-type: none"> • Corporate managers in distribution relating to motors and wholesale distribution, transport and storage, professional services, public administration/defence and education. • Teaching and research professionals in education. • Business/public service (associate) professionals and health associate professionals in health and social work. • Business/public service associate professionals in banking/insurance. • Caring/personal service occupations in education, health and social work and miscellaneous services. 	<ul style="list-style-type: none"> • Teaching and research professionals. • Culture/media/sports occupations. • Caring/personal service occupations. • Customer service occupations.

Source: *Working Futures 2007-2017*

6.4 Other evidence to qualify these likely changes

The evidence is based on forecasts made prior to the recession. As a consequence, the actual volumes of employment growth anticipated are likely to be somewhat less than suggested. It may also be the case that both the recession and recovery lead to changes in the structure of employment. However, it is important to distinguish cyclical from structural trends and also to recognise that long term structural trends have, at least in the past, tended to re-assert themselves in post recession periods.

Evidence from other sources on likely occupational change within sectors does provide substantial additional support for a number of the patterns outlined above. **We now outline and summarise the main trends from the sectoral studies provided by SSCs as key inputs to the Audit.**

There is extensive evidence of a significant demand for technology professionals in the computing sector

There is evidence that technology professionals and managers in the computing sector will be in high demand. Based on forecasting commissioned by e-skills UK from Experian, which includes both growth and replacement demand, software professional occupations will grow at two per cent per annum leading to an increase of 67,000 jobs by 2018. Under the most pessimistic growth scenario based on a survey of major purchasers of IT services mainly in financial services, sectoral job growth is predicted to be 1.2 per cent per year to 2018 (e-skills UK, 2009).

In the medium-term, over the period 2009-2013, an average of 110,500 jobs each year will need to be filled by people moving into technology professional jobs and 63 per cent of the intake will be into managerial and senior professional positions including ICT managers, IT strategy and planning and software professionals (e-skills UK, 2009). This source estimates that 52 per cent of these (57,800 people per year) will come from another profession, 19 per cent (20,800 per year) from the education system, and 29 per cent (31,900 per year) from other sources such as unemployment. At the same time, an employer survey for e-skills UK indicates continuing skills shortages of IT professionals in programming, technical support and IT management posts as well as programmers for the games industry.

One concern raised in the evidence is about the adequacy of supply to meet demand for labour in these roles. This relates to the decline in the number of UK applicants for computing degrees which has fallen by 50 per cent in the last five years down to only 14,000 people. Evidence from a survey of 1,000 students suggested that the content of the IT GCSE syllabus relates to IT use rather than design or development and therefore creates an unfavourable perception of the likely content of higher level IT courses and possible content of IT occupations (e-skills UK, 2009). A further possibility for expanding labour supply would be to examine ways of addressing gender imbalances within the occupations. According to LFS data, only 17 per cent of IT professionals are female; one way to ensure supply meets potentially significant demand in this role would be to examine ways of attracting more women to work in these occupations. There may be additional benefits here, since employing larger numbers of women may lead to greater capacity to exploit any latent demand for ICT applications which could be tailored by gender for female consumers.

There is evidence of skill gaps among managers and professionals which may hamper exploitation of the potential of technology, IT and the digital economy

There is relatively strong evidence from a number of sources that as well as increasing numbers of management roles across some of the key sectors for employment growth, the success of these sectors and full exploitation of technological potential will depend on specific skills among managers and professionals.

Within industries primarily engaged with, and therefore most familiar with, digital media production, half of employers surveyed have skill gaps, and these are highest in the use of specific software applications, and understanding and exploiting digital technological advances (Skillset, 2009). New skills are required due to dissolution of traditional boundaries in delivering creative content. There will be increasing demands to deliver content using multi-platform capability, that is providing creative content which will suit a range of devices including HD television, portable display units, for example telephones and more conventional PC displays (Skillset, 2009). For managers, this will require project management skills for multi-platform development, mixing conventional leadership skills with innovation, creativity and understanding of technology (Skillset, 2009). Among related industries in the creative and cultural sector, over 30 per cent of advertising and design businesses surveyed currently have difficulty recruiting to graphic design roles, and over 40 per cent of employers report skill gaps which are most likely to be in digital media (Creative & Cultural Skills, 2009).

The broadcast and digital media industries comprise a high proportion of SMEs, of which 77 per cent are very small businesses with fewer than 10 employees, and freelancers (Skillset, 2009). The industry has high global growth potential, in part due to the advantages of the relative dominance of the English language. However, full exploitation of the potential markets will require collaboration between telecommunications, technology and creative content organisations, requiring strong management skills in forming, brokering and maintaining networks and alliances (Skillset, 2009). Skillset's research highlights in particular support needed by SMEs to create digital content, exploit intellectual property and develop new business models using digital platforms. e-skills UK (2009a) similarly raises the challenge to businesses of how collaborative and user-led internet technologies can be commercialised and exploited.

In scientific manufacturing there is evidence that organisations may be failing to exploit opportunities to adapt existing products or materials which could have an application in the potentially lucrative and growing medical equipment market (Hogarth *et al*, 2010). One example here is of the 'serious game' industry, where software originally designed for computer leisure gaming could have training applications for medical procedures in the healthcare sector. The barriers to entering this market for organisations lie partly in management capability to develop innovation processes and partly in understanding the highly regulated healthcare sector and NHS procurement processes.

Beyond sectors which are heavily reliant on technology as a major driving force for innovation, there are nevertheless potential opportunities for technology use and exploitation. For example in warehousing and logistics management, IT driven systems may be adopted to support goals of cost efficiency and eco-friendly delivery. This is likely to involve greater complexity in logistics planning and management, and the organisation of warehousing processes (Skills for Logistics, 2009). In facilities management, the adoption of energy efficient systems and 'intelligent' IT systems to regulate environmental conditions may create demand for higher level IT skills (Asset Skills, 2009). In the public sector, effective management of digital technology could offer capacity to make services more accessible and more cost effective (Government Skills, 2009).

Despite the growth of online commerce in recent years, some sectoral analyses conclude that there is further potential for its exploitation. In the retail sector, skill gaps persist which could support online retailing development through web design, front line administration, data analysis, logistics and distribution and seamless transition of customers between multiple channels (Skillsmart Retail, 2009). In hospitality, recent research concluded that even among larger hotel chains in the sector, use of online applications for promotion, marketing and trading purposes have not yet been fully exploited (People 1st, 2009).

The last area for technology exploitation concerns the use of technology as a medium for learning. Lifelong Learning UK identifies optimising use of online learning mechanisms as a key challenge for the sector. This may include support to help learners navigate virtual learning environments, enable digitisation and retrieval of material through (online) libraries (Lifelong Learning UK, 2009; SAMI, 2010). There could also be demand from the sector to support learners with information, advice and guidance on career choice, and selection of learning methods, which may increasingly rely on IT assistance.

There is mixed evidence of expanding demand for corporate managers and professionals in 'other' business services

The 'other business services' sector footprint covers some of the professional and financial services sector. The effects of recession have dampened demand in parts of these industries such as legal work related to property services, architectural design and engineering consultancy so employment demand is likely to be lower than expected. In particular, there is already concern about oversupply of entrants to legal practice as both solicitors and barristers, some of whom are unable to secure training contracts/pupilages and therefore work in paralegal roles for which they are overqualified. Among relevant professional services occupations, employment growth is forecast to be quite small, comprising 1,170 civil engineers, 1,670 other construction professionals and 400 architects (Construction Skills Network blueprint cited in *Skills for Justice et al*, 2009). However, some occupations are already experiencing skills shortages, which are likely to heighten over time. These include the need for engineers (some specialisms of which are already on the MAC shortage occupations list) and urban planners. Much of the demand for these occupations, is however, likely to be concentrated in London and the South East of England, which already experience high levels of skills shortage vacancies. There is also concern that suspension of graduate recruitment programmes in the short-term for engineering consultancy, finance and law may lead to supply bottlenecks in the future as older workers retire in the event that demand expands rapidly.

Evidence supports high expected demand for corporate managers and health associate professionals in health and social work sectors

This is consistent with the evidence from chapter four on the likely expansion in demand for services as a result of population ageing. This evidence suggests that expanded demand for managers may occur in services which are providing care and support to enable independent living among an older population, and the management of long-term conditions in community settings, rather than in secondary health care settings. *Working Futures* also predicts considerable needs for health associate professionals in the relevant sector, with growth of at least 10 per cent in a sector which is predicted to employ at least 100,000 workers.

There are already recognised shortages among some healthcare professions according to MAC data, and further information is provided by Skills for Health. Its analysis of NHS vacancy rate data shows labour shortages in pharmacy, other physiological sciences (7.6%) and respiratory physiology (6%), although it does not label these as skills shortage vacancies, so their cause may require further investigation. Vacancy rates for registered pharmacists are approximately 5.3 per cent, but the vacancy rate among pre-registration pharmacy trainees, is higher still at six per cent. Skills for Health concludes that this is evidence of 'not only a severe shortage but potential long-term challenge for this staff group' (Skills for Health, 2009).

There are ongoing recognised challenges in recruitment of professionals in social work. Skills for Care and Development notes the existing difficulties in recruitment of social workers evident in their MAC listing as a shortage occupation, and at least 60 per cent of respondents in a survey of local government workforce needs reported recruitment problems for these roles. Skills for Care and Development notes likely increased short- to medium-term demands for the role as a result of family breakdowns related to pressures of recession. This must be offset against budgetary pressures which may limit expansion capacity and the effects of planned interventions to improve recruitment and retention within the sector which may ameliorate current shortages, including the establishment of a Royal College of Social Work (Social Work Taskforce, 2009).

There is evidence of the need for improved management skills which are diverse in character and often related to sector

A number of sources identify a diverse set of (mostly unquantified) management skill needs/gaps. These are shown in Table 6.4.

Table 6.4: Sectoral needs for future management and leadership skills

- The ability to manage integrated service models in the public sector (Skills for Care and Development, 2009).
- The related and ongoing trend for managing 'partnership working' between organisations to deliver public services, to tackle key issues such as obesity or climate change, and to deliver policy goals through decentralised, local services (Skills for Government, 2009).
- General commercial awareness (Skillsmart Retail, 2009 and Skillfast, 2009 especially among new graduates), or more specifically entrepreneurial skills related to the ability to spot and manage opportunities, for example for diversification in medical technologies (Hogarth *et al*, 2009); estate agency to letting (Asset Skills, 2009).
- Procurement and commissioning skills and commercial awareness to become an expert customer, to ensure contracted services deliver value for money in the public sector (Government Skills, 2009; Skills for Care and Development, 2009; Skills for Justice, 2009). Equally, some private sector industries have identified needs for skills in contract, negotiation and client relationship management (Asset Skills, 2009).
- Financial management skills (Government Skills, 2009; People 1st, 2009; Asset Skills, 2009).
- Financial risk management skills, understanding of capital markets, corporate risk, application of ethics and influencing skills among senior managers in financial services and accountancy professions (Financial Services Skills Council, 2009; PwC, 2010b).
- Workforce planning and development to meet changing service priorities and/or to align workforce capacity and capability with service needs (Skills for Health, 2009; Skills for Justice, 2009) and aligned to strategic planning (Semta *et al*, 2009 and Creative & Cultural Skills, 2009). A recent survey for the latter showed 40 per cent of employers do not attempt to assess future skill gaps in their workforce).
- Change management and staff engagement skills during what is likely to be a major period of change arising from financial constraints on public sector spending (Skills for Government, 2009; Skills for Justice, 2009; Skills for Health, 2009).
- People management skills (IMI, 2009; People 1st, 2009).
- PR/media and public engagement skills to promote, explain and defend funding levels and priorities in public service provision which may be less generous than in the recent past due to the need to economise to address public sector debt (Government Skills, 2009).
- Process improvement techniques for managers (Semta, 2009) to make manufacturing more efficient and for service managers in the justice sector to streamline service delivery (Skills for Justice, 2009).
- ICT skills among senior staff (Government Skills, 2009).
- Leadership skills (IMI, 2009).
- Strategic thinking and planning (Government Skills, 2009; IMI, 2009).
- Data security management across the wider economy (SAMI, 2010) and protection of intellectual property (e-skills UK, 2009a; Skillset, 2009).

The demand for highly skilled specific STEM-related occupations is significant

Across a number of sectors, a small number of specific highly skilled occupations are required, which in some cases are critical to the relevant industry or sector.

These include food technologists in the food and drink manufacturing industries (Improve, 2009) and a range within medical technologies including: postgraduate bio scientists including pharmacologists, toxicologists, pathologists, molecular biologists, analytic/synthetic chemists, biomedical imaging physicists, bioinformatics graduates with high level maths and statistics skills, health economics postgraduates and chemical/instrument engineers (Hogarth *et al*, 2010). Within aerospace, the numbers of undergraduates studying relevant subjects is declining, fewer than one-fifth then enter the aerospace industry and using overseas graduates as an alternative source of supply is not possible due to difficulty of gaining work permits and security clearance for the defence sector (Semta *et al*, 2009).

The primary industries for the low carbon economy are not likely to yield significant employment growth in the next 10 years, but will have requirements in particular for high level STEM occupations. These include highly qualified engineers in specialisms such as aeronautics for the wind industry, geologists who may support the development of offshore carbon capture storage facilities, and project managers with engineering expertise (PwC, 2010a). Some of the skills required for carbon capture storage development in offshore engineering techniques may be imported from related industries whose futures may be less certain, such as non-renewable oil and gas supplies.

For other sectors, shortfalls may be larger. In the largest sub-sectors of pharmaceuticals, oil, gas and chemicals, significant shortages of staff are forecast based on comparisons between adjusted *Working Futures* assessments of demand and projections of data on likely skills supply from HESA. This could amount to 40,000 roles in hard-to-fill scientific, technical and process occupations (Cogent, 2009). Power generation already has notable shortages in engineering occupations for electricity generation and transmission recognised in the MAC shortage occupation lists. Cogent notes plans to close 16 power stations by 2018 and their replacements will require network and substation planning, design and construction. According to industry research, around 1,000 workers per year will be required for the planning, construction, maintenance, operation and regulation that will take place over a 13-year period (Cogent, 2009). The likely roles involved range from design, commissioning and geotechnical engineers, to project management and welding roles and nuclear safety experts (PwC, 2010a). Training lead times, capacity and the ageing profile of the workforce are claimed to create heavy replacement demand (Energy & Utility Skills, 2009).

