



UK COMMISSION FOR
EMPLOYMENT AND SKILLS

Careers of the Future Background report

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Careers of the Future: Background Report

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Foreword

The UK Commission for Employment and Skills (UKCES) is a publicly-funded, industry-led organisation providing leadership on skills and employment issues across the UK. Our ambition is for a sustained recovery driven by the skills and talents of people, with the creation of “ladders of opportunity” for everyone to get in and on in work.

As a central part of our approach we mobilise impartial and robust business and labour market research to inform choice, practice and policy. Our key audiences include business, trade unions, government, industry bodies and education providers.

Access to high quality intelligence about the world of work is also critical for individuals: for young people looking to get a foothold in a good career and for established workers looking to progress in their career by gaining new skills.

Our research on *Careers of the Future* seeks to deploy the UK Commission’s intelligence about the labour market for the specific purpose of supporting individual career choices. The research highlights 40 top jobs in 10 key occupations based on an analysis of the labour market, profiling 12 of them in detail. As a result we hope to encourage young people, and those who support them, to find out more about the wide range of job opportunities, exploring the huge range of information and resources that are available from careers service agencies and professional and sector bodies across the UK, such as the National Careers Service, Skills Development Scotland, Careers Wales and Northern Ireland, NIDirect.

This Evidence Report provides essential background to *Careers of the Future*, including a detailed description of the methodology employed to assess those top jobs with positive career prospects. The analysis is set in the context of the UK Commission’s wider work on the labour market and its core intelligence products (current and forthcoming), which provide rich and distinct business intelligence. It is this wider labour market analysis that has informed our understanding of developments in the economy, broad employment trends and, therefore highlighted existing and future careers opportunities and skills needs, thus, forming the springboard for this work.

Much of the analysis upon which *Careers of the Future* is based relies on forecasts and projections of the future. As with all projections and forecasts, this analysis should be regarded as being indicative of likely trends and orders of magnitude, given a continuation of past patterns of behaviour and performance, rather than definitive, precise forecasts of the future. Nonetheless, we believe it is important to make the latest evidence available as part of a balanced picture of labour market prospects. The results should not be seen as definitive and should be used in conjunction with other sources of intelligence about the labour market.

Sharing the findings of our research and engaging with our audience is important to develop the evidence on which we base our work. Evidence Reports are our chief means of reporting our detailed analytical work. All of our outputs can be accessed online at <https://www.gov.uk/government/organisations/uk-commission-for-employment-and-skills>

But these outputs are only the beginning of the process and we engage in other mechanisms to share our findings, debate the issues they raise and extend their reach and impact.

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

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

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Executive Summary

Introduction

This report provides context and technical background information for the UK Commission's careers publication *Careers of the Future*.

The role of the UK Commission in labour market intelligence

The UK Commission has a distinct role in improving access to high quality labour market intelligence to inform choice, policy and practice. This includes making data available to support careers decisions. However, the UK Commission is not a provider of careers advice and guidance.

Key trends in the labour market

In chapter 3, in order to set the context for *Careers of the Future*, we examine the key trends in the labour market that have the greatest relevance to careers prospects.

- The best prospects for future jobs growth are expected to lie with higher skilled management, professional and associate professional and technical occupations; together with some lower-skilled areas including caring and customer service related occupations.
- The effect of replacement demands is expected to mean that all broad occupational areas will have a need for new recruits. Even those occupations where employment is projected to decline may still offer good career prospects, with a significant number of job openings.
- Business need is a key dimension to consider with regard to career prospects. An analysis of skill shortages tells us about the areas in which employers face the greatest problems in recruiting people with the appropriate skills. This shows that skilled trades occupations are a key focus of shortages together with “STEM” professionals.
- Pay is a key indicator of job quality (although not the only one) and is an important criterion in careers decisions. There are large differences in the levels of pay associated with different occupations, mainly reflecting the level of skill required but also other factors relating to the desirability of the job.

Approach used to identify the top jobs

Chapter 4 provides an overview of the analytical approach used to identify the top jobs that are featured in the *Careers of the Future* publication, including the process by which the indicators used in the occupational model were selected, the method used to compute scores for each occupation, and the approach taken to presenting the results of the analysis in the careers publication. The key points are as follows:

- The model of occupational prospects uses four indicators relating to future job openings, future net employment change, current average pay and current business need (skill shortages).
- An overall composite score is calculated for each occupation based on the weighted sum of scores for each of the indicators and this is used to rank occupations. A ranked list of the “top 100” jobs is provided in Appendix A.
- In order to provide a diverse picture of the career opportunities that are available the overall ranking of top jobs has been segmented using a set of “job families”, with the highest ranking jobs in each family presented in the careers publication. This provide the basis for the 40 top jobs in 10 key job families that are presented in *Careers of the Future*.

1 Introduction

1.1 Background

This document accompanies the UK Commission's [Careers of the Future report](#). It provides essential background to that report, describing in detail the methodology employed to assess top careers. The specifics of this approach are set in the context of the UK Commission's wider work on labour market analysis, and its core intelligence products (current and forthcoming). This then serves to show how our understanding of broader labour market developments and existing and future employment and skills needs, has provided an important springboard to undertaking this assessment of careers.

1.2 Structure of the document

This report sets out the analytical approach that forms the basis for the *Careers of the Future* publication in the context of the UK Commission wider work on the labour market.

The key elements are as follows:

- The UK Commission's role in labour market research – how does the UK Commission take forward its distinct remit in this area and how does it seek to meet the information needs of the key groups in the labour market, including individuals, employers, education and training providers and policy-makers?
- Significant trends in the labour market – what are the key features and trends that we can observe in the labour market and how do they shape career prospects?
- The analytical approach used in *Careers of the Future* – how does this approach harness the labour market intelligence assets of the UK Commission to provide an objective assessment of career prospects?

1.3 The overall role and remit of the UK Commission

The UK Commission for Employment and Skills (UKCES) is a publicly funded, industry-led organisation providing leadership on skills and employment issues across the UK.

Together, our Commissioners comprise a social partnership of senior leaders of large and small employers across from across industry, trade unions, third sector, further and higher education and across all four UK nations.

Our Vision, as set out in our [business plan](#) for 2014/15, is to create with industry the best opportunities for the talents and skills of people to drive competitiveness, enterprise and growth in a global economy. We are working with industry and Government to secure improvements in the skills and employment system.

Over the next three years our Ambition is to see industry in the UK create “ladders of opportunity” for everyone to get in and on in work. This means employers improving entry routes into the labour market for young people, ensuring the existing workforce has the skills businesses need to compete and individuals need to progress, and deploying those skills in a way that drives productivity and growth.