Evidence suggests that supply to the STEM workforce from first degree courses and 'A' levels has improved in recent years (Hogarth *et al*, 2010), and DIUS (2009) also note that supply has dropped in engineering, computing and chemistry but is rising in biological sciences and non-traditional STEM subjects such as psychology. The proportions of undergraduates undertaking STEM-related courses compared to the total volume of students are, however, declining. This may give rise to concern about future supply if net demand for STEM qualified labour increases.

Within STEM-related occupations, the nature of the skills required is also likely to expand. The main theme to emerge from analysis here is of *multi-disciplinarity*. For example, understanding whole process cycles will be important for roles in industrial biotechnology to enable mass market production of biotech applications (Cogent, 2009). Engineers in the medical technology industry will require skills in nanotechnology, design and use of new materials/biomaterials, software/IT together with expert knowledge of their own discipline (Hogarth *et al*, 2010). To develop the industrial biotechnology industry, one study notes: '*Graduates and post graduates will also need to have multidisciplinary experience where ever possible as industrial biotechnology crosses the boundaries between such areas as biology, genetics, microbiology, chemistry and chemical engineering*' (Semta *et al*, 2009).

Broader understanding across scientific disciplines and the mechanics of industrial processing/manufacturing will also be a requirement among sub-graduate level roles. For example, electronics technicians may require an awareness of printing, materials science or chemistry (Semta *et al*, 2009). These technical roles are likely to experience significant expansion and we examine this in more detail in the next section.

There is a widespread demand for associate or 'para' professional and technician roles

A clear and consistent theme across the sources of evidence reviewed in this report is of significant likely expansion in associate professional, and skilled technician occupations. This partly reflects new expansion of employment, and partly a shift in the proportions of the workforce working at different occupational levels. On balance, much of the expansion appears to be likely as a result of the shift in the skills profile within the workforce. The precise location of these roles within standard occupational and qualification frameworks is imprecise, but they will generally require a specialist relevant level 3 or 4 qualification. This in itself may create skills demands outside the sectors directly affected; for example Lifelong Learning UK identifies that provision of learning for technician type occupations may create skills needs within its own sector's workforce (Lifelong Learning UK, 2009).

The likely increased demand for technician roles is driven by three factors. First, increasing technological complexity of delivering products and services coupled with decline in routine manufacturing operations in some sectors will have an 'up skilling' effect on existing roles (Lantra, 2009a; Semta, 2009; Cogent *et al*, 2009; Semta *et al*, 2009; Construction Skills, 2009; IMI, 2009). Second, industrial survival in some sectors which are vulnerable to the effects of globalisation and relocation of production may be dependent on product development and innovation strategies requiring higher level skills. For example, ProSkills (2009) notes a need for higher level skills focused mainly on STEM subjects such as materials engineering, chemistry, and other physical sciences to achieve this goal, and Lantra (2009a) notes a need for high level scientific research skills in relation to food production. IMI notes that new product development in the automotive sector will usually require process development, creating a need for up skilling at technician level (2009).

Third, in the public sector especially, resourcing pressures as a result of heightened pressures on public sector spending will highlight the need to deliver high quality services cost-effectively by using the most efficient staffing methods. Within the public sector, there have been recent innovations in delegation of discrete tasks and functions of professional roles to associate professionals or technicians with a clearly defined area of competence or to paraprofessionals who are able to provide a generalist support role within a closely prescribed set of powers. Examples include a suite of roles loosely classified as assistant and advanced practitioners in the health service (Skills for Health, 2009). Evaluations of these roles have demonstrated potential for widespread benefits to patient care and service delivery (Skills for Health, 2009) and as these roles have not yet been fully rolled out across the healthcare sector, there is considerable potential for their expansion.

Within the legal services sector, the expansion of paralegal roles undertaking discrete tasks within legal transactions may continue, while the Retail Distribution Review in 2012 will impose a requirement of holding a level 4 qualification for investment advisors in the financial services sector. The FSSC concludes that around 60,000 people are likely to need the new qualification (excluding those who already meet the standard) based on estimates produced by the FSA (Financial Services Skills Council, 2009).

In the creative and cultural sectors, estimates suggest that over half of the employment growth in the industry is to be driven by expansion in associate professional and technical roles, and that employment will increase in these roles in this sector at a faster rate than compared to the UK as a whole (26% compared to 15% respectively) (Creative & Cultural Skills, 2009).

This demand for technician roles is also evident among industries otherwise characterised by shrinking demand, particularly in the manufacturing sector. Analysis of engineering requirements in the UK to 2014 have been undertaken using *Working Futures* predictions corrected from 2007 to take account of the changed economic climate. These show a demand for 162,300 people in engineering roles or 32,460 new entrants per year (Semta, 2009). Similarly, the fashion and textiles sector claims to require specialist textile technologists, as well as graduates across a wide range of STEM disciplines, including chemistry and engineering in order to preserve the remainder of the industry by expanding into higher value added niche markets (Skillfast-UK, 2009).

There are also some ongoing acute shortages within existing roles at this level which appear likely both to persist and worsen, given likely expanded demand for the occupations concerned. One example is broadcast engineers. This occupation is suffering from an ageing workforce and lack of new recruits due to greater interest shown by potential candidates in 'creative' higher profile roles within the industry (Skillset, 2009).

The scope of expansion in technical or associate professional occupations indicated by this evidence suggests that the plans proposed in the recent White Paper *Skills for Growth* (BIS, 2009b) to expand training provision for these occupations are consistent with future labour market need.

Expansion of front line personal service occupations, particularly in the care sector

By 2026, a further 1.7 million more adults are estimated to need care and support as a result of population ageing (DoH, 2009), while rising expectations among a generation which has never lived without a National Health Service mean that they will expect more choice and control over their services (SAMI, 2010). Chapter four noted increasing labour market participation and expectations of lifestyle choice among women, upon whom caring responsibilities have mostly fallen in the past. This may therefore reduce the available voluntary input for personal care of relatives. There is potential for greater use of technology to assist independent living among older people including robotics to help with routine household tasks and monitoring systems to check personal safety and medication compliance, but much routine care of elderly people cannot be automated, especially among those with more advanced dementia-related conditions or those who require intimate personal care. This is likely to create expanded demand for care assistant roles in both domiciliary and residential settings, which will only be constrained by the ability of the individual or the state to pay. The SSC Skills for Care and Development notes recent improvements in longstanding recruitment difficulties to these roles (Skills for Care and Development, 2009). It attributes this both to the effects of recession in making job seekers less selective about occupations and the possible impact of sector promotion through the Government's Care First programme which offers subsidies to employers who recruit unemployed young people into adult social care roles. The duration of these improvements, may however, depend on the speed of recovery of the labour market. It is possible that by the middle of the decade, there may be a return to rising unmet demand for these roles.

Future need for other caring related roles are for advice workers, counsellors and community development workers working with victims, survivors and witnesses of crime and in substance misuse (Skills for Justice, 2009). This sector also identifies broader skills needs in handling members of the public and justice system users with mental health problems, given the rise in these conditions in the general population. This skills need may therefore extend to any sector with front line customer service staff.

Better customer care in front line retail and hospitality occupations

There is a wide swathe of occupations in the retail and hospitality sectors that require direct interaction with customers and are likely to experience significant expansion, should predicted demand in the UK tourism, leisure, retail and hospitality sectors materialise. *Working Futures* also points to growth of customer service occupations in growing sectors such as computing, which is consistent with the analysis earlier in this chapter and in chapter five. Overseas demand for hospitality services may be both predictable and time-limited around major sporting events as discussed in the previous chapter. There does not appear to be great concern about capacity to fill roles in these occupations. However, there is more concern about skill gaps within the workforce. These often relate to 'employability' skills concerning basic communication, literacy/numeracy, team working, problem-solving, product knowledge, empathy and providing a positive emotionally engaging experience for customers (People 1st, 2009, data based on survey of 2,000 employers in the visitor economy; Skillsmart Retail, 2009). These skill gaps tend to be perennial concerns among these sectors. However, the consequences of success or failure in filling these skill gaps may be more significant, given the opportunities to secure repeat custom among first-time overseas visitors to England for international sporting events.

6.5 Occupational demand and skill requirements in key sectors

The previous section discussed a large amount of qualitative evidence, covering developments in a wide range of sectors. Table 6.5 more concisely summarises likely future occupational demands and skill requirements in the 10 key sectors identified in chapter five.

Table 6.5: Occupational demands and skill needs in key sectors

Sector or sub-sector	Demands for occupations?	Skills demands within occupations?
Low carbon	<p>A wide variety of specialist, highly qualified engineering roles, in a wide variety of specialisms such as aeronautics for the wind industry and geologists who may support the development of offshore carbon capture storage;</p> <p>Facilities and project managers;</p> <p>High integrity welders and technicians;</p> <p>Technicians in a range of engineering disciplines.</p>	<p>Additional skills relating to installation and maintenance of new equipment in building services/engineering sectors including electrical trades, heating/ventilation and air conditioning fitters related to developments in the low carbon economy (SummitSkills, 2009a).</p> <p>Project managers will need engineering expertise (Energy & Utility Skills, 2009; PwC, 2010a).</p> <p>Skills in resource management across the rest of the economy from more efficient use of fuel in driving, to reducing waste in food production and land management. (Skills for Logistics, 2009; Improve, 2009; Lantra, 2009).</p>
Advanced manufacturing	<p>High demand for technicians; licensed mechanics in civil aviation.</p>	<p>Up skilling and multi-disciplinary knowledge at technical, associate professional and professional science occupations; in managers' commercial exploitation and entrepreneurship, the ability to harness new technology, and the ability to manage across complicated supply chains; among technicians, strong practical skills, team working and project management skills. Technical skills include design, modelling and integration of high integrity systems, software modelling and simulation, mathematics, advanced materials engineering, diagnostic and prognostic skills, process excellence. Skilled trades occupations will need knowledge of computer aided design and machine operation in the silicon electronics industry and electronics technicians may require an awareness of printing, materials science or chemistry (Semta, 2009).</p>
Engineering/construction	<p>Demand particularly for skilled craft workers or higher with largest single sectoral share in power generation.</p> <p>Greatest demand for engineering design and project engineering including civil, mechanical and electrical engineering in associate professional and craft roles including high quality supervisors, welders, steel erectors and pipe fitters.</p>	<p>Management and leadership skills required will include design management, multi-discipline team and technical leadership; contract and relationship management; leadership and supervision onsite, including operating plant, construction and maintenance (ConstructionSkills, 2009).</p>
Professional/financial services	<p>Urban planners, (civil and other specialist) engineers, actuaries, housing regeneration experts.</p>	<p>Level 4 qualification for 60,000 investment advisors by 2012; financial services professionals may require expertise in carbon trading, financing emerging market growth and Islamic banking; risk management, understanding of capital markets, corporate risk, ethical management and influencing corporate stakeholders among senior managers in financial services (Skills for Justice, 2009; PwC, 2010b, Financial Services SSC, 2009).</p>

Sector or sub-sector	Demands for occupations?	Skills demands within occupations?
Digital economy	Software professionals and technology professionals/specialists.	<p>There will be increasing demands to deliver creative content using multi-platform capability which will suit a range of devices including HD television, portable display units, e.g. telephones and more conventional PC displays. Managers will need project management skills for multi-platform development; mixing conventional leadership skills with innovation, creativity and understanding of technology. Collaboration will be needed between telecommunications, technology and creative content organisations requiring strong management skills in forming, brokering and maintaining networks and alliances (Skillset, 2009).</p> <p>Technology professionals will need greater skills in the application of technology to improve business performance. As well as continuing to have very strong technical skills in areas such as systems architecture and security, they will also need to develop greater expertise in networking, and more will need skills in areas such as multi device management and design, to take advantage of converged technologies. Web and internet specialist skills will be increasingly in demand, as will the project management and supplier management skills to manage outsourced work (e-skills UK, 2009).</p>
Life sciences/ pharmaceuticals	<p>Postgraduate bio scientists including pharmacologist, toxicologists, pathologists, molecular biologists, analytic/synthetic chemists, biomedical imaging physicists, bioinformatics graduates with high level maths and statistics skills, health economics postgraduates and chemical/instrument engineers.</p> <p>In pharmaceutical sub-sectors of oil, gas and chemicals, possibly sizeable shortages of staff in scientific, technical and process occupations.</p>	<p>Technician level roles with strong practical, team working and project management skills will be required in all sub-sectors. Technical skills could include nanotechnology skills, design and use of new materials/biomaterials; software/IT (Hogarth <i>et al.</i>, 2010).</p> <p>Economic cost benefit analysis for health interventions, quantitative modelling skills in postgraduate mathematicians and statisticians.</p> <p>Management skills in exploitation of technologies required for medical equipment manufacturing as well as broader skills in commercialisation, managing across networks and supply chains and understanding of client procurement processes, for example NHS.</p>
Care	Corporate managers in health and social care work, social workers and care assistants.	ICT literacy among care assistants to support care users in learning to manage assisted living technologies.
Retail	Professionals skilled in online retailing.	Management/professional skills in online retailing development through web design, front line administration, data analysis, logistics and distribution and seamless transition of customers between multiple channels; customer handling and team working skills in customer service roles; entrepreneurship, commercial acumen/awareness and leadership skills, understanding supply chains to meet customer expectations for information about ethical sourcing and fair trade among managers (Skillsmart Retail, 2009).
Tourism, hospitality, leisure	High demand for professional/elementary workers in hospitality. Specific occupations: Higher skilled chefs, sports coaches, classical musicians/dancers, graphic designers, archaeologists, high demand for professionals/associate professionals in cultural/creative sector.	Customer service roles in hospitality/retail – basic communication, literacy/numeracy, team working, problem-solving, empathy to enhance customer experience (People 1st, 2009).
Creative	Associate professional and technical roles, skill shortages for some performers including classical dancers and musicians, archaeologists, graphic designers.	Skills in the use of digital media, ICT skills. advertising and visual arts, marketing skills (Creative and Cultural Skills, 2009).

Source: Institute for Employment Studies, drawing on evidence from sector assessments produced for this Audit

For the sake of completeness, and also because of intrinsic merit, **we have also sought to summarise the key skills needs contained within the 25 sector skills assessments produced by the SSCs for the Audit.** Those requiring more granularity are directed to these individual assessments, but **the headlines are summarised in Table 6.6.**

Table 6.6: Key skill needs in each SSC sector

Lantra	Construction Skills	Skills for Logistics
<ul style="list-style-type: none"> • There is a 'spiky' profile to skills demand, with employers requiring skills at a mix of levels. • The skills which employers most frequently cite as being required (and also in need of improvement) are job specific technical skills. These vary by occupation and include farming, operating machinery, animal care/handling. • Generic skills, such as team work, problem solving and communication are being seen as increasingly important. • Given the high proportion of self-employed people in the sector management skills and business skills (such as finance and marketing) are seen as important. • High level scientific research skills are becoming increasingly important as parts of the sector are adopting new processes and methods driven by science. • High level of replacement demand associated with the workforce age profile. 	<ul style="list-style-type: none"> • Increasing demand for higher levels of skills for both skilled trades and at level 4 and above, including management and leadership and in evolving areas of sustainability and innovation. • Changes in skill needs due to increased offsite construction and more mechanised pre fabricated approaches. Skills in supply-chain management, product and quality control and assembly, involving increased levels of multi skilling. • Specialised skills to meet low energy requirements of future buildings and to support development of energy infrastructure. • Over-arching need to develop ability to interface with other sectors and their supply chains, particularly in infrastructure projects with long lead times. • Skilled trades will remain the dominant grouping for qualifications within the industry. • Additional skill needed in existing jobs to deal with changing legislation/regulation, and new products and processes. 	<p>Current skill needs:</p> <ul style="list-style-type: none"> • Customer service and IT skills (at all levels); • Technical (at managerial, process and elementary level); • Communication (at managerial, associate professional and administrative level); • Leadership and management skills (at managerial level). <p>Future skill needs:</p> <ul style="list-style-type: none"> • Legislative and regulatory knowledge. • Technical skills and generic skills (e.g. team working, project management, business development and IT). • Management skills for more complex logistics systems and higher level or regulation. • Analytic and communication skills among transport planners working with drivers and customers. • 'Eco' friendly driving skills in conjunction with new equipment.
Energy and Utility Skills	Lifelong Learning UK	Asset Skills
<p>Management and leadership:</p> <ul style="list-style-type: none"> • Transferable managerial skills. • Project and planning management. • Degree-level engineering and science disciplines. • HND-level engineering and science disciplines. • Supervisory, Health and safety, customer service, literacy/numeracy skills. • High levels of replacement demand due to age structure of workforce. 	<p>Current skill needs:</p> <ul style="list-style-type: none"> • IT. • Engaging 'hard to reach' groups of learners and employers. • Management and leadership including: <ul style="list-style-type: none"> – Managing workforce through change and uncertainty. – Risk management and health and safety (particularly in WBL environments). – Project and contract management. – Collaboration and partnership. • Customer service skills. • Industry and subject specific knowledge and experience. <p>Future needs include:</p> <ul style="list-style-type: none"> • Management knowledge of shifting policy contexts and adaptability to change. • Budgetary planning and financial management to adapt to more complex funding arrangements. • Changing curriculum requirements (e.g. NQCF). • Bid writing and negotiation skills. • Innovation and entrepreneurship – to ensure business development in global markets. • Developing and commercialising new products – linking to Research and Development. • Developing new teaching techniques – e.g. blended learning; greater learner autonomy; work-based learning (WBL) environments. 	<ul style="list-style-type: none"> • Management and leadership. • Contract and client relationship management. • Financial and budget management. • Strategic and business planning. • Customer service skills. • Sector specific knowledge. • Innovation. • Communication. • Basic skills. • ESOL. • Employability skills related to sustainability agenda (e.g. energy management, energy efficiency and certification, energy advice and support for carbon reduction measures, and sustainable use of resources). • Negotiation and enabling skills (including partnership working). • Tendering and procurement skills. • Legislative and regulatory knowledge.

Table 6.6: Key skill needs in each SSC sector (continued)

<p>GoSkills</p> <ul style="list-style-type: none"> • Management and leadership skills (including compliance and kaizen). • Project management and planning skills. • Customer service, marketing and communication skills (especially for operational staff). • (Foreign) language skills. • Carbon reduction skills. • Technical and new equipment skills. • Functional IT, ICT and new technology implementation skills. • Increasing need for transport planners and transport engineers in the medium term. 	<p>Skillfast-UK</p> <ul style="list-style-type: none"> • Technical skills at operative and craft level/technicians. • Graduate-level technical skills and commercial awareness (especially an issue with designers working/coming into the sector). • Science and engineering graduates who can aid the development of new products, particularly within technical textile markets. • Management and leadership skills (increasingly prevalent in terms of production and supply chain management as well as general management behaviours during times of change). • Literacy and numeracy • Improving sales and marketing skills including skills for international trading. 	<p>Improve</p> <ul style="list-style-type: none"> • Management and leadership in operational people management. • Financial and Business Management. • Sales Strategy. • Technical, practical and job specific skills in customer handling, team working, literacy and numeracy. • Higher level roles with higher skills needs will develop among craft occupations.
<p>Automotive</p> <ul style="list-style-type: none"> • Management skills. • Technical skills (related to vehicle maintenance and vehicle technicians). • Customer service skills. 	<p>Skillsmart Retail</p> <ul style="list-style-type: none"> • Customer service skills (coupled with improved product knowledge). • Retail managerial skills: entrepreneurial skills, commercial acumen/awareness and leadership skills/vision. • Online retailing skills: web design skills, front line administration, data analysis, logistics and distribution. 	<p>People 1st</p> <p><i>Main current and future skill needs:</i></p> <ul style="list-style-type: none"> • Management and leadership skills; • Customer service skills; • Chef skills; • Employability skills. <p><i>Emerging skill needs:</i></p> <ul style="list-style-type: none"> • Multi-skilling; • Entrepreneurialism; • Marketing and sales skills; • IT skills (particularly in terms of maximising the potential of the internet); • Waste management/environmental cost savings.

Table 6.6: Key skill needs in each SSC sector (continued)

Skills for Care and Development	Skills Active	Skills for Health
<p><i>Current skills needs:</i></p> <ul style="list-style-type: none"> • Qualified Social workers, especially experienced and specialist workers. • Leadership and Management – new service delivery models/ways of working (e.g. leading multi-agency teams; mandatory qualifications/early years professional status); • Commissioning, procurement and tendering/negotiation skills. • Community building and HR planning skills; • Mandatory qualifications and ongoing CPD requirements (e.g. 'Step Up to Social Work'); as well as effective induction for all new workers. • Improving understanding of the common core of skills and knowledge for the Children's workforce. • Specialist skills – LDSS, sensory impairment, dementia, etc. • Employability – basic skills, comms/team working skills for new entrants. <p><i>Future skills needs:</i></p> <ul style="list-style-type: none"> • New types of worker, service delivery models and processes (e.g. personal assistant role, common assessment). • Skills to support closer working across social care and community/primary healthcare. • New technologies – e.g. effective use of ICT and other assistive technologies, telecare to support service users at home, etc. • Flexible/accessible qualifications to support cross sector/partnership working and workforce flexibility. 	<ul style="list-style-type: none"> • Communication. • Management and leadership skills. • Customer service skills. • Employability skills. • Sports officials. • Coaches/instructors. • Play workers. • Grounds staff. • Technical staff for caravan maintenance. 	<ul style="list-style-type: none"> • Some nursing and medical specialisms. • Pharmacists and physiology occupations. • Employability skills in team working and communication. • Skills in negotiating and facilitating change. • Assistant and Advanced Practitioners. • Supporting patients to use ICT. • Data and information management. • Management of volunteers. • Mainstreaming volunteer and short-term funded programmes. • Training carers and educating patients in self-managed care. • Change management and employee engagement for managers. • Workforce planning to align with patient pathways. • Collaboration with biomedical and pharmaceutical industries. • Numeracy/literacy skills for those moving into care roles.
<p>e-skills UK</p> <p><i>Current skill needs:</i></p> <p>Recruitment needs for programming, technical support and IT & Telecoms management occupations and business, technical and sector specific skills and knowledge. Programmers for games industry. Skills gaps in programme, Project, Supplier management, service management and delivery, leadership and personal skills.</p> <p><i>Future skill needs:</i></p> <p>Growth in software professional, ICT managers and IT strategy and planning occupations. Future skills needs in business processes, enterprise change and management, business architecture, risk management and security. Web and internet specialist skills project management, supplier management, service management and delivery. Leadership and personal skills. For telecoms professionals distributed and internet application skills, network management and security, and information management skills.</p> <p>Digital technology and ICT understanding for non-IT professionals including increased levels of skills for IT users in basic desk top and digital technologies (web, email, instant messaging, online document management), security management and IT support processes and tools, and for business managers, skills to innovate through technology.</p>	<p>Proskills</p> <ul style="list-style-type: none"> • Higher level roles with higher skills needs will develop among craft and technical occupations. • Management and strategic skills. • Teamworking skills and increasing flexibility to work across job roles. • Skills to do with developing the workforce in-house. • Adapting to changing customer demand. • Skills related to value-added services such as design, multimedia and customer service. • Skills in developing environmentally sustainable and low carbon processes and products. • Engineering and innovation in product development. 	<p>Summitskills</p> <ul style="list-style-type: none"> • Management and leadership training at all levels, particularly at first line supervisor and middle management level. • Customer handling. • Problem-solving. • Environmental technologies and micro-generation. • Greatest volume of people will be needed to work as electricians (but it is unclear whether there is any mismatch between supply and demand).

Table 6.6: Key skill needs in each SSC sector (continued)

Skillset	Financial Services Skills Council	Creative and Cultural Skills
<ul style="list-style-type: none"> • Leadership and Management Skills: <ul style="list-style-type: none"> – Forming and managing partnerships and alliances. – Senior management negotiation and leadership skills, creative understanding of technological capacity and entrepreneurial ability. • Intellectual Property and digital management. • Project management for multi-platform content. • Creative and production skills for multi-platform content. • Core business skills incl. structuring deals, risk and partnership management. • New business models and monetising content. • Sales, marketing, commercial acumen and entrepreneurial skills. • Multi-skilling. • T-skills – highly specialised in one core field but with broad skills and knowledge to use skills across teams and platforms. • Technology including software, hardware or communication technology. • Broadcast engineers. • Visual Effects (VFX). • Digital content archiving. • Insufficient industry skills specialism on graduate supply – not industry ready. • Lack of ethnic/gender diversity in the sector. • Increasing reliance on freelancers and additional pressure on limited resources. • High level skills. 	<p>Current skills needs:</p> <ul style="list-style-type: none"> • Communication skills in accountancy and finance. • Commercial awareness (e.g. impact of recession on clients). • Skills in budgeting/forecasting for finance functions. • Presentation, communication and influencing skills for finance functions. <p>Future skills needs:</p> <ul style="list-style-type: none"> • Risk management, particularly at senior levels and in accountancy. • 60,000 people likely to need to new retail investment level 4 qualification. • Commercial awareness and influencing skills. • Transparency, ethical behaviour and professionalism. • Forensic accountancy. • Corporate risk/insolvency. • Communications skills. 	<p>Current skills needs:</p> <ul style="list-style-type: none"> • Shortage of graphic designers. • Specialist skills in advertising and visual arts. • Archaeologists in Cultural Heritage organisations. • Visitor relations roles in Cultural Heritage organisations. • ICT skills. • Marketing skills. • Digital skills in design and advertising businesses. <p>Future skills needs:</p> <ul style="list-style-type: none"> • Associate technical and professional roles. • Lack of appropriate skills in recruits despite holding appropriate qualifications.

Table 6.6: Key skill needs in each SSC sector (continued)

Semta	Cogent	Skills for Justice
<p><i>Current Skills needs:</i></p> <ul style="list-style-type: none"> • Innovation skills. • Need for higher-quality applicants across sector with appropriate. • Technical and generic skills. • Professional engineers. • Technician occupations. <p><i>Future skills needs:</i></p> <ul style="list-style-type: none"> • Bioscience skills. • Technical and generic skills. 	<p><i>Current skills needs:</i></p> <ul style="list-style-type: none"> • Process operators, technicians and skilled trades in the chemical industry. • Skills in process improvements in the chemical industry. • Need for more technical apprentices in the chemical industry. <p><i>Future skills needs:</i></p> <ul style="list-style-type: none"> • Nuclear construction and operation due to industry expansion. • Technical, professional and high level management skills (due to ageing workforce). 	<ul style="list-style-type: none"> • Expertise in cross-agency knowledge and understanding, especially among generalists • Improved commissioning skills across the sector to maintain standards and secure effective and sustainable delivery. • Proficiency in the IT systems used across agencies. • Process improvement skills throughout the workforce to ensure better information flow and co-ordination between agencies. • New and better forms of leadership throughout the ranks; self-management, management and leadership as well as decision-making skills further down the ranks. • Further appropriate para-professional qualifications according to employer need. • Expertise in working with specific categories of people who may present specific challenges or require specialist knowledge (at specialist and generalist levels). • Managing and leading other professionals outside their own area of expertise. • Performance management skills to deal with targets/indicators/accountability issues. • Equality and diversity-related knowledge and skills • Skills in outreach work with young people and those vulnerable to extremist ideologies. • Skill shortage vacancies include: Social workers for young people in secure settings; advice workers, counsellors and community development workers working with victims, survivors and witnesses of crime and in substance misuse.
<p>Government Skills</p> <p><i>Current skills needs:</i></p> <ul style="list-style-type: none"> • Strategic thinking skills. • ICT (computer) skills. • Programme and project management skills. • Leadership skills. • Technical/occupation-specific skills. <p><i>Current and future skills needs include:</i></p> <ul style="list-style-type: none"> • Leadership skills. • Innovation and entrepreneur skills. • Information technology skills. • Risk management. • Data handling and analysis skills and systems. • Communication and customer facing skills. 		