Providing access to intelligence about the labour market and careers opportunities is a critical part of achieving this Ambition. Not only is it crucial, to enabling young people to get into work and effectively navigate a jobs market that is more complex than ever before, but more established workers too seeking to progress who need reliable information about future career opportunities and the right pathways to pursue to reach higher rungs of the career ladder.

Research and intelligence is integral to the UK Commission’s way of working, as reflected in the four core elements of our approach, set out in our latest business plan.

We are commissioner-led, with 30 leaders, drawn from a variety of sectors including big business, small business, trade unions, further and higher education, and the voluntary and Third Sectors. This means the Commission forms a strong social partnership, providing a unique perspective that is based on the diversity and independence of Commissioner thinking. Consequently, we are able to reach out into industry and take a long term, ‘big picture’ view of skills and jobs for the UK. Our Commissioner leadership also provides access to distinctive insights into the way in which the wider labour market is evolving, and the actions of specific industries and occupations are being shaped by key drivers including technology and globalisation.

Our approach is also explicitly evidence-based. We apply impartial and robust business and labour market research, in combination with commissioner insights, to inform choice, policy and practice in the field of employment and skills.

This relies upon an open and collaborative approach. We work with government to bring forward effective policy solutions and with business to influence business behaviour. In both cases this work is founded on robust intelligence. Moreover, we pursue transparency by working to improve access to our data and intelligence, through our LMI for All open data initiative, for example.

The UK Commission is focused on undertaking research and securing improvements in areas where we can make the biggest impact. This is partly about influencing government policy and the design of the employment and skills system. But, it is also about enabling employers to take a strong leadership role. As our broader research has shown (see for example our [Employer Ownership](#) vision and the recent skills statement [Growth through People](#)) employer leadership on skills, in partnership with Government and wider players is essential to a strong system, and improving the employment and learning opportunities on offer. High quality information about the labour market, clearly then plays an important role shaping investment behaviour and the actions businesses and individuals take.

The role of the UK Commission in the field of business and labour market intelligence is examined in more detail in the next chapter.

2 The UK Commission's role in labour market intelligence

- The UK Commission plays a distinct role in the field of labour market intelligence by virtue of:
 - Its positioning as an honest broker with an impartial perspective, seeking to provide intelligence products that are robust and conform to common and consistent definitions and methods, set down by the Government Social Research Service.
 - Its multifaceted role at different stages in the research process, which incorporates data collection via its major employers surveys through to active dissemination of information and intelligence across a number of channels.
 - Its unique role in providing overarching synthesis of key labour market issues as part of a “whole system” approach to generating insights.
 - The wide range of audiences it seeks to engage, from individuals making decisions about careers to policymakers in central government, but with business acting as a key audience.
 - The variety of purposes to which the information is applied; including to inform choice, policy and practice in many different contexts.
- A key part of the UK Commission's work programme is to improve access to labour market information to support careers decisions. However, the UK Commission is not a provider of careers advice and guidance.

2.1 Introduction

The effective operation of the labour market is the best way of ensuring that individuals, employers and the economy as whole have the skills they need. The labour market works best when accessible, timely and relevant labour market and skills information are available. This chapter examines the role of the UK Commission in helping to contribute to this information requirement.

2.2 The UK Commission's distinctive role

The UK Commission's role in strengthening labour market information in the UK system is unique and multi-faceted. Given its position as a Non-Departmental Public Body and important social partnership, this sets it apart from other organisations operating in the field and offers a distinctive role in supplying robust and up to date business intelligence.

- It undertakes high quality and robust research covering all stages of the research process from: the development of underlying data products; through to synthesis of the evidence and generation of insights; and into active dissemination of information and intelligence through a variety of tailored mechanisms.
- The UK Commission positions itself as an objective, honest broker in this field, considering multiple perspectives, and offering common and consistent data backed by an impartial outlook. This allows effective comparisons from varying outlooks; whether by sector, different geographies, jobs or skills.
- Its work in this area has a range of purposes, seeking to influence choice, as well as to shape policy and practice.
- The UK Commission aims to engage with a range of audiences, looking to inform all key groups in the labour market.

A fundamental focus of our work is using information and intelligence to make the labour market work better. The richer the information, the better the quality of decision making and the more informed the actions of business and individual people.

2.3 Audiences

So, who are the “actors” in the labour market who serve as audiences for this information? The key groups comprise:

- Individuals considering their career prospects and skills investment choices;
- Businesses who are looking to inform their talent strategy – in order to attract and develop talent as a key resource for competitiveness;
- “Skills practitioners”, such as education and training providers, aiming to respond to the needs of the learning market;
- Policy-makers seeking to address market failures and maximise benefits for wider society.

Generating information and intelligence about and for business is the key focus of the UK Commission's research work. This is not surprising since the workplace serves as the key focus for employment and skills issues and the UK Commission is committed to the principle of employer leadership of the skills agenda. If employers are to take this agenda forward effectively they need high quality intelligence about skills needs and the wider labour market. However, when we talk about business our focus is not simply upon the employer and the UK Commission's approach takes account of the central role of the employee within a social partnership setting and the need of the individual worker for intelligence to inform their plans for career progression.

The broad audience groups identified above are not homogeneous. They contain a range of segments with differing information needs. An obvious example of this is presented by the business audience, within which there are distinct needs by industry sector, to name one key dimension. The employment and skills profile of one sector, such as manufacturing, is clearly very different to that of another, such as health and social care. The UK Commission undertakes a programme of focused intelligence work to explore the specific needs of particular industry sectors (see Appendix I for an overview of the UK Commission's research products).

The spatial dimension is key for all of the broad audience groups. In England the policy focus on Local Enterprise Partnerships has placed an increased emphasis on the need for a strategic dialogue at local level between employers, education and training providers and local government, with skills issues forming a key part of a wider economic development agenda. Therefore, the UK Commission's information and intelligence need to take account of the local context in order to inform this dialogue.

Box 1: Working with local partners

Challenge

Localism is clearly a key agenda for the Coalition government. The abolition of regional development agencies and their replacement with 39 Local Enterprise Partnerships (LEPs) has marked a fundamental shift towards local strategic leadership and accountability for economic growth. The Commission has sought to respond to this shift in the responsibility for driving sub-national growth in a variety of ways. The provision of high quality intelligence on which local economic actors can make effective and informed decisions is clearly fundamental and this is one of the key ways in which the Commission has been able to support LEPs and their partners.

The Commission's unrivalled access to intelligence on the labour market, and especially employer demand, has enabled it to make a significant contribution to many of the

Strategic Economic Plans which LEPs are currently preparing.