6.6 Conclusions

This chapter has shown that in broad terms, **expansion in the number of jobs is most likely to be found in the higher skilled occupations of managers, professionals and associate professional/technical occupations.** Indeed, growth in these three groups over the next 10 years is likely to be equivalent to the whole net increase in employment for the economy as a whole. **The other major growth occupation looks likely to be personal service occupations,** where more than 400,000 additional jobs may arise. On the other hand, declines are anticipated in administrative/secretarial, skilled manual trades and operatives.

However, it is important to note that these changes in overall growth (and decline) do not take full account of the total job requirements because, in addition to new additional jobs, it will be necessary to fill the job opportunities that arise as current jobholders retire.

Both sets of skill needs will need to be met. Replacement demand is especially important in managerial; teaching/research professionals; business and public service associate professionals, administrative occupations, caring personal services and elementary occupations in services. Overall, less than two million of the potential 13 million job openings are 'new,' the bulk is to replace those leaving employment.

It is also possible to examine these occupational changes on a sector-by-sector basis, creating a 'matrix' of occupation/industry requirements. To do this we looked at high growth occupations in four types of sector: large sectors with expanding employment; sectors of expanding employment; large sectors; and otherwise 'contracting sectors.'

We then reviewed the detailed sector studies, which corroborate and support much of evidence on these trends. In particular, the cluster sector provide evidence of:

- **significant demand for technology professionals** in the computing sector;
- skill gaps emerging amongst managers and professionals across a range of sectors, in relation to ICT, **the digital economy and technological change more broadly;**
- high levels of **anticipated demand for corporate managers and health associate professionals in the health and social work sectors;**
- a need for **improved management skills** across several sectors, often specific in character, related to the sector;
- a **high demand for highly skilled, specific STEM related occupations;**
- widespread **demand for associate or 'para' professional and skilled technician roles,** across a wide range of sectors;
- **significant expansion of frontline personal service occupations, especially in the care sector;**
- **improvements in customer care in front-line retail and hospitality occupations.**

Additionally, individual sectors experience a range of particular skills challenges.

7.0

Conclusions and strategic priorities

7.1 Introduction

The National Strategic Skills Audit has identified current and likely future trends in demand for skills and employment in England over the coming five to 10 years, using a range of available national data sources, and supplemented by a detailed analysis of sectoral and occupational insights. It has thus sought to provide greater insight into, and foresight of, England's existing and future skills needs.

In this final chapter **we draw together the vast array of material analysed so far**, and set out some core, **strategic areas** for action in the short, medium and longer term. We focus, more specifically, on the **occupations and sectors** where most attention is required if we are to ensure England has the **essential skills** it needs both today and tomorrow to meet the emerging labour market demands, and, ultimately, to maximise economic growth and prosperity.

The intention of this chapter is not to be prescriptive, but to provide '**intelligence**' which can give insight and foresight about strategic skills needs to stakeholders in the skills and employment system. It aims to act as a signal to better informed choices, and provide a strong foundation on which to steer and build further dialogue and action on the most pressing strategic skills priorities for England. The aim is to assist all stakeholders in making their education, training and development decisions, enabling a better response to current needs. It should help inform and influence all stakeholders: individuals and their advisors; providers (schools, colleges, universities and training providers); funders; employers; government and public agencies, so that they take appropriate action on demand and supply and get a better balance between the 'skills we need and the skills we've got.'

7.2 Priority areas for action

In this final part of the analysis within the Audit, we seek to identify the skills which are strategic priorities for action, both currently and in the future. In particular, we focus attention on the most pressing areas that have been identified in the analysis, which are accentuated when the data is brought together. This is essentially where there are:

- current and/or anticipated future skills needs, which are significant in scale or volume already in the labour market, or are expected to be a significant requirement in terms of future needs;
- significant current and/or emerging skills needs which are already making (or likely to make in the future) a significant contribution to economic performance (although they may be more moderate in scale);
- concerns over whether the skills needed will be adequately met and hence there is a skills deficit (or there may be questions over future supply if future demand is stimulated).

We identify **where short, medium and long-term action is needed**, and discuss the implications if action is not taken. As discussed earlier (for example chapter three), such action may be in terms of supply or demand. Thus whilst it could involve action to reskill or upskill people, it could also equally involve action on the demand side to ensure better job-matching and that people's skills are effectively managed and utilised.

In prioritising the areas for action, we draw on the risk-based approach adopted in Australia (Skills Australia, 2008) as this has already been used and effectively deployed in a policy context, in developing a national workforce development strategy. The approach enables us to identify the key occupations, and in turn related sectors, where there are most likely to be **important strategic skills** needs, which risk not being effectively met. The risk based approach uses the following criteria:

- **Degree of certainty** – this essentially considers the likelihood of the drivers of the skills demand materialising, and, the risk of supply failure, with assessments ranging from 'unknown certainty' to the outcome being definite. It also includes consideration of the significance of the skill deficit under multiple scenarios.

- **Magnitude** – this considers the *scale* of action required based on the magnitude of skills needs. Essentially, this is broadly based on the numbers of jobs that need filling. Future assessments of magnitude capture total employment demand and incorporate both replacement demand as well as new jobs. The rating varies from small to large, with the highest scale covering demand for at least 100,000 workers, the medium scale for 50,000 to 100,000 workers and the small scale applying where demand is for less than 50,000 workers.
- **Lead time** – this seeks to assess the length of time taken to rectify the skills deficit. In doing so, it also considers whether there is an absence of alternative preferred strategies to overcome the deficit. It deploys categories ranging from short to long term, with: the long lead time being more than five years, three–five years capturing the medium lead time, and less than three years applying to the short lead time. This measure includes both the learning time required for individuals and the set up time for any new training or educational provision.
- **Criticality** – this seeks to assess the potential risk to economic growth and development according to:
 - i. the priority sectors analysis of chapter five to identify where the opportunity costs of skills deficits could be high to the economy;
 - ii. the analysis in chapter six to identify where the consequences of skills deficits could be high within industries, even if the numbers of jobs involved are small.

Thus, some of the likely deficits are about **capacity** – i.e. insufficient numbers of people with the necessary skills and knowledge, and others are about **capability** – the numbers of people exist, but their skill sets needs to change in order to meet changing needs.

Depending on how these factors combine, each skills deficit is then given **an importance rating or ‘traffic light’ colour**, indicating how much of a priority it is for action. The only weighting given to these factors is whether the opportunity costs of skills deficits could be high to the economy overall and require immediate action. Where this is most severe it automatically results in a top priority rating, which is signified with the colour red. More specifically, the ratings used are:

- **Red**, reflecting skills deficits which are of *critical* importance to the economy and require *immediate action*, either because there are current skills needs already not being met and/or because lead times are such that early action is required to fully optimise economic growth potential and avoid deficits in future.
- **Pink**, reflecting skills deficits which are again of critical importance to the economy or a particular part of the economy or sector, in terms of expansion, survival and/or optimising returns, but which may be smaller in scale and have a shorter lead time than for those rated as red.
- **Amber**, reflecting skills deficits which are important to the economy and/or a distinct sector rather than critical (although the degree of certainty may be less clear and hence the true impact unknown, where the skills needs are connected to a developing or emerging sector in the economy). Furthermore, skills deficits are either moderate in scale and/or can be filled in a medium to short time frame.

Green ratings are not separately identified as these represent areas where generally there is a better alignment between supply and demand and hence less pressing skills issues requiring additional action. Figure 7.1 presents a summary of the results of our priorities analysis. The table is organised under broad skill/occupational priority headings (these are illustrated in the white rows in the table), it also seeks to show in which sectors of the economy the effects are being felt (or expected to be felt). Overall, the analysis taken together points to the importance of a number of key **strategic skills** we need to address to meet the emerging demands of the labour market and, ultimately, to maximise economic growth. In general, this broadly highlights higher skilled occupations including managers, professionals and associate professional and technicians. But it also extends to some other areas such as personal service occupations and skilled trades in particular parts of the economy, as well as more pervasive generic skills. A number of key trends provide the context for the priorities analysis:

- **Current demand:** The largest numbers of people in the current labour market are employed as managers, professionals, associate professionals and technicians. Indeed, these occupations account for 43 per cent of all jobs today.
- **Broad skills shortages:** Recent figures show that professional occupations experience one of the highest proportions of skills shortages (25%, in the NESS 2009) and shortages are also above average in managerial, associate professional and personal services occupations. Their density however is greatest in associate professional and technical, skilled trades and personal service occupations.

- **Detailed shortages:** More detailed analysis of skills shortages by the Migration Advisory Committee (MAC) provides further insights into a broad range of occupations including many within these skilled areas such as science technology and engineering occupations, particularly in the healthcare and electricity sectors, as well as education professionals, senior care workers and skilled chefs.
- **Skills gaps:** Most skills gaps across the economy as a whole are found in elementary, sales and administrative roles but also are high in managerial jobs too. In addition, in larger organisations, above 500 staff, a larger share of skills gaps occur in management, professional and administrative roles.
- **Wage returns:** Further evidence of demand for higher skills comes from the wage returns that individuals receive in the labour market. Indeed, evidence on returns to qualifications show that higher level qualifications often associated with more highly skilled professional jobs, achieve greater wage returns than those at lower levels, and academic qualifications carry a premium over vocational qualifications (although higher level vocational qualifications carry a premium too for level 4 and above).
- **Future trends and drivers of change:** Drivers of change, structural trends and developments in the coming years in the economy are expected to accentuate the demand for many of these high level skills, particularly because of their importance in securing a continuing edge and competitive advantage within key sectors, and an ability to respond to on-going changes in the labour market due to factors such as the effects of globalisation, technological advancements and developing consumer demands.
- **Future demand:** Jobs amongst corporate managers, professionals, associate professionals and technicians are anticipated to exhibit the highest levels of anticipated demand in the future too, with proportions expected to increase to 47 per cent by 2017. But in addition, personal service occupations also exhibit higher growth, which is accentuated when replacement demand due to people retiring from the labour market is also included. Such trends highlight key future skills demands for skilled trades and administrative staff.

In addition, our initial assessment has sought to identify those sectors of the economy where particular attention to skills needs might be targeted. Whilst this is only an initial assessment which we need to review and develop over time, these sectors also feature within the priority assessment below. For instance:

- **Key sectors:** Our earlier analysis identifies those sectors which currently exhibit the greatest economic significance and skill deficits. These include: computing; retail; electricity, gas and water, construction hospitality and the manufacture of transport equipment. The sectors which combine growing economic significance and future skills needs are business services; health and social care; retail; education; financial services; and wholesale and distribution.
- **Emerging Sectors:** In addition, the analysis has included the emerging sectors identified by Government (BERR, 2009) as offering particularly significant potential for economic expansion and in turn job opportunities: low carbon; advanced manufacturing, engineering construction; financial and professional services; the digital economy and life sciences and pharmaceuticals. Again, the analysis here is not conclusive and will inevitably need to be enhanced over time, but some initial insights are included below.

Given these general trends, we now summarise the main priorities in our priority action matrix.

Red – high priority skills needs for immediate action

The priority analysis undertaken and presented in Figure 7.1 reveals a number of high priority strategic skills needs.

Corporate managers as a group, and a range of specific management skills have been identified in a number of key sectors. Based on the priority sector analysis and existing reports of above average management skills gaps from NESS 2009, the sectors include retail, business services, computing/digital media organisations, financial and professional services; health and social care, education, public administration, and hospitality. Management and leadership covers a range of different types of manager in the varying sectors in the corporate managers group and a multitude of different core activities and behavioural competences. These include leadership, change management, people management, financial management, risk management, negotiation and procurement skills requirements which must be delivered exceptionally well to fully respond to and exploit future challenges. Our sector research has highlighted a number of these components developing in emerging sectors too, if these sectors are to fully exploit economic growth potential. Broader global developments and key future drivers of change, accentuate the importance of understanding and tackling these skill needs to ensure that organisations can continuously adapt and change. ‘Good’ managers and leaders, and more specifically, their management skills, are crucial to ensuring high performance working and business success, and seizing economic opportunities. This explains the red rating given to this group.

In addition, **specific management and professional skill shortages have been identified in the computing and software sectors**. These occupations receive the highest rating because of the direct and indirect significance of the digital economy, and the importance of these occupations within those industries. More specifically this includes, management skills to harness the potential of the digital media industry through delivery of multi-platform content, the successful operation of networks within the sector, and the exploitation and commercialisation of broader ICTs in manufacturing and across the wider economy.

The analysis also points to a number of pressing strategic skills needs amongst professionals. For instance:

- **Health and social care professionals are currently in short supply in a number of medical specialisms such as particular medical practitioners** (i.e. audiological medicine, genitourinary medicine, haematology, paediatric surgery – see for example the MAC list) **pharmacy and qualified social workers**. Some of these roles may be sourced using immigration and action is currently being taken to address skills shortages in some of these occupations. The sector is an important one in terms of volume of demand, therefore these skills needs receive a red rating.
- **Science and technology professionals in pharmaceutical and medical technology industries** and also in key parts of the **traditional and advanced manufacturing sector** are both essential to the preservation of globally specialist sectors and their future development. A new multi-disciplinary knowledge base will be essential for the higher value added product market strategies that will be required to compete in these markets and to adapt to the pace of technological change. In the pharmaceutical and medical technology sectors this will call for very specialist graduate and postgraduate skills, especially for research and development activities such as biological skills (e.g. toxicology, pathology biochemists, pharmacists, clinical pharmacology, translation medicine), chemistry, physics, mathematics and statistics. These STEM skills for professionals therefore collectively receive a red priority rating.
- **Teaching and research professionals across the education sector** will be essential to support the supply of new recruits to a number of priority sectors. As business develop their technology and production processes this will require close and on-going co-operation between education providers and employers to ensure that evolving curriculums effectively meet industry needs. This will be especially important in key areas such as STEM related subjects where there is a more general emerging skills need for multi-disciplinarity both within science, technical and business areas. Research within higher education is critical too to providing the insights and innovations which can be commercialised through the relevant sectors. With an ageing teaching workforce it is vital that people are continually attracted to the sector, and this includes ensuring an adequate number of trainers of teachers too. Consequently, these skills are also given a red rating.