Actions

The Commission has undertaken a wide range of actions in order to support local economic partners in understanding their labour markets and the skills challenges they face. These include:

- We have organised a series of local events across England which have sought to raise awareness of our key labour market intelligence products, the data they offer and, most importantly, how they can be used to support local partners to understand their skills challenges and how best to respond to them. More than 300 delegates have attended these events, including representatives from the vast majority of LEP areas.
- We have produced and published a comprehensive guide to collecting and using local LMI. The guidance provides advice on data sources, a selection of analytical frameworks, as well as examples of best practice from around the UK.
- We have produced and disseminated a number of local products using our main research outputs that help local partners understand the nature and scale of skills issues in their areas. These have included: GIS maps for both LEP areas and local authorities on key variables from our surveys; data tables of all key variables for LEP and local authority areas; and guidance and methodological materials so that local partners can replicate and benchmark their own surveys. These have been freely available to download from The Commission's website. We have also supported access to our labour market forecasts of employment and output for LEP areas.
- The Commission launched a new social media group (LinkedIn LMI Network) designed specifically for the wide range of local partners responsible for collecting, analysing and interpreting labour market and skills intelligence.

For individuals making decisions about careers the local picture is even more important and we consider this aspect in section 3.12.

2.4 Applications

The UK Commission actively seeks to promote its use across a variety of key applications, which can be broadly summarized as informing choice, policy and practice.

A key example of the way in which the UK Commission's labour market information is used is to inform the design and development of skills provision and "choice" about what careers options to take. The different dimensions of this are explored further in the sections below.

But it is also used to inform policy and practice and is widely used by partners across the UK as the following examples demonstrate. One key partner is the Migration Advisory Committee (MAC) sponsored by the Home Office. The MAC uses skills shortage data from the UK Commission's Employer Skills Survey (UKCESS) as a key input into the analytical process to determine its list of skills shortage occupations, which then forms part of its recommendations to government on immigration policy.

UKCESS analysis was also a key element of the evidence and advice provided to the Department for Business, Innovation and Skills to support the analytical work underpinning the development of its industrial strategies.

The OECD aims to promote policies that will improve the economic and social well-being of people around the world. The UK Commission also has partnered with the Office for Economic Co-operation and Development over several years and supporting international projects and policy insights beyond the UK. For instance the UK Commission has input into the programme of work centred around developing a [skills strategy](#) and improving skills systems operating across their 34 member states.

These examples demonstrate the importance of the UK Commission's technical research function and its ability to deliver it with integrity, impartiality and independence.

2.5 Common and consistent data

A further distinct element of the UK Commission's role in the field of labour market information is its widely-recognised positioning as an objective and "honest broker". One of the key benefits of a commissioner-led approach is that it provides a safeguard with regard to the independence, impartiality and rigour of the organisation's research work. With commissioners drawn from a wide variety of backgrounds, representing each element of the social partnership, this allows for strong and effective scrutiny to be placed upon the UK Commission's research methods and results. The outcome is data and analysis that provide an objective and balanced picture of the labour market.

The UK Commission also places a strong emphasis on generating data that are common and consistent in terms of methods and definitions, and which provide a basis for straightforward comparison and benchmarking across industries, occupations, spatial areas and other dimensions of interest. This approach adds value because it provides a clear and robust analytical framework around which other evidence, including material of a more qualitative nature, can be structured and interpreted. As a result complexity and confusion are minimised in an arena in which a large volume of data are available from diverse sources and in which inconsistency and incoherence are potential problems.

2.6 Data, research and insights

The UK Commission has a multi-faceted role, in terms of its involvement in the various stages of the research process, as part of a comprehensive intelligence strategy.

It is responsible for maintaining a number of key underpinning datasets that provide the raw material and foundation for the UK Commission's intelligence programme and which support third-party analysis by partner organisations in the wider employment and skills network. These datasets include the UK Employer Skills Survey, the Employer Perspectives Survey and *Working Futures*.

Beyond the provision of these underlying data the UK Commission also carries out targeted research studies to extend the evidence base in identified areas of interest. For example, [Listening to Business](#) provides a barometer of ongoing employer opinion on the issues that face business around the employment and skills agenda, investigating topics such as the impact of flexible employment practices (including zero hours contracts) on skills investment practices.

The UK Commission is also involved in the development of products that seek to distil the available evidence base into key insights and compelling messages that can inform Commissioner thinking, directly influence policy advice and support collective action by employers. For example, Sector Insights is a series of packs, each of which presents a narrative around the skills challenges faced by individual sectors and the kinds of action that employers can take collectively to address these challenges. These are also effectively deployed to shape the design of occupational standards and wider development tools, which ensure that skills provision effectively meets employers' skills requirements.

The UK Commission takes a unique role in generating insights that are based on a holistic overview of the labour market and which draw on a comprehensive synthesis of the available evidence. Examples of products that embody this approach include The Labour Market Story (2014) and before that the National Strategic Skills Audit (2010), and Ambition 2020 (published in 2009 and 2010). These products add distinctive value because they take a “whole system” view of the labour market, identifying skills challenges that exist at the strategic level.

The UK Commission’s key products are reviewed in more detail in Appendix I.

2.7 Active dissemination

Research impact ultimately relies upon effective engagement with the audiences for the research, using a range of appropriate mechanisms and channels. We have established a more proactive and targeted dissemination strategy aimed at both technical and outward facing audiences. Last year we delivered over 40 research reports and 20 research events. Within our new approach, we have taken steps to use different routes to sell messages from traditional reports through to blogs, events and animations, including deploying infographics and a range of outputs to bring findings to life. We have also been proactive about getting the *right* messengers for our research, using the expertise, authority and presence of Commissioners in particular.

The UK Commission places a significant emphasis on the open data agenda and increasing the accessibility of data for its key audiences for a range of purposes. For example, an extensive range of underlying data from the UK Commission’s Employer Skills Survey is available from the data.gov.uk portal to facilitate secondary analysis by partners. A transparent approach to large datasets creates the conditions for the generation of new insights and added value by the wider analytical community.

The UK Commission’s LMI for All data service extends this open data ethos to the field of careers.

Box 2: LMI for All

The UK Commission is taking forward innovative approaches to making labour market information more accessible to those considering their careers choices.

LMI for All is the UK Commission’s pilot online data service, offering access to a range of labour market information designed to be useful in informing careers decisions.

LMI for All builds on a proposition made by Sir John Holman in October 2011 as part of the government’s Growth Review. The core focus of the recommendations was on

making high quality LMI more accessible, particularly to young people and their parents, to enable better, more informed decisions about careers, education and training options.