Another key skills requirement will involve **associate professional and technical roles in a broad range of sectors, particularly manufacturing, process sectors, including oil, gas, electricity, chemicals, life sciences and pharmaceuticals, automotive, engineering, and broadcasting**. They are likely to be required in large numbers, will require breadth as well as depth of knowledge including generic product lifecycles and manufacturing techniques, and are essential to survival if competitive strategies of moving into higher value added markets are pursued. In particular, one of the most striking themes to emerge from the Audit is the growing importance of technicians, especially in specialist STEM areas – workers with the ability to apply an in-depth understanding of a particular field in a practical setting. Demand is rising for technicians across a range of sectors driven by:

- growing technological complexity – driving up skill levels across the production sectors;
- the growing attention given to higher value added product market strategies – accentuating the need for higher and intermediate vocational and technical skills;
- changing skill mix in some professions, for example in the public and professional services.

As such these skills are also given a red rating.

In addition, **health and social care associate professionals and technical roles** are currently in short supply in a number of medical specialisms such as distinct areas of nursing. Indeed, these areas have significant current demand and are anticipated to exhibit significant growth, not least because replacement will be more substantial due the age composition of the current workforce. They are already experiencing skills shortages. For instance, skills shortage vacancies reported amongst associate professional staff account for 30 per cent of vacancies in these sectors. Furthermore, some occupations exhibiting particularly strong skills deficits are listed on the MAC skills shortage list such as distinct areas of nursing in operating theatres and neonatal intensive care units. Migration therefore may also be obscuring the true nature and level of skills deficits.

There are pressing strategic skills issues at intermediate skills levels too. The increasing importance of **higher and intermediate jobs in some of our key existing and emerging sectors (such as manufacturing, processes industries, engineering)**, places a growing emphasis on strengthening the intermediate vocational career pathways (from level 3 up), to ensure that the skill requirements for these jobs can be met and people can progress into intermediate and higher skill areas. However, there has been little change in the proportion of people taking up intermediate qualifications (level 3), and consequently, this has raised questions over the adequacy of supply. Indeed, the highest and most persistent skills shortages occur in many of these **intermediate jobs (such as skilled trades)**. In addition, whilst there are indications that in some of the traditional sectors, key skilled trades are forecast to decline, many of these areas comprise a largely ageing workforce and when replacement demand is taken into account, this highlights significant pressing skills supply needs. Further, there will also be emerging opportunities amongst the *New Industry, New Jobs* emerging sectors for skilled trades too which will need to be met. This includes a range of skillsets across traditional and emerging sectors: builders, engineering and electrical trades, plumbing, joinery, heating, ventilation and air-conditioning. For these reasons key skilled trades in these sectors receive a red rating.

In addition, **the ageing population will lead to increased demand for care services with particularly significant volume of staff in care assistant roles, who will need greater understanding of ICT to support care users with assisted living technologies**. This skills need receives a red rating because the volume of demand predicted by *Working Futures* is very high and this is supported by our wider evidence and qualitative assessments. Demand for care is likely to increase substantially, and associated with it, greater attention will need to be given to the quality of the care provided. Because of the history of difficulties in recruiting to the sector, which may return following economic recovery, this adds further importance to the need to manage the skills issue. The proportion of migrants has tended to be high in this sector historically which may be further masking the full scale of the skills problem and acting as a disincentive to upskill the domestic workforce.

Finally, there are a range of pressing generic skills priorities which are more pervasive across the economy. One such priority will be associated with the **expansion in the volume of customer service roles**. These are highly important to priority industries within the service sector including retailing, and are also expected to be increasingly associated with after-service and maintenance roles related to manufacturing and digital economy sectors. Although there is some uncertainty about the volume of increase due to the effects of recession, and evidence suggests few particular difficulties in filling these roles, the size of the sectors involved is significant. The quality of customer service skills required in particular for occupations in hospitality, tourism and leisure sectors handling overseas tourists visiting Britain receives a red high priority rating as these skills may be critical to generating repeat business and therefore the economy. Similarly, employability skills in team working, problem-solving, communication and essential literacy/numeracy are potentially critical among front line staff in these industries.

Pink – high priority skills needs which are of importance rather than critical to the economy and/or distinct sectors but where deficits are smaller in scale and require a shorter lead time to rectify than for those rated red

The analysis identifies in the next tier of strategic skills needs a wider range of key management skills and capabilities. For instance:

- **Procurement, commissioning and financial management skills** are identified in a range of private sector industries as well as within key parts of the public sector including central and local government. Whilst in the case of the latter, they may not generate economic growth, they still achieve significant importance, having potential to reduce public sector debt through securing better value for money.
- **Management skills required to develop innovation processes** to apply existing products for **medical/healthcare markets** could be critical to prevent further job loss in parts of manufacturing sector.
- Within the **financial services sector risk management, ethics and influencing skills** among senior managers are likely to be a necessary (although possibly insufficient) condition to avoid a further financial crisis. These therefore also receive a pink priority rating.
- Specific **management skills around data security management and exploitation of intellectual property** identified in the Audit also receive a pink rating. This is not due to imminent security risks, but rather because the ability to commercialise user-generated innovations and develop revenue streams may be a key source of profit generation and competitive advantage within key sectors such as the digital economy, as well as high value-added parts of emerging sectors like advanced manufacturing such as nanotechnology and electronics.

The analysis also identifies a range of key skills amongst professional roles:

- **Urban planners and actuaries** are in short supply for the professional and financial services sector. The volume of demand is relatively small but the training lead time for actuaries in particular is long, within a sector which is predicted to experience lower growth than others, therefore these occupations receive a pink rating.
- **Science and engineering professionals** with additional specialist expertise in low carbon energy generation will be needed for large scale projects in the engineering/construction sector and energy generation industries for the low carbon economy.
- **Food technologists for the manufacturing and processing industries** and also possibly parts of the biotechnology sector will be essential, albeit possibly in smaller numbers, to safeguard sufficient quantity and quality of food supplies and safety as the population expands.

Amber – medium priority skills needs of moderate scale and/or time frame for action where the degree of certainty of their impact may be less critical

The analysis has identified strategic skills needs of medium priority, which cover a range of largely management, professional skills.

Amongst the **professional group**, engineers for large scale construction projects in the engineering/construction sector are already recognised as skills shortage occupations in the MAC listings. The level of demand for these occupations is contingent upon public and private sector investment in major construction projects, which are currently negatively affected by economic downturn. Given the alternative sources of overseas labour and some doubt over level of demand, these skills needs receive an amber rating. However, it will be important to monitor both the levels of demand and supply, and in particular, to identify any bottlenecks in supply of experienced staff due to a shortage of new recruits to the industry.

A number of **associate professional or technical roles, and skilled trades** receive an amber rating across a variety of sectors. These include chefs, graphic designers, paraprofessional roles in the public sector (e.g. PCSOs and advanced practitioners in healthcare), and investment advisers in financial services. Others include advice workers, counsellors and community development workers for victims of crime/substance which are important for national well-being. These roles are important ones within these sectors for which either alternative sources of recruits can currently be found (chefs through migration), or where other roles receive higher ratings of criticality.

Other specific needs include:

- **Investment advisers in the financial services sector.** A requirement for these skills raise likely demands at level 4 and are essentially related to attempts to strengthen processes within the industry following the recent financial crisis as discussed earlier. A sufficient supply is hence essential to service delivery in the industry in future.

Finally, the assessment has identified wider strategic skills needs which perhaps are less of a priority, although nonetheless important in:

- **Change management (involving people management and staff engagement skills) among managers** in a wide range of sectors across the economy affected by intense competition heightened by the recession and/or public spending cuts. This is a key area which will be important for optimising the capability of staff, organisational reputation and ensuring the long-term staff retention, and improved service delivery.
- **Sports coaches are likely to rise due to increased interest in active leisure pursuits** following the Olympics and a more active ageing population. They are important for optimising national health and well-being and therefore receive a amber priority rating.

In addition to the more pressing high and intermediate skill needs identified above, the Audit has also highlighted areas that are currently and will continue to provide significant employment but which are anticipated to remain low skilled. These include sectors such as retail, hospitality and services involving care of the elderly and young. Whilst this covers an important area of the economy, and vital services, and also forms an important source of employment for some, the low skilled nature of the work does raise wider skills and social issues which will need to be more carefully studied and monitored in future assessments.

Figure 7.1: Priority action matrix

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Management roles					
Significant and increasing requirement for corporate managers with questions over current/future capability	Higher incidence in range of sectors, particularly: Computing/digital media; Business services; Health; Social care; Distribution; Financial and professional services; Education; Retail; Public administration; Hotels	Definite Significant current as well as future demand; and current evidence of deficits e.g. gaps Future trends accentuate demand e.g. organisations expected to need to be increasingly 'agile' to cope with market change, increasing competition, and adopt HPW – change management and leadership key amongst core management population Ageing population will lead to increased demand for health and care services – only constrained by ability of state or individuals to pay for care	Large Significant demand for these jobs Increase of at least 20% growth projected in many of these sectors, but reduced supply from education system	Medium No single quick fix. Takes time to develop/build management capability through mix of on-the-job and off-the-job development	Critical to both as a) core skills needed in range of industries b) need in some sectors of high priority in terms of economic growth e.g. digital media and computing related industries predicted to outperform other sectors despite recession
Management skills and capability in exploitation of general purpose and specific technologies	Economy-wide	Definite/likely Given rate of on-going technological change and its importance as a driver of business development etc., but type of technology and its application very difficult to predict	Large Effects potentially pervasive and large scale given importance of on-going technological developments across economy	Medium	Anticipated to be critical to maximising productivity across the economy – job creation potential unknown

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Management skills and capability in commercial awareness and entrepreneurialism	Economy-wide	Definite Based on analysis of current skills shortages and future needs stemming from globalisation and growing competition from leading international economies/businesses	Large Effects potentially pervasive and large scale	Medium	Important for both sectoral survival and economic growth; job creation potential unknown
Management skills in forming, brokering and maintaining networks and alliances for digital media industry due to global scale of opportunities and need for collaboration between telecoms, technology and creative organisations Identify commercial opportunities and exploit IP among SMEs Management of multi-platform content creation key to avoid skills gaps in skills for specific software applications	Digital media Creative sector	Likely Based on analysis of global market potential and key trends	Medium	Medium	Critical to both as a) core skills for the industry and b) digital media part of the high priority digital economy growth sector
Specific management skills in procurement, commissioning and financial management	Range of private sector industries (as above) including facilities management, as well as local and central government, and health care organisations	Definite Financial crisis already created uncertainty for business and public sector and heightened need for such skills	Large Among senior managers with purchasing responsibilities – these sectors have significant current and future growth	Short	Critical especially in public sector for securing value for money and reducing public sector debt. But also key to efficiency of private sector

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Specific management skills in data security management and protection of IP	Whole economy but acute in digital sectors and emerging technology sectors e.g. advanced manufacturing such as nanotechnology and life sciences	Definite Innovations in highly specialist sectors already calling for such expertise	Large All managers with specific or overall responsibility – potentially large scale	Short	IP protection essential for commercial exploitation and taking advantage of emerging markets; data security management essential for business continuity and reputation preservation among customers
Specific management skills/ capability to develop innovation processes to apply existing products for 'new' markets	Manufacturing (especially medical and healthcare products) Key to advanced manufacturing sectors more generally to securing foothold	Likely Based on analysis of trends to date	Small to medium In isolated parts of manufacturing but in aggregate more significant demand	Medium	Could be critical to prevent further job loss in parts of manufacturing sector and to strengthening foothold in new, emerging areas of the sector
Risk management, ethics and influencing skills among senior managers	Financial services	Definite Has come to light through recent financial crisis	Large Significant current and future demand creates pervasive need within sector	Short	May be critical to sector and economy to safeguard against further financial crisis
Change management (people and staff engagement)	Economy-wide	Definite/likely Increasing globalisation, on-going technological developments, increasing customer demands, requiring continual change in private and public operations	Large Effects potentially pervasive and large scale	Short to medium	Could be important for organisational reputation and staff retention long-term within industries
Professional roles					
IT professionals in programming, technical support and programmers All ideas generated for creative digital industries must have multi-platform capability	Business services Computing/digital economy Especially for games industry	Definite Digital media and computing related industries predicted to outperform other sectors despite recession – deficits already evident	Medium Evidence predicts software professional occupations will grow at 2% per annum leading to an increase of 67,000 jobs by 2018	Medium Requires level 3 or above qualifications	Critical to both as a) core skills for the industry b) computing and digital economy emerge from analysis as high priority economic growth sectors