The “business model” for the project is that third party developers will draw on the data service to power their websites and applications and that, as a result, individual decision-makers will gain access to engaging and informative careers intelligence. The database is provided to developers free of charge via an API (application programming interface) and there are no restrictions on commercial use of the data.

The key benefits of LMI for All is that it provides robust data from national sources that allow end-users to explore and benchmark the occupations that they are interested in on a consistent basis.

A comprehensive range of labour market datasets are available from LMI for All and can be accessed by developers via an Application Programming Interface. Data are available on pay, employment opportunities (both current and forecast), entry routes into graduate occupations as well as real-time vacancy data.

The datasets are organised by occupation at the 4-digit unit group level using the Standard Occupational Classification (2010). An intuitive search facility is in place which enables end-users to connect to data relating to the job that they are interested in.

The intention is that data from LMI should ideally be presented in conjunction with other sources of information that will help users to understand jobs. For example, [iCould](#) presents LMI for All occupational data alongside videos in which people talk about the personal career histories. It is also intended to be used as a resource by professional careers practitioners.

The UK Commission has a contract in place with a consortium led by Warwick University Institute for Employment Research for key aspects of the development and delivery of LMI for All; including support around data development, implementation of the technical infrastructure and stakeholder engagement.

2.8 Labour market information and careers decisions

As we have noted, an optimally-functioning labour market relies on individuals having access to the richest possible information on current and future opportunities.

One of the key applications of the labour market data and analysis that the UK Commission generates is to inform individuals' decisions about their future career path so that they can make vital investments in their personal development with an eye to potential economic returns and acceptable future levels of reward.

Information on the nature and range of jobs and employment opportunities, and the likely development of the labour market over time, should be factors they are able to take into account in making career choices, alongside the informal community and cultural influences, personal preferences, aptitudes and abilities that also affect their choices.

However, the UK Commission has a clear positioning in the careers field. Its role is as a provider of labour market information that can inform careers decisions and it seeks to promote the use of this information in appropriate contexts. The UK Commission is not a provider of careers advice and guidance services and does not claim to have the specialist expertise and skillsets needed to perform this role.

3 Key trends in the labour market

Chapter Summary

- In this chapter we examine the key trends in the labour market that have the greatest relevance to careers prospects.
- Changes in sectoral patterns of employment will have a significant influence on career prospects. Future job growth is expected to be concentrated in private sector services, particularly in areas like professional services and information technology. Health and social care is also projected to be a major source of growth.
- The best prospects for future jobs growth are expected to lie with higher skilled management, professional and associate professional and technical occupations; together with some lower-skilled areas including caring and customer service related occupations.
- However, net change in the number of jobs only provides part of the picture with regard to career prospects. The effect of replacement demands is expected to mean that all broad occupational areas will have a need for new recruits. Even those occupations where employment is projected to decline may still offer good career prospects, with a significant number of job openings.
- Business need is a key dimension to consider with regard to career prospects. An analysis of skill shortages tells us about the areas in which employers face the greatest problems in recruiting people with the appropriate skills. This shows that skilled trades occupations are a key focus of shortages together with “STEM” professionals.
- Pay is a key indicator of job quality (although not the only one) and is an important criterion in careers decisions. There are large differences in the levels of pay associated with different occupations, mainly reflecting the level of skill required but also other factors relating to the desirability of the job.
- Career prospects can vary markedly by geographic area in terms of employment opportunities but also rates of pay and business need. It is important that national sources of data, like *Careers of the Future*, are supplemented by information and advice on the local picture.

3.1 Introduction

What are the key features and trends evident in the UK labour market and how are they shaping emerging job and skill requirements and hence future career prospects? In this chapter we place *Careers of the Future* into a fuller context by examining the trends that are influencing occupational employment patterns and business needs and which will play a part in determining the profile of future demand.

This analysis draws on findings from the key intelligence products of the UK Commission as described in the previous chapter. We provide a brief precis here, with references to the relevant source material.

In order to assess future trends we need to rely on a model of the labour market that incorporates forecasts / projections of future developments. The key tool used by the UK Commission is its *Working Futures* labour market model, the latest iteration of which provides projections for the period from 2012-2022 (see Box 3).

3.2 The economic and sectoral context

In order fully to understand changes in the labour market we need first to understand the way in which macroeconomic developments in the UK and the linked prospects for industry sectors influence the demand for different kinds of job.

In the *Working Futures* model the macroeconomic prospects for the UK provide the context for the detailed forecasts of employment by sector and therefore for the projections of occupational employment.

Within *Working Futures 5* the macroeconomic outlook is characterised by a gradual and steady upturn, with general prospects somewhat more positive than historic performance in the decade to 2012, although the rate of recovery is forecast to be modest relative to the pre-recession picture. The underlying forecast indicates an average annual rate of economic growth of 2.1 per cent between 2012 and 2022. Overall, the number of jobs in the UK is forecast to rise by around 1.9 million over the next decade (2012-2022), an average annual rate of growth of 0.6 per cent. This is barely half the rate seen in the peak years between 2002 and 2007.

Box 3: The *Working Futures* model

Working Futures focuses on sectoral and occupational employment structures, qualifications, and general workforce trends (including replacement demand). The approach exploits existing official data, including the Labour Force Survey (LFS),

generating more detailed estimates than are available from official sources. Innovations in *Working Futures 2012-2022* include the extension of the database to cover the full set of SOC 2010 4 digit occupational categories.

The complete *Working Futures* database presents a range of historical data and projections on likely sectoral developments and their implications for occupational and qualification requirements.

At the heart of the projections is the latest Cambridge Econometrics multi-sectoral multi-regional macroeconomic model. This is used to produce detailed 75 industry projections, for the period 2012-2022, covering all the English regions and the devolved nations of the UK. Official ONS data on output and various other economic indicators as well as employment are used.

Data from the Labour Force Survey and other sources (including the 2011 Census of Population) are used to develop historical measures of the occupational and qualification structure of employment within industries. A combination of econometric methods and judgement is then used to generate projections of these patterns forward to 2022.

Analysis of labour supply by age and gender is carried out using econometric methods. These are then further disaggregated by formal qualifications held to obtain measures of the supply of skills by highest qualification held as defined by the National Qualifications Framework.

Full details of the approach are set out in the separate *Technical Report*. (Wilson *et al.*, 2014b).