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
<p>Science and technology professionals</p> <p>Postgraduate science and technology skills (STEM) e.g. bioscientists including pharmacologist, toxicologists, pathologists, molecular biologists, analytic/synthetic chemists, biomedical imaging physicists, bioinformatics graduates with high level maths and statistics skills, health economics postgraduates and chemical/instrument engineers</p>	<p>Health</p> <p>Life sciences</p>	<p>Definite</p> <p>Some current deficits already experienced</p> <p>Increase very likely based on developments of new technologies and to retain competitive edge/internationally</p>	<p>Small</p>	<p>Long</p> <p>Requires Level 4 or above qualifications, highly specialist training</p>	<p>Critical to industry survival in higher value added markets</p>
<p>Specific skills related to high level STEM occupations</p> <p>Multi-disciplinary in understanding of related sciences used in the industry for other parts of production process and practical laboratory skills</p>	<p>Manufacturing (especially advanced manufacturing and parts of low carbon economy) e.g. chemistry, physics, electronics, nanotechnology</p> <p>Advanced manufacturing – e.g. aerospace professionals – high level STEM skills and ability to commercialise innovations</p>	<p>Definite</p> <p>R&D already key to exploit emerging opportunities. In future increase very likely based on developments of new technologies and to retain competitive edge/internationally – direction of product market strategies</p> <p>Definite unless sudden industry collapse – facing intense international competition</p>	<p>Small</p> <p>Aerospace is a significant sector but small growth forecast e.g. 8,000 over next 5 years</p>	<p>Long</p> <p>Requires Level 4 or above qualifications, highly specialist training</p>	<p>Critical to industry survival and exploitation of new opportunities in higher value added markets</p> <p>Critical to maintaining industry's global performance</p>

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Teaching and research professionals (as well as need to train the trainers)	Education	<p>Definite</p> <p>Possibly tempered by new supply of teachers (e.g. to STEM) from former careers in financial services</p> <p>LLUK has high share of SSVs, and at least 30% of these are for professional staff</p> <p>Ageing workforce likely to accentuate problems</p> <p>Increase of at least 10% predicted in education, MAC shortages of science and maths teachers at secondary level and special needs teachers</p> <p>As growth in adults seeking lifelong learning growing demands on numbers of teachers modes of teaching and importance of training teachers to ensure high quality provision</p>	<p>Medium to large</p> <p>Significant current and future demand</p> <p>Future trends placing greater emphasis on role and developing modes of delivery</p>	<p>Medium</p> <p>Requires level 4 or above qualifications</p>	<p>Essential for ensuring high quality current and future supply of provision and hence high quality skills to industry</p>
Health/social work professionals such as pharmacists	Health and social care	<p>Definite</p> <p>Advances in medical technology, ageing population and prevalence of long-term conditions will increase demand for healthcare, while recession may create demand in social work, only constrained by ability of state or individuals to pay</p> <p>SSVs in professional staff groups account for at least 20% of vacancies in health/social work; some occupations listed on MAC shortage lists; trainee pharmacists in short supply</p>	<p>Medium</p>	<p>Medium to long</p> <p>Requires level 4 or above qualifications</p>	<p>Critical to an expanding sector, and shortages already exist recruitment</p>

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Science professionals (STEM)	Low carbon industries e.g. engineers in specialisms such as aeronautics for the wind industry, civil, electrical, mechanical, structural engineers for marine, geologists to develop offshore carbon capture storage facilities and project managers with engineering expertise	Definite/likely But scale heavily dependent on government investment, levels of innovation to move England to compete internationally and appeal of low carbon products/services to private consumers and business	Small to moderate Growth in sector likely to offset declines in other sectors e.g. utilities Growth could be more moderate/more significant if secured public/private investment	Medium Requires level 4 or above qualifications	Critical skills for the industry, contribution to national economy potentially more moderate
Current shortage of food technologists	Manufacturing (food and drink) Advanced manufacturing (food industry biotechnology)	Definite In current industries Likely in emerging sectors if attempts to stimulate innovations/R&D effective	Small	Medium Requires level 4 or above qualifications	Essential to industry survival as well as strengthening aspects of the biotechnology sector
Urban planners and actuaries	Business services Professional services Public administration	Likely Urban planners will be needed in particular if low carbon economy develops	Small	Medium For urban planners Long For actuaries	Critical for the relevant industries
Engineers e.g. engineering design, project engineering, chartered engineers, scientists	Engineering Construction	Likely Dependent on level of investment in large scale construction projects (e.g. low carbon, process industries, manufacture etc) may be offset by recession Has current deficits – On MAC shortage list	Small	Long Requires level 4 or above qualifications	Essential for the industry, could be sourced through migrant labour

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Associate professional technician roles					
<p>Technician roles</p> <p>Specific skills related to technician roles e.g.</p> <p>1) Higher level STEM skills e.g. IT skills to install and maintain complex electrical systems (automotive and domestic maintenance roles)</p> <p>2) Holistic understanding of innovation and whole product/process lifecycle</p>	<p>Broad range of sectors, particularly manufacturing/advanced manufacturing, process sectors, including oil, gas, electricity, chemicals, automotive, engineering, broadcasting in creative sector, life sciences, pharmaceuticals, agriculture</p>	<p>Likely/definite</p> <p>But dependent on scale of impact of globalisation and predicated on industry survival based on adoption of new technologies, higher value added product market strategies and reduction in lower skilled roles</p> <p>Engineering roles already on MAC shortage list within power generation/transmission sector</p> <p>Broadcast engineers already in short supply</p> <p>Licensed mechanics in civil aviation</p>	<p>Large</p> <p>40,000 roles in hard-to-fill scientific, technical and process occupations within Cogent footprint</p>	<p>Medium</p>	<p>Essential to industry survival if competitive strategy of moving into higher value added markets is pursued</p>
<p>Health/social work associate professionals such as nursing</p>	<p>Health and social care</p>	<p>Definite</p> <p>Advances in medical technology, ageing population and prevalence of long-term conditions will increase demand for healthcare, while recession may create demand in social work, only constrained by ability of state or individuals to pay</p> <p>SSVs in associate professional staff groups account for at least 30% of vacancies in health/social work; some occupations listed on MAC shortage lists</p> <p>True extent of deficits may be masked by migration</p>	<p>Medium</p>	<p>Medium</p> <p>Requires level 3 or above qualifications</p>	<p>Critical to an expanding sector, and shortages already exist in recruitment</p>

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Graphic design roles	Advertising	Likely Already difficult to recruit but may be offset by recession	Small	Medium	Desirable for industry
Technical or associate professionals with a clearly defined area of competence or generalist support role with prescribed responsibility e.g. practitioners in healthcare, PCSOs in the justice sector	Public services occupations including teaching, healthcare, justice and central/local government	Definite Likely to be helpful in meeting public sector spending targets through use of cost-effective staffing mix	Large Numbers given scale of employment in these sectors	Medium	Likely to be important to efficient delivery of services
Investment advisors	Professional and financial services	Definite Significant current and future demand Financial crisis tightening up system for financial advice. Investment advisors in financial services will require level 4 qualification by 2012 as a result of Retail Distribution Review	Medium Approximately 60,000 people will require investment advice qualification	Medium Require level 4 qualification	Essential to service delivery for industry
Advice workers, counsellors and community development workers for victims of crime/substance abuse	Public and voluntary sector	Likely Due to social pressures arising from recession and on-going economic uncertainties for significant parts of the population who risk exclusion	Moderate	Medium	Important for optimising national health and well-being
Sports coaches	Leisure	Likely Already shortages to rise due to increased interest in active leisure pursuits following Olympics and a more active ageing population	Small – medium	Short If already have relevant technical capability	Important for optimising national health and well being

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Skilled trades					
Skilled trades occupations	<p>Construction</p> <p>Manufacturing/ advanced manufacturing</p> <p>Low carbon economy (e.g. nuclear, micro generation)</p> <p>Engineering construction</p> <p>Utilities, e.g. skilled welders, steel erectors, pipe fitters essential to power generation industries</p> <p>Life sciences e.g. pharmaceutical and medical biotechnology</p>	<p>Definite</p> <p>Already skills shortages in some areas. Recession dampened demand in some areas (e.g. construction) but demand forecast to rise mid 2010</p> <p>Migration masking scale of deficiencies in domestic workforce in some areas e.g. construction</p> <p>Ageing workforces give rise to significant future demand</p> <p>Future demand likely, but scale heavily dependent on government investment, levels of innovation to move England to compete internationally and appeal of new products/services to private consumers and business e.g. low carbon</p> <p>Issues about perceived ‘attractiveness’ of roles to potential trainees yet important career pathway to technicians too</p>	<p>Medium</p> <p>Where questions over future demand, ageing workforce suggests significant demand still required</p> <p>Areas historically of persistent skills shortages year on year</p>	<p>Short to medium</p> <p>Requires level 3 or above qualifications</p>	<p>Critical to relevant industries and important more generally to the economy through supply chains. Contribution to build current industrial strengths and emerging priorities</p>
Chefs	Tourism and hospitality	<p>Definite</p> <p>But skills level needed may vary between reheating prepared food and cooking from scratch; need to train indigenous workforce may rise if occupation removed from MAC list</p>	<p>Medium</p>	<p>Medium</p> <p>Requires level 3 or above qualifications</p>	<p>Essential to industry, possibly rising in significance to enable expansion of visitor economy</p>

Figure 7.1: Priority action matrix (continued)

Skill/occupational priority	Sector(s) affected?	Degree of certainty – definite, likely, possible, unknown?	Magnitude – large, medium, small? (current and future)	Lead time – short/medium/long?	Criticality to a) the relevant industry b) English economy through GVA and/or job volume?
Care/customer service roles Care/personal service occupations	Health Social care	Likely Ageing population will lead to increased demand for care services only constrained by ability of state or individuals to pay for care Longstanding difficulty in recruiting care assistants (e.g. poor terms and conditions), abating slightly due to recession. But migration may be masking true scale of the skills issue amongst domestic workforce	Large	Short	Critical to relevant industry and important contributor to employment given job volumes
Cross-cutting skills Employability and basic skills (communication, literacy, numeracy, team working, problem-solving)	Range of sectors, particularly those with strong personal/customer service element	Definite Particularly important for tourism, retail and visitor economy, sectors and areas catering for overseas visitors	Large	Short	Critical role to industry to enhance service quality
Customer service occupations	Range of sectors	Definite Already reported skills deficits Significant current and future demand in key service sectors but also growing in after-care services in parts of manufacturing Expansion in retail sector, banking/insurance and public administration uncertain due to recession but growth of online commerce, possible expansion of tourism for international sports related events and consumer demand for niche products/services	Large Significant demand especially in service sector Growth of 10% predicted in wide variety of sectors	Short	Desirable but substitutable with technology to a limited extent

7.3 Conclusions

This assessment of priorities is necessarily preliminary and a result of professional judgement based on the vast amount of material assembled and analysed for this Audit. It does, however, provide a strong foundation on which to build policy priorities and funding, and further dialogue between stakeholders on the skills priorities for England. We also hope that the very process of publishing and disseminating the results of this National Strategic Skills Audit will encourage adaptation in the behaviour of the key ‘change agents’ – individuals (and their advisers), employers, providers, funders, public agencies and government – which will contribute to issues being actively resolved.

10 key messages emerge from this Audit over and above the detailed specific findings we have already discussed:

We need intelligent markets that anticipate needs

The Audit has adopted a systematic approach to maximise the use of available Labour Market Information (LMI) and has taken an over-arching and long term perspective. It is not possible or desirable to plan **precisely** the ‘numbers’ of skills or jobs that we need now and in the future in particular localities, estimating demand, supply and mismatch and then structuring provision precisely to meet these needs. The labour market is too complex and dynamic and the means of adaptation of supply too slow. But we can use intelligence about the operation and structure of the economy and labour market, to inform the choices and decisions of all the relevant key players – individuals (and their advisers); employers; providers; intermediaries; funders; public agencies; and government. We are all more likely to make better informed decisions if we have access to the same high quality information and ‘intelligence.’ Markets work best when information is rich, dense and available and when actors are able to respond to the ‘signals’ provided. This national information, when enhanced by more detailed local intelligence, may alone be enough to encourage actors to adapt their behaviour, to stimulate dialogue and to identify and anticipate priorities. It may be sufficient to change the behaviour of participants in ways that will address pressing skills priorities. But we can go further than this too. While we cannot plan provision or individual/ employer behaviour, we can encourage, stimulate and ‘nudge’ it, especially when intelligence is supplemented with other policy levers providing financial and/or behavioural incentives.

Skills for jobs matter

The Audit identifies the fundamental importance of increasing skill levels in key sectors and jobs to economic recovery and future economic growth over the longer term. If we are to move towards high performing, high value added sectors, this requires higher level jobs, and in turn skills. To fully maximise economic performance, and to generate real opportunity for individuals and for business success, *we need to ensure that we supply the skills which effectively meet the changing needs and requirements of the labour market.* It is vital that the skills acquired are responsive to labour market changes, and better align, match and balance, what is demanded both in volume and composition. This calls for a renewal of the commitment to ‘**economically valuable skills.**’ Without this we risk: the existence of structural mismatches in the labour market; imbalances between what the skill system produces and what the economy requires; skill shortages, structural unemployment; skill gaps; underemployment; and a growing dependency on migrant workers to meet the needs of the labour market left unmet by the indigenous workforce. As a consequence, the full benefits of up skilling will not be fully realised to individuals, employers, communities or the country as a whole. Skills for jobs must be our mantra.

Demand matters as well as supply

The Audit assesses the extent to which skills needs are being effectively met to identify the most pressing strategic skills priorities. Measures of **skills mismatch** highlight where there are imbalances between, on the one hand, the *supply* of skills and, on the other, what skills are *demanded* for specific jobs. The Audit draws attention to the variation in the nature and scale of different skills mismatches. These will require different attention and hence action – in short, responses are required both on the demand and supply side.

Indeed, **skill shortages** (which occur where employers face difficulties recruiting new workers due to a lack of available skills in the external labour market), clearly require action on the supply side to tackle unmet needs; as do **skill gaps** which indicate deficiencies in skills in the internal labour market. Further, if **unemployed** people are to be 'brought back in' to employment, in many cases they will need to be up skilled or re-skilled. But, in addition **underemployment** needs to be addressed. This requires a different response. When individuals are over-skilled for the jobs they do, this may reflect under-utilisation of skills, and hence employers not sufficiently making use of their employees' available skills within the workplace. But it may also suggest individuals are not pursuing the 'right' qualifications or training valued by employers (i.e. economically valuable skills). Underemployment can best be tackled by more companies moving up the value chain, into higher value added products and services; using a more knowledge-intensive work organisation and hence better means to effectively deploy their more highly skilled and qualified workers,' but it also requires individuals to pursue skills and qualifications that employers really do need. The solution to mismatches requires: steps to increase the number of higher skilled jobs; to continue to supply people to fill those jobs in the 'right skills areas' (influencing skill supply flows as appropriate to meet demand); and, then, more effective job-matching so that people's skills are deployed effectively.