Source: UKCES *Working Futures*, 2012-2022

3.3 Sectoral prospects

Patterns of change in occupational employment, which are a key determinant of career prospects, are strongly influenced by the changing fortunes of industry sectors. Occupations concentrated in growing sectors will gain employment in contrast to those concentrated in declining sectors.

The following points summarize some of the key developments with regard to the projections of sectoral employment in the period to 2022.

- Private sector services are expected to contribute 80 per cent of net job growth between 2012 and 2022 (around additional 1.5m jobs), reflecting the broad structural shift towards services. Business service activities such as professional services and Information technology are expected to see the strongest rates of growth.
- The number of Finance and insurance jobs is expected to grow relatively quickly at around 9 per cent, contributing 100,000 additional jobs over the decade.
- The manufacturing sector is projected to see a continued decline in jobs (with a loss of 9 per cent of jobs over the course of the decade) although this will be coupled with output and productivity growth, implying that jobs will become more skilled.
- A bounce back in employment in the construction sector is forecast as the performance of the economy improves. The impact of the recession meant that construction barely grew between 2002 and 2012 but net growth of 300,000 jobs (15 per cent) is expected in the decade to 2022.
- Public administration is projected to see net decline over the decade of around 120,000 jobs. However, in contrast, health and social care is expected to generate a significant number of additional jobs (+450,000).

It should be noted that this pattern of growth does not lead to dramatic changes in the structure of employment by 2022. For example, employment in private sector services is forecast to grow by 1.5m but this only means an increase in employment share of 1.5 percentage points (56.8 to 58.3 per cent of total employment).

The manner in which these changes in industry structure shape the occupational profile of jobs is examined in the next section.

Box 4: The limitations of forecasts and projections

Nobody can predict the future with certainty. Most people can and do make plans and try to prepare for it. In doing so they adopt assumptions about what the future might be like, even if it is simply that the future will be the same as the past.

The rationale behind *Working Futures* is that a comprehensive, systematic, consistent and transparent set of projections can help to inform everyone about the world they are likely to face. Such projections can provide a focus for discussion and may help to breakdown misperceptions about the labour market as well as providing a basis for a longer-term outlook rather than a reactive approach.

The detailed projections present a carefully considered view of what the future might look like, assuming that past patterns of behaviour and performance are continued over the longer term. The results are indicative of general trends and orders of magnitude and are not intended to be perceived as definitive. If policies and patterns of behaviour are changed then alternative futures can result.

- Forecasting is as much an art as a science and requires considerable judgement on the part of the researcher especially when the forecast horizon is as much as 10 years ahead. Any errors in the forecaster's ability to predict the future will result in inaccuracies in the projections.
- The extent to which the historical base is inaccurate due to data limitations further exacerbates this problem. There are margins of error associated with the estimates from key official statistical sources used and these are carried over into *Working Futures*.

Table 1: Employment by Broad Sector, 2012-2022

Employment levels (000s)					
	1992	2002	2012	2017	2022
Primary sector & utilities	960	698	819	769	773
Manufacturing	4,221	3,627	2,646	2,542	2,417
Construction	1,932	1,986	2,010	2,151	2,312
Trade, accommodation, transport	7,468	8,289	8,572	8,651	8,986
Business & other services	6,300	8,376	9,665	10,327	10,788
Public admin, health and education	6,581	7,207	8,401	8,350	8,657
Total	27,461	30,183	32,112	32,788	33,933
Employment share (per cent of total)					
	1992	2002	2012	2017	2022
Primary sector & utilities	3.5	2.3	2.5	2.3	2.3
Manufacturing	15.4	12.0	8.2	7.8	7.1
Construction	7.0	6.6	6.3	6.6	6.8
Trade, accommodation, transport	27.2	27.5	26.7	26.4	26.5
Business & other services	22.9	27.8	30.1	31.5	31.8
Public admin, health and education	24.0	23.9	26.2	25.5	25.5
Total	100.0	100.0	100.0	100.0	100.0
Employment growth (per cent per annum)					
	1992-2000	2002-2012	2012-2017	2017-2022	2012-2022
Primary sector & utilities	-3.1	1.6	-1.2	0.1	-0.6
Manufacturing	-1.5	-3.1	-0.8	-1.0	-0.9
Construction	0.3	0.1	1.4	1.5	1.4
Trade, accommodation, transport	1.0	0.3	0.2	0.8	0.5
Business & other services	2.9	1.4	1.3	0.9	1.1
Public admin, health and education	0.9	1.5	-0.1	0.7	0.3
Total	0.9	0.6	0.4	0.7	0.6
Employment change (000s)					
	1992-02	2002-12	2012-17	2017-22	2012-22
Primary sector & utilities	-263	121	-50	4	-45
Manufacturing	-594	-981	-104	-124	-228
Construction	55	24	141	161	302
Trade, accommodation, transport	821	284	79	336	414
Business & other services	2,076	1,289	662	461	1,123
Public admin, health and education	627	1,194	-52	307	255
Total	2,722	1,929	676	1,145	1,821

Source: UKCES, Working Futures, 2012-2022

Notes:

Total employment and employment in non-market services includes H. M. Forces.

Numbers may appear not to sum due to rounding.

3.4 Occupational employment prospects

Changing patterns of occupational employment have a significant impact on career prospects, with some occupational areas expected to see growth and others decline. This has a clear bearing on the attractiveness of different occupations if we assume that growing occupations are more attractive than declining ones, all else being equal. Although, as we shall see, net changes in the level of employment within an occupation present only part of the story so far as future job opportunities are concerned.

In this section we consider the key trends in occupational employment, including the main “winners” and “losers” and examine the main drivers underlying the ongoing change in patterns of employment¹.

The drivers of change in occupational employment structure are many, varied and complex. Some of the most important factors are summarised in Box 5. One key driver is structural change in the economy, which affects the sectoral patterns of employment. As we have seen some sectors are expected to see rapid employment decline while others have much brighter prospects. Given that sectors have very different needs for particular occupations, this has a strong impact on occupational employment prospects. The other key driver is the way that technological and organisational change affects the way work is done within each sector.

Box 5: Drivers of change

Occupational employment patterns are a derived demand; they are dependent on the pattern of demand for goods and services in the economy. The key factors can be broadly categorised into two groups: those which are external to the organisation and those which are primarily internal.

External skills drivers influence the pattern of goods and services produced and therefore the sectoral structure of employment. These drivers include: technological change; globalisation; and public policy (including legislative and regulatory frameworks). Those sectors that benefit from such changes will see employment grow. Conversely those that fail to keep pace will experience job losses. Occupations concentrated in the former sectors will gain employment in contrast to those concentrated in declining sectors (industry effects).

Internal skills drivers produce significant changes in the patterns of employment within particular industries, including major restructuring of the way work is organised (occupational effects). Skill requirements within organisations are driven by the business

¹ This discussion draws heavily on Wilson et al., 2014.

strategies they adopt. These reflect choices about what products or services to deliver and where and how to pitch that delivery. Some may focus on product differentiation in high value added, premium markets while others may choose a low specification product or service, where the emphasis is keeping price and costs down. The former generally require higher skills, including the use of specialised and distinctive competencies, compared with strategies that focus on low level specifications. Organisations facing technological changes, or trying to move up-market, usually need to upgrade their skills. The introduction of new products and services, major changes in equipment and in working methods or workforce organisation often require the deployment of new skills.

Both internal and external drivers are influenced by technology (especially ICT) and other general factors. A number of commentators have focused on the biased nature of technical change, which has tended to favour higher skills and to displace lower skilled jobs. For example, ICT has led to the displacement of many clerical and secretarial jobs previously concerned with information processing using paper technology (internal effect).

On the other hand, information technology has opened up many new product markets where information services can be provided which were previously not feasible (external effect). These new businesses often require jobs of a professional, associate professional and managerial nature. The application of IT in other areas such as such as robots in motor manufacturing has led to the loss of many jobs for skilled workers.

Other factors have also been important. These include the drive for efficiency in response to global competition, increased emphasis on customer service and product quality and related changes in production methods and the management of human resources. Changes in consumer preferences are altering the patterns of demand towards an emphasis on high value added, higher quality, high specification goods and services.

There is a major restructuring of production to meet these needs. Many of these products and services require expert knowledge as well as customer care, personal attention and face-to-face human interaction, (for example, leisure, hospitality, travel, personal care), increasing the need for such generic skills.

Changing patterns of industrial specialisation (industry effects) have had profound implications for the demand for different occupations. The decline of employment in primary and manufacturing industries has resulted in a dramatic reduction in the need for many skills associated with the production of the output of these industries. For example: the agricultural sector now requires many fewer labourers; the manufacturing sector no longer requires the same number of skilled engineering and other types of specific craft

skills that were the foundation of its success in the past; utilities and transport now require far fewer workers than previously.

In contrast, the growth of the service sector has led to an increase in employment in many occupations. The growth of non-market, public service, employment, for example, has (up until recently) led to substantial additional jobs for: professional, managerial and clerical workers in public administration; for doctors and nurses in health services; and for teachers in education services. Similarly, growth in marketed, private sector, services has resulted in many new jobs for: leisure and other personal service occupations (in hotels and other services); sales occupations in distribution; and for professional, associate professional, clerical and secretarial in business and financial services.

Future Influences on Occupational Change

The projected patterns of occupational change for the next decade are expected to mirror those of the recent past. The same basic forces are expected to operate. Changes in the industrial structure of employment in favour of the service sector (industry effects) will tend to favour white collar, non-manual occupations, while the continued loss of jobs in manufacturing and primary industries will result in yet further job losses for many manual blue collar jobs.

The impacts of information technology and other related organisational changes are likely to further reduce the demand for clerical and basic secretarial skills across all industries (occupational effects). Similarly, the introduction of new technologies in manufacturing will tend to displace many skilled workers. Conversely, the management and operation of the new technologies will require greater shares in employment for managerial, professional and associate professional occupations, including technicians of various kinds.

Source: *Working Futures 2012-2022*

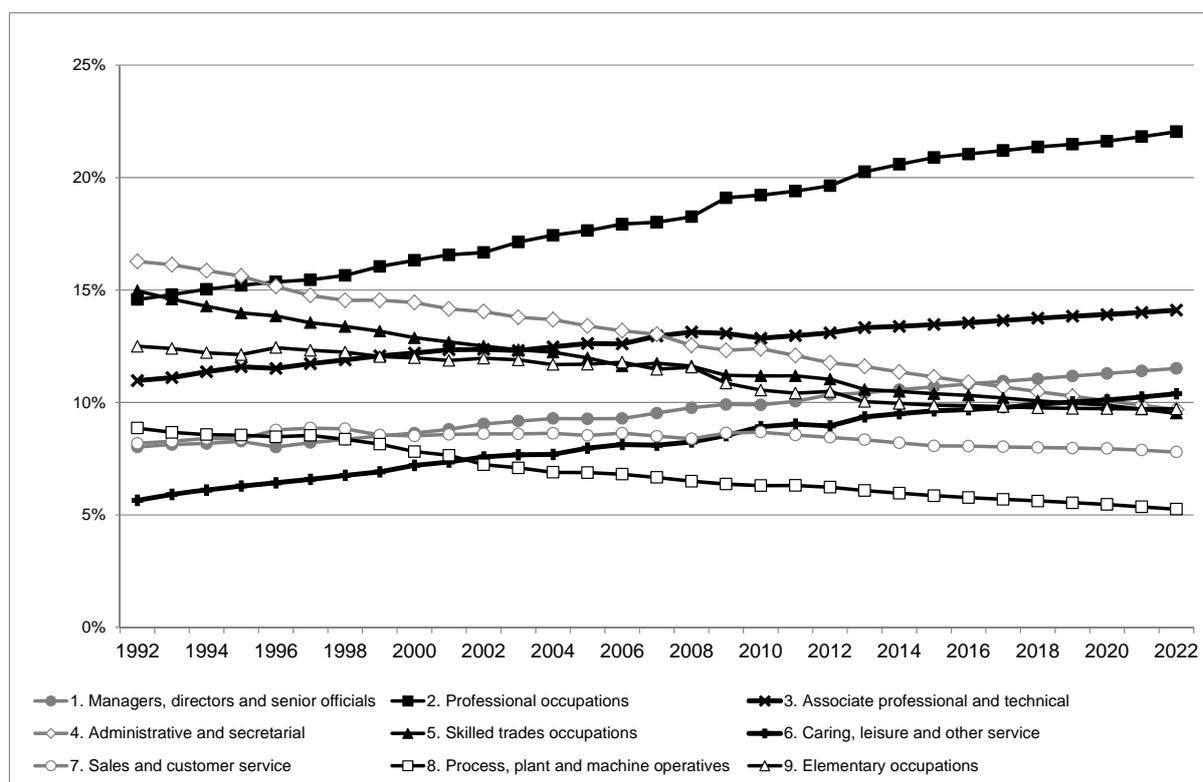
An examination of historic trends in occupational structure confirms the importance of these underlying long term drivers as well as the strength and resilience of the overall pattern of change (see Figure 1). Following the fallout from the global financial crisis of 2008 and the subsequent worldwide recession the longer term trends quickly reasserted themselves. The broad underlying trends in occupational employment shares continued more or less unabated: for most occupations the trend over the period 2008-2012 is indiscernible from that prior to the crisis in 2008.