The workplace matters

With much of skills mismatch being internal to organisations (such as skill gaps, and underemployment), this places crucial importance on the workplace. The appropriate supply of skills, whilst essential, is not enough on its own. It is a necessary, but not sufficient, condition for success. What goes on in the office, factory or shop floor is as important as what goes on in school, college and university. This means that high performance working (HPW) practices which seek to improve the management of organisations, and their staff, are as much part of the solution to skills issues as skills provision and learner choice. This raises issues for policy makers about how to provide public services to businesses and support a greater take-up of HPW 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 developments and utilisation in the workplace and also firm performance.

Migration matters

Migration is clearly another important feature of the labour market. It can mask underlying skills mismatches between the skills demanded and those available in the domestic workforce. Migrant workers will help to overcome some skills shortages and will represent a preferred source of skills for some employers, possibly also affecting training activity. The migrant workforce is relatively highly concentrated in particular occupations, sectors and regions. However, much migration is 'low skilled' and may act as a deterrent to employers to 'raise their game' and move from 'low cost, low skilled' to more highly skilled operations. Indigenous workers would be in a better position to compete with other EEA nationals, if they had better signposting via advice and guidance, and access to appropriate training the skills that the relevant employers seek. 'Non EEA migrants' are now subject to the Points Based Migration System (with a strong focus on skilled workers). More opportunities for indigenous workers in skilled occupations could be incentivised by indicating timescales for removing those occupations from the shortage list where there is greatest potential to grow a sustainable supply of labour from the indigenous workforce.

Sectors and geography matter

Studies of the 'emerging sectors' identified in *New Industry, New Jobs* (BERR, 2009) commissioned as a part of the Audit together with the skills assessments produced by Sector Skills Councils (SSCs), show that sectoral differences in need, mismatch and skill issues are significant. Distinct sectors experience a specific combination of drivers of demand, with particular consequences for businesses, jobs, and in turn skills. Where there is a focus on particular sectors (nationally or regionally) in terms of strategy, policy or delivery, it is essential to take clear cognisance of the particularities of sectoral priorities. Nonetheless, our work shows too that there are many transversal/pan sector priorities, where issues are common across sectors. In addition, there are considerable variations across the regions in the pattern of skills demand and nature of skills imbalances. Such regional distinctiveness also needs to be recognised in terms of shaping action.

High level skills and jobs matter

The Audit highlights the increasing importance of higher skills and jobs to the economy. There is a significant demand for highly skilled workers in the labour market, with the largest number of people employed as managers, professionals, associate professionals and in technical roles, with associated requirements for higher level skills. Furthermore, the importance of these roles is anticipated to increase in future with the effects of drivers of change such as globalisation, on-going technological developments and continued growing sophistication in consumer demand.

Significant progress has been made in raising the qualifications levels of the workforce and **stimulating supply** over the last 10 years, so that compared to other OECD nations our supply of highly skilled people is likely to place us 10th in the OECD by 2020. This progress needs to be sustained to retain our international position. A further challenge, however, is ensuring we supply the ‘right,’ economically valuable skills, which employers demand and which then can be to be effectively deployed in the workplace. Whilst overall returns to higher qualifications have held up (despite the recent growth in higher skills), there is substantial variation in experience by subject area. This raises questions about the provision currently supplied, and student choices. The ageing workforce, and associated decline in the number of 15 to 24 year olds also means that we will increasingly be dependent in the future on up skilling older workers already in the labour market to meet our higher skills goal, and this raises issues about modes of provision, as well as the nature of provision.

There are also **demand side** issues. Despite the recent growth in high skilled jobs, there are indications that the UK has recently experienced a relatively slow rate of high skilled job creation, and certainly one which is well below the overall growth of high skilled people. Skills shortages are higher in more highly skilled professional occupations, but there is increasing evidence of underemployment in the workforce, which raises questions about the relevance of supply, and whether employers are fully optimising their employees’ skills, as well as the adequacy of job matching in the labour market.

Intermediate skills and jobs matter

There are pressing strategic skills issues at intermediate skills levels too. In recent times, there has been little change in the proportion of the workforce qualified at intermediate levels (level 3) and consequently, on current progress, we are not expected to meet the goals set for intermediate level in the Government’s Skills Strategy. The Audit highlights the growing importance of technicians, driven by growing technological complexity, many within emerging sectors as well as existing sectors. This calls for vocational knowledge and workers with the ability to apply an in-depth understanding of a particular (often technical) field in a practical setting. This, in turn, places a growing emphasis on strengthening the intermediate vocational career pathways (from level 3) to ensure that the skill requirements for these jobs can be met and people can progress into these areas. Furthermore, whilst there are indications that in some of the traditional sectors, intermediate jobs (in for example skilled trades) are forecast to decline, many of these areas comprise a largely ageing workforce, and when replacement demand is taken into account, combined with issues about the adequacy of supply, this highlights significant pressing skills supply needs. In addition, the highest densities of skills shortages occur in many of these areas, and have persisted for some time. Further, there will also be emerging opportunities amongst the ‘emerging’ sectors for skilled trades too which will need to be met.

Generic, employability and basic skills matter

There is substantial evidence within the Audit pointing to the importance of generic skills – which are often pervasive across the economy. These include ‘employability skills’ such as customer handling, problem solving, team working, oral and written communication, but also extend to cover a basic platform of literacy and numeracy too. Indeed, evidence is increasingly emphasising the importance of ‘T-shaped’ skillsets where technical aspects to jobs, requiring detailed knowledge and skills, are supplemented with more generic skills, which enable individuals to work more effectively with their colleagues and/or customers and apply their technical expertise in practice, often in commercial settings. This is supported by recent survey findings (Shury *et al*, 2010) where employers often cite a range of technical and practical skills in combination with generic skills as being the skills lacking amongst workers. Another vital component of the generic skills issue concerns the importance of management. High quality management skills are crucial to achieving high performance working,

management. High quality management skills are crucial to achieving high performance working, and to ensuring that businesses are continually developed and organisations effectively managed to make full use of their staff to optimise business benefits.

Low skilled jobs are expected to persist

Despite the continued growth of highly skilled work within the labour market, and a substantial overall decline in recent years in lower skilled jobs, in the future it is expected that significant employment will remain in areas that have traditionally demanded low skills. Current forecasts suggest that this could be in the region of about a fifth of all jobs working in some substantially growing sectors such as retail and hospitality and care of the young and elderly. Many such jobs experience high labour turnover, requiring continuing skills replenishment. It is also the case that a lot of these jobs are in considerable need of up-skilling to improve customer service, product/service quality and deliver increasingly tailored services to individuals and families. Many such jobs, in addition, operate in specifically local labour markets, face limited international (or even often national) competition, but meet important local public and market needs. Improving the quality of such jobs and the goods/services provided is important. Whilst the actual scale of future demand may vary depending on broader structural developments within the labour market, changes in consumer demand, and the extent to which a significant number of businesses adjust their modes of working, break out of 'low skill equilibrium' and move into more higher value markets, it is still expected that this will be a key source of employment. Moreover, these jobs may also be important for those seeking to move out of unemployment and through the labour market, people supplementing incomes through part-time work (such as students and women returners); and as a key source of employment for migrant workers.

In order to further develop our understanding in preparation for, and in, the 2011 Skills Audit, UKCES will:

- work with BIS to further develop the identification of key sectors that are both economically significant and exhibit skill deficiencies;
- work with HEFCE to identify areas of imbalance between skills demand and supply in higher level skills;
- work with the MAC to incorporate the results of their developed methodology for, and results from, their 2010 Review of the Shortage Occupation list.
- commission a new set of projections which take account of the impact of the recession and structural change on the labour market and skills.

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Glossary of terms

AI Artificial Intelligence	GNVQ General National Vocational Qualification	OMC Open Method of Co-ordination
APS Annual Population Survey	GOR Government Office Region	ONC Ordinary National Certificate
BERR Department for Business, Enterprise and Regulatory Reform	GVA Gross Value Added. Gross Value Added is the difference between the value of the output produced by a sector or region and its intermediate consumption. Intermediate consumption is the cost of raw materials and other inputs that are used up in the production process	OND Ordinary National Diploma
BIS Department for Business, Innovation and Skills	HE Higher Education	ONS Office of National Statistics
BRIC Brazil, Russia, India, China	HESA Higher Education Statistics Agency	PAYE Pay-As-You-Earn. The system of withholding tax by an employer for the purpose of paying an employee's income tax
BRIMICS Brazil, Russia, India, Mexico, Indonesia, China, South Africa	HMT Her Majesty's Treasury	PCSO Police Community Support Officer
BTEC Business and Technology Educational Council. BTEC may refer to the Council itself or to the vocational qualification which it administers	HPWPs High Performance Working Practices	PR Public Relations
CBi Confederation of British Industry	IAEA International Atomic Energy Agency	PSA Public Service Agreement targets. A Public Service Agreement sets out what a department will deliver in the form of measurable targets over the public expenditure review period, in return for its agreed spending
CCS Carbon Capture and Storage	IAG Information, Advice and Guidance	PWC Pricewaterhouse Coopers
CIPD Chartered Institute of Personnel and Development	ICT Information and Communication Technology	R&D Research and Development
DCDC Development, Concepts and Doctrine Centre	IEA International Energy Agency	SAMI St. Andrews Management Institute
DCSF Department for Children, Schools and Families	IER Institute for Employment Research	Semta Sector Skills Council for Science, Engineering and Manufacturing Technologies
DfES Department for Education and Skills	IES Institute for Employment Studies	SIC Standard Industrial Classification
DELNI Department of Education and Learning Northern Ireland	ILO International Labour Organisation	Skill gap A lack of skills, work experience or qualifications among workers already employed in a job. Skill gaps refer to gaps internal to an organisation
DTI Department for Trade and Industry	ILR Individual Learner Record	SMEs Small and Medium Sized Enterprises. Typically defined as those employing fewer than 250 people
DWP Department for Work and Pensions	IP Intellectual Property	SOC Standard Occupational Code
Economic inactivity Description of the state of not actively seeking work	JSA Jobseeker's Allowance	SSC Sector Skills Council
EEA European Economic Area. The trade regulation area which includes the EU member states and Switzerland, Iceland, Norway and Liechtenstein	LCSS Low Carbon Skills Strategy	SSDA Sector Skills Development Agency. Now defunct; a precursor of the UK Commission for Employment and Skills
Employment rate The number of people in employment expressed as a percentage of the relevant population. For example, the working age employment rate is the number of people in employment aged 16-59/64 as a percentage of the population aged 16-59/64	LFS Labour Force Survey	SSV Skill Shortage Vacancy. A subset of job vacancies where a role is hard-to-fill due to a lack of skills, work experience or qualifications in the applicants for the role. Note that SSVs refer to skill shortages external to an organisation
EU European Union. The EU currently has 27 member states	LLUK Sector Skills Council for Lifelong Learning (learning professionals)	STEM Science, Technology, Engineering, Mathematics
Eurostat European Commission official statistics body	LMI Labour Market Intelligence/Labour Market Information	UKCES See UK Commission
G7 Group of seven industrialised nations	LSC Learning and Skills Council	UK Commission UK Commission for Employment and Skills
G20 Group of 20 industrialised nations	MAC Migration Advisory Committee	UN United Nations
GCSE General Certificate of Standard Education. Standardised examinations taken by 16-year-olds in compulsory education	MIT Massachusetts Institute of Technology	USD US dollars
GDP Gross Domestic Product. A measure of the value of total economic activity. Gross Domestic Product can be measured in three ways:	MRO Maintenance, Repair and Overhaul	VAT Value-Added Tax
<ul style="list-style-type: none"> • As the sum of all the Value Added by all activities that produce goods and services (output); • As the total of incomes earned from the production of goods and services (income); or • As the total of all expenditures made either in consuming finished goods and services or adding to wealth, less the cost of imports (expenditure) 	NESS National Employer Skills Survey	WTO World Trade Organisation
	NESTA National Endowment for Science, Technology and the Arts	WWF World Wide Fund for Nature/World Wildlife Fund
	NHS National Health Service	
	NOMIS UK official labour market statistics service provided by the Office for National Statistics	
	NQF National Qualification Framework	
	NVQ National Vocational Qualification	
	OECD Organisation for Economic Co-operation and Development. The OECD currently has 30 members	
	OGC Office of Government Commerce	

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Appendix 1: List of key LMI sources

Labour Force Survey

The Labour Force Survey (LFS) is a quarterly sample survey of households living at private addresses in Great Britain. Its purpose is to provide information on the UK labour market that can then be used to develop, manage, evaluate and report on labour market policies. The questionnaire design, sample selection, and interviewing are carried out by the Social and Vital Statistics Division of the Office for National Statistics (ONS) on behalf of the Statistical Outputs Group of the ONS.

ONS publishes full UK LFS results. However, the fieldwork is carried out separately; by ONS for Great Britain, and by the Central Survey Unit of the Department of Finance and Personnel in Northern Ireland on behalf of the Department of Trade and Investment (DETINI).

The survey seeks information on respondents' personal circumstances and their labour market status during a specific reference period, normally a period of one week or four weeks (depending on the topic) immediately prior to the interview.

The LFS is carried out under a European Union Directive and uses internationally agreed concepts and definitions. It is the source of the internationally comparable (International Labour Organisation) measure known as 'ILO unemployment.'

National Employer Skills Survey

The National Employer Skills Survey (NESS) is a biannual survey of English employers. It provides detailed analysis at a national, regional and sector level of the extent and nature of employers' recruitment problems, skill gaps and training activity.