The key features have been:

- Rising employment levels and shares for higher level, white-collar groups such as:

- Managers, directors and senior officials;
- Professionals; and
- Associate professional and technical occupations;
- Rapid increases for caring, leisure related and other personal service occupations;
- Decline in employment for administrative and secretarial occupations;
- Declining employment levels and shares for most blue collar/manual occupations;
- Declining employment in elementary roles which require little or no prior training.

Figure 1: Occupational Trends: historic and projected (per cent shares) 1992-2022



Source: UKCES Working Futures, 2012-2022.

3.5 Projections to 2022

Figure 1 presents employment projections for the nine major occupations for the period from 2012-2022. These are compared with developments over the previous decade.

The analysis confirms the general trends in favour of more highly skilled occupations, some growth in less skilled employment in areas that are currently difficult to automate and a reduction in traditional clerical and skilled and semi-skilled manual jobs.

- **Managers, Professional, and Associate professional and technical occupations** are all expected to show significant increases in employment to 2022.

- **Caring, leisure and other service occupations**, and some parts of both the **Sales and customer service occupation** group and **Elementary occupations** are projected to experience some positive employment prospects. These groups have exhibited employment growth since the early 1980s, reflecting positive shifts in sectoral employment structure in the sectors in which they are employed and the difficulties in replacing the non-routine manual and non-manual tasks which they undertake with machines.
- Modest job losses are now projected for the **Sales and customer service occupation** group as a whole, especially for the sales occupations sub-category.
- **Administrative and secretarial occupations** have been one of the groups hardest hit by technological innovations in the office environment in recent years. These groups have seen significant job losses since the early 1990s, mainly as a consequence of the increasing use of IT systems to replace human effort. This trend is projected to accelerate over the next decade. Nevertheless, this category will still employ well over 3 million people in 2022.
- **Skilled trades occupations, Process, plant and machine operatives**, and parts of the **Elementary occupations** group are expected to experience further job losses continuing the pattern of long term decline.
- As noted above some modest growth in the latter half of the period is expected for some parts of the **Elementary occupations** group, as many more industries, especially within the service sector, find a need for such occupations. This part of the polarisation of the demand for skills, has been attributed to the difficulties of automating some relatively low skill jobs that require a human response.

3.6 More detailed occupational projections

It is useful to move beyond the broad patterns of change that are evident from the nine SOC major groups to a more detailed breakdown using the 25 sub-major groups. It is this level of analysis that serves as the main basis for our indicators of projected future job opportunities used in the *Careers of the Future* model.

Table 2 and Figure 2 present this more detailed analysis. See Appendix H for an explanation of the categories.

Managers, directors and senior officials: The *corporate managers* category has been a significant source of employment growth for many years and this pattern of growth is expected to continue over the coming decade. The other category within this group is *other managers and proprietors*. This includes the owners and managers of small businesses, especially in the service sector. This category has also experienced steady growth in the past decade. This is expected to continue over the coming decade although the growth is moderated by the restructuring of the distribution and retailing sector, including the shift towards the use of the internet.

Professional occupations: All four of the professional sub-major groups experienced employment growth between 2002 and 2012 and this is projected to continue. The highest rate of growth for 2012-2022 is projected for Health professionals as the health sector begins to recover from slowdown caused by deficit reduction constraints. Science, research engineering and technology professionals and Business, media and public service professionals are also expected to see significant growth. All these professional groups are projected to increase their share of overall employment.

Associate professional and technical occupations: Substantial employment growth has been experienced by a number of these sub-major groups in recent years. Employment has grown most rapidly over the previous decade for health and social care associate professionals. The group was affected by cuts in public spending, but this is not expected to slow down the longer term trend. It is now projected to experience the most rapid rate of increase of all sub-major groups between 2012 and 2022. Growth was slowest over the past decade for science, engineering and technology associate professionals and for protective service occupations, both of which saw a net decline over the decade as a whole. The latter are expected to see some further job losses but things are expected to pick up for science, engineering and technology associate professionals as the economy recovers.

The largest sub-major group in the associate professional category is Business and public service associate professionals, which includes specific roles such as Sales accounts and business development managers. This is also projected to be by far the biggest contributor in this major group to future employment growth, contributing almost four times as many jobs as Health and social care associate professionals, the next largest contributor.

Administrative and secretarial occupations: A continuation of the decline in employment is expected for this group as a whole as ICT displaces many such jobs. Secretarial and related occupations, which includes secretaries, typists and word processing operators, are expected to be particularly affected, reflecting their vulnerability to being displaced by advances in computer technology.

Skilled trades occupations: The recession has accelerated the already significant loss of jobs in many skilled trades occupations. Job losses in manufacturing and, post 2008 in construction, have impacted negatively on skilled metal and electrical trades, textile, printing and other skilled trades and construction and building trades. Construction trades are expected to recover over the coming decade, but this is not sufficient to reverse the overall decline for skilled trades. For textiles, printing and other skilled trades the pace of decline accelerates. Over the next decade jobs in construction and building trades are expected to grow more quickly than the average for the economy as a whole.

Caring, leisure and other service occupations: Historical employment growth in these categories is expected to continue over the coming decade. Caring personal service occupations were the most rapidly growing occupational sub-major group between 2002 and 2012. Although they slip into second place in terms of rate of growth over the period 2012-2022, in absolute terms they remain in top place, with an increase of over half a million jobs. A key driver here is the rising demand for services for an ageing population. The majority of these jobs are expected to be taken by women. The rate of growth in leisure, travel and related personal service jobs is expected to be more modest.

Sales and customer service occupations: This group is dominated by occupations such as sales assistants and check-out operators in retail outlets who fall into the Sales Occupations sub-major group. This category has seen job losses in recent years as the retail and distribution sector restructures itself. Increasing concentration of businesses, competition from the Internet and technological developments such as automated checkout are expected to reduce the need for more traditional sales occupations, meaning that this pattern is expected to continue. In contrast, customer service occupations represent a much smaller but rapidly growing category. The demand for more specialist sales and customer care occupations is expected to continue over the coming decade.

Process, plant and machine operatives: This group includes a variety of occupations, some operating fixed plant in factories while others drive mobile plant and passenger and goods vehicles. Employment declined quite rapidly for the former category (process, plant and machine operators) over the last decade, linked to the loss of jobs in manufacturing. However, there were modest job gains for the transport and mobile machine drivers category. Over the coming decade, further substantial job losses are expected amongst process, plant and machine operators, whilst little change in the numbers of jobs for the transport and mobile machine drivers category is expected.