The overarching aim of NESS is to provide the UK Commission, the Learning and Skills Council (LSC), BIS, the Alliance of Sector Skills Councils, and their partners with robust and reliable information from employers in England on skills deficiencies and workforce development to serve as a common basis to develop policy and assess the impact of skills initiatives.

The most comprehensive survey of its kind in the UK, NESS 2009 incorporated responses from over 79,000 employers. Since 2005, NESS has also included a detailed follow-up on the cost of training.

Working Futures 2007-2017

Published by the UK Commission for Employment and Skills, *Working Futures 2007-2017* is the third in the *Working Futures* series, a regular set of projections of the effects on the UK labour market of technological change, government policy, macroeconomics and social change. It presents a view of medium to long term trends across five to 10 years.

Working Futures is a key part of the UK's response to the European Council's conclusions on anticipating and matching labour market needs. All EU member states have been charged with contributing to the assessment and anticipation of future skills requirements.

The 2007-2017 report comprises two main publications: a final report which summarises and presents findings, and a Technical Report which provides quantitative support for the findings, as well as sets out the basis for the statistical models used to project labour market futures to 2017.

Modelling is based on a breakdown of information provided at a range of sectoral levels. The definitions used are mainly based on the 2003 Standard Industrial Classification (SIC) codes, presented along broad sectoral and industry categories. Underlying these results are more detailed estimates for a 41-fold and 67-fold breakdown of employment, again based on SIC codes.

UK Employment and Skills Almanac 2009

Published by the UK Commission for Employment and Skills, the UK Employment and Skills Almanac consolidates data from a number of surveys of the labour market in England, Scotland, Wales, Northern Ireland and the UK.

It is a repository of high-quality, robust indicators on a number of labour market factors including the UK macroeconomic context, the productivity and drivers of productivity in the workforce, the structure and outcomes of employment, the structure and outcomes of skills, and inequalities in the employment system.

The Employment and Skills Almanac is presented as a hard copy publication providing analysis and spotlight features on the statistics, as well as a website where data can be accessed in a downloadable format (<https://almanac09.ukces.org.uk/>).

Ambition 2020: World Class Skills and Jobs for the UK

The Leitch Review of skills in the UK set the target of becoming a world leader – within the top eight in the world – in low, medium and high skills by 2020. Published by the UK Commission for Employment and Skills, *Ambition 2020* is the first annual assessment of progress towards those targets. It sets out and assesses progress towards the aims and priorities for the four nations of England, Scotland, Wales and Northern Ireland. It provides a sound evidence base for advice on strategies, policies and measures needed to increase skills, employment and productivity. As the first in an annual series, the first report also provides a baseline from which to assess future progress.

The report sets out the economic performance agenda: productivity, jobs and income equality and how the UK compares on these measures of success against other leading countries. It provides a solid evidence base for the current picture of employment and skills as well as modelling several scenarios of these indicators towards 2020.

Migration Advisory Committee

The Migration Advisory Committee (MAC) is a non-departmental public department sponsored by the UK Borders Agency of the Home Office. It provides independent evidence-based advice to the UK Government on skills shortages, skill gaps and labour shortages with the UK. The aim of the research is to assist the MAC and policymakers to compile lists of occupations that can be filled by allowing recruitment of migrants.

Key publications from the MAC used in the preparation of the National Strategic Skills Audit include the Review of Labour Shortages, Skills Shortages and Skill Gaps, and Skilled Shortage Sensible: The recommended shortage occupation lists for the UK and Scotland.

Review of Labour Shortages is a review of international academic and governmental evidence on skills and migration, providing a comparative analysis of international policy on skills shortage and migration, as well as policy implications and recommendations for the MAC.

Skilled Shortage Sensible is an analysis of skills shortage vacancies in the UK based on research into the nature of work, the supply of workers, and the evidence on the applicability of international migration and recruitment to meet UK needs.

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Appendix 2: Disaggregating the measures of current and future economic significance

In the main text we presented findings which ranked sectors in terms of economic significance based on an overall measure combining productivity and employment indicators. As we explained in the text, a sector's relative position in these rankings could be because of its performance in either employment or productivity, or indeed, in both.

Here we disaggregate these overall measures so that readers can identify a sector's ranking on productivity and employment separately, both in terms of current and future significance.

Current sectoral economic significance

Overall ranking	Productivity rankings			Employment rankings		
	Level, 2007	Change 2002-07	Level, 2009	Change 2002-07	Level, 2009	Change 2002-07
1 Financial services	1 Electricity, gas and water	1 Textiles, etc.	1 Business services	1 Business services	1 Business services	1 Business services
2 Business services	2 Real estate, etc.	2 Financial services	2 Health and social care	2 Health and social care	2 Construction	2 Construction
3 Renting and real estate	3 Financial services	3 Post and telecoms	3 Retail trade	3 Retail trade	3 Real estate, etc.	3 Real estate, etc.
4 Computing	4 Mining, etc.	4 Transport equipment	4 Education	4 Education	4 Health and social care	4 Health and social care
5 Health and social care	5 Post and telecoms	5 Machinery, etc.	5 Construction	5 Construction	5 Education	5 Education
6 Retail	6 Computing	6 Computing	6 Miscellaneous services	6 Miscellaneous services	6 Public administration, etc.	6 Public administration, etc.
7 Post and telecoms	7 Chemicals, etc.	7 Chemicals, etc.	7 Hotels and restaurants	7 Hotels and restaurants	7 Transport	7 Transport
8 Electricity, gas and water	8 Transport equipment	8 Metals, etc.	8 Public administration, etc.	8 Public administration, etc.	8 Miscellaneous services	8 Miscellaneous services
9 Construction	9 Publishing, etc.	9 Retail trade	9 Transport	9 Transport	9 Computing	9 Computing
10 Transport equipment manufacture	10 Food and drink, etc.	10 Manufacturing NES	10 Wholesale trade	10 Wholesale trade	10 Hotels and restaurants	10 Hotels and restaurants
11 Hospitality	11 Machinery, etc.	11 Hotels and restaurants	11 Financial services	11 Financial services	11 Agriculture, etc.	11 Agriculture, etc.
12 Transport	12 Transport	12 Real estate, etc.	12 Real estate, etc.	12 Real estate, etc.	12 Retail trade	12 Retail trade
13 Chemicals	13 Wholesale trade	13 Wholesale trade	13 Vehicle maintenance, etc.	13 Vehicle maintenance, etc.	13 Wholesale trade	13 Wholesale trade

Overall ranking	Productivity rankings			Employment rankings		
	Level, 2007	Change 2002-07		Level, 2009	Change 2002-07	
14 Wholesale	14 Metals, etc.	14 Mining, etc.	14	14 Machinery, etc.	14	Vehicle maintenance, etc.
15 Machinery, etc.	15 Vehicle maintenance, etc.	15 Electricity, gas and water	15	15 Computing	15	Financial services
16 Education	16 Public administration, etc.	16 Business services	16	16 Chemicals, etc.	16	Food and drink, etc.
17 Miscellaneous services	17 Manufacturing NES	17 Food and drink, etc.	17	17 Post and telecoms	17	Wood, pulp, etc.
18 Public administration	18 Textiles, etc.	18 Vehicle maintenance, etc.	18	18 Agriculture, etc.	18	Publishing, etc.
19 Mining and quarrying	19 Construction	19 Transport	19	19 Food and drink, etc.	19	Manufacturing NES
20 Food and drink manufacture	20 Wood, pulp, etc.	20 Wood, pulp, etc.	20	20 Metals, etc.	20	Post and telecoms
21 Vehicle maintenance	21 Miscellaneous services	21 Publishing, etc.	21	21 Transport equipment	21	Mining, etc.
22 Metals manufacture	22 Agriculture, etc.	22 Health and social care	22	22 Publishing, etc.	22	Electricity, gas and water
23 Textiles manufacture	23 Education	23 Agriculture, etc.	23	23 Wood, pulp, etc.	23	Transport equipment
24 Publishing and printing	24 Business services	24 Miscellaneous services	24	24 Manufacturing NES	24	Chemicals, etc.
25 Other manufacturing	25 Health and social care	25 Public administration, etc.	25	25 Electricity, gas and water	25	Metals, etc.
26 Agriculture	26 Retail trade	26 Construction	26	26 Textiles, etc.	26	Machinery, etc.
27 Wood and paper manufacture	27 Hotels and restaurants	27 Education	27	27 Mining, etc.	27	Textiles, etc.

Future sectoral economic significance

Overall ranking	Productivity rankings						Employment rankings						
	Level, 2017		Change 2007-12		Change 2012-17		Level, 2017		Change 2007-12		Change 2012-17		
1	Financial services	1	Electricity, gas and water	1	Textiles, etc.	1	Post and telecoms	1	Business services	1	Business services	1	Computing
2	Business services	2	Real estate, etc.	2	Financial services	2	Chemicals, etc.	2	Health and social care	2	Computing	2	Business services
3	Renting and real estate	3	Financial services	3	Post and telecoms	3	Machinery, etc.	3	Retail trade	3	Health and social care	3	Miscellaneous services
4	Computing	4	Mining, etc.	4	Transport equipment	4	Computing	4	Education	4	Hotels and restaurants	4	Hotels and restaurants
5	Health and social care	5	Post and telecoms	5	Machinery, etc.	5	Transport equipment	5	Construction	5	Financial services	5	Health and social care
6	Retail	6	Computing	6	Computing	6	Agriculture, etc.	6	Hotels and restaurants	6	Construction	6	Retail trade
7	Post and telecoms	7	Chemicals, etc.	7	Chemicals, etc.	7	Real estate, etc.	7	Miscellaneous services	7	Miscellaneous services	7	Construction
8	Electricity, gas and water	8	Transport equipment	8	Metals, etc.	8	Textiles, etc.	8	Public administration, etc.	8	Retail trade	8	Financial services
9	Construction	9	Publishing, etc.	9	Retail trade	9	Mining, etc.	9	Transport	9	Education	9	Transport
10	Transport equipment manufacture	10	Food and drink, etc.	10	Manufacturing NES	10	Electricity, gas and water	10	Wholesale trade	10	Wholesale trade	10	Manufacturing NES
11	Hospitality	11	Machinery, etc.	11	Hotels and restaurants	11	Wholesale trade	11	Financial services	11	Vehicle maintenance, etc.	11	Wholesale trade
12	Transport	12	Transport	12	Real estate, etc.	12	Metals, etc.	12	Real estate, etc.	12	Transport	12	Education
13	Chemicals	13	Wholesale trade	13	Wholesale trade	13	Financial services	13	Computing	13	Real estate, etc.	13	Vehicle maintenance, etc.
14	Transport	14	Metals, etc.	14	Wood, pulp, etc.	14	Public administration, etc.	14	Vehicle maintenance, etc.	14	Manufacturing NES	14	Real estate, etc.

Overall ranking	Productivity rankings						Employment rankings						
	Level, 2017		Change 2007-12		Change 2012-17		Level, 2017		Change 2007-12		Change 2012-17		
15	Mining and quarrying	15	Public administration, etc.	15	Publishing, etc.	15	Retail trade	15	Machinery, etc.	15	Public administration, etc.	15	Public administration, etc.
16	Transport equipment manufacture	16	Vehicle maintenance, etc.	16	Textiles, etc.	16	Food and drink, etc.	16	Post and telecoms	16	Food and drink, etc.	16	Post and telecoms
17	Public administration	17	Textiles, etc.	17	Retail trade	17	Health and social care	17	Chemicals etc	17	Post and telecoms	17	Wood, pulp, etc.
18	Hospitality	18	Manufacturing NES	18	Health and social care	18	Wood, pulp, etc.	18	Food and drink, etc.	18	Wood, pulp, etc.	18	Publishing, etc.
19	Machinery manufacture	19	Wood, pulp, etc.	19	Manufacturing NES	19	Publishing etc	19	Metals, etc.	19	Publishing, etc.	19	Food and drink, etc.
20	Vehicle maintenance, etc.	20	Construction	20	Vehicle maintenance, etc.	20	Vehicle maintenance, etc.	20	Agriculture, etc.	20	Transport equipment	20	Metals, etc.
21	Printing and publishing	21	Agriculture etc	21	Education	21	Education	21	Transport equipment	21	Chemicals, etc.	21	Chemicals, etc.
22	Food and drink manufacture	22	Misc Services	22	Food and drink, etc.	22	Business services	22	Publishing, etc.	22	Metals, etc.	22	Mining, etc.
23	Other manufacturing	23	Education	23	Transport	23	Transport	23	Manufacturing NES	23	Mining, etc.	23	Electricity, gas and water
24	Metals, etc.	24	Health and social care	24	Miscellaneous services	24	Construction	24	Wood, pulp, etc.	24	Electricity, gas and water	24	Transport equipment
25	Agriculture	25	Business services	25	Hotels and restaurants	25	Manufacturing NES	25	Electricity, gas and water	25	Machinery, etc.	25	Agriculture, etc.
26	Wood and paper manufacture	26	Retail trade	26	Business services	26	Miscellaneous services	26	Textiles, etc.	26	Agriculture, etc.	26	Machinery, etc.
27	Textiles manufacture	27	Hotels and restaurants	27	Construction	27	Hotels and restaurants	27	Mining, etc.	27	Textiles, etc.	27	Textiles, etc.

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Notes:

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UK COMMISSION FOR
EMPLOYMENT AND SKILLS

The UK Commission aims to raise UK prosperity and opportunity by improving employment and skills. Our ambition is to benefit employers, individuals and government by advising how improved employment and skills systems can help the UK become a world-class leader in productivity, in employment and in having a fair and inclusive society: all this in the context of a fast-changing global economy.

Because employers, whether in private business or the public sector, have prime responsibility for the achievement of greater productivity, the UK Commission will strengthen the employer voice and provide greater employer influence over the employment and skills systems.

Having developed a view of what's needed, the UK Commission will provide independent advice to the highest levels in government to help achieve those improvements through strategic policy development, evidence-based analysis and the exchange of good practice.

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