Elementary occupations: The elementary occupations consist of jobs that require little or no prior training. Employment levels across this group of occupations have been in long-term trend decline for many years, but there are some signs of this changing. The service sector, in particular, is beginning to generate a number of extra jobs in this area. Small job losses are expected for the decade as a whole but with some recovery in the second half of the period.

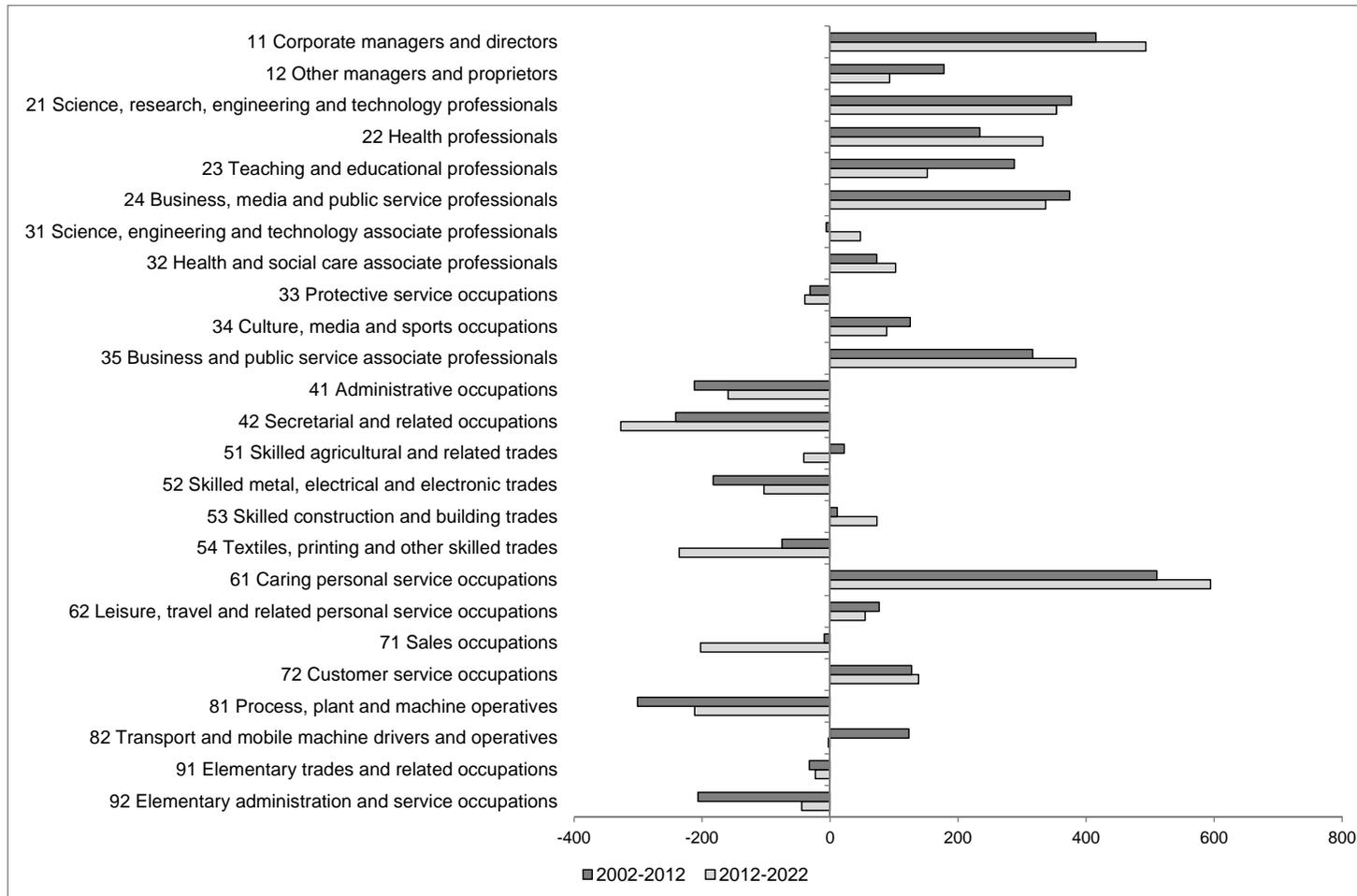
Components of change

Shift share techniques allow us to break down the change according to three components: industry mix, occupational effects and scale effect (the impact of the overall expansion or decline of employment levels in the economy)². This analysis suggests that the key drivers of occupational employment change over the decade 2012-2022 are expected to be more closely related to changing ways of working within industries (occupational effects) and the way in which technological change, especially IT, impacts on the need for different skills. This is in contrast to earlier decades when it has been the changing sectoral structure of employment that was the prime driver.

The industry mix effect is significant for the projected period in only a few occupations such as Science, research, engineering and technology professionals (for which it has a positive impact). The occupational effect is very strongly positive for most professional and associate professional groups and especially in the case of the caring personal service occupations. In contrast it imposes a strong negative impact for administrative and secretarial occupations, most skilled trades sub-major groups, and process, occupations, plant & machine operatives and elementary occupations. In all of these sub-major groups, significant changes in organisation and technology within the employing industries are expected to have a marked negative impact on employment levels.

² See Wilson et al (2014) pp 86-91 for a fuller discussion.

Figure 2: Detailed changes by occupation (000s)



Source: UKCES Working Futures, 2012-2022.

Table 2: Expansion and Replacement Demand by Occupation, 2012-2022

UK, All industries							
(Results in 000s)	Base employment level 2012	Expansion demand	% of base	Replacement demands (retirements & mortality)	% of base	Net requirement (excluding occupational mobility)	% of base
11 Corporate managers and directors	2,189	493	22.5	844	38.5	1,337	61.1
12 Other managers and proprietors	1,115	93	8.3	534	47.9	627	56.2
21 Science, research, eng. and technology professionals	1,731	354	20.4	559	32.3	913	52.7
22 Health professionals	1,330	332	25.0	572	43.0	905	68.0
23 Teaching and educational professionals	1,507	152	10.1	666	44.2	818	54.2
24 Business, media and public service professionals	1,701	337	19.8	739	43.4	1,076	63.3
31 Science, eng. and technology associate professionals	532	47	8.9	167	31.4	215	40.3
32 Health and social care associate professionals	334	102	30.7	138	41.5	241	72.1
33 Protective service occupations	450	-39	-8.7	112	24.8	72	16.1
34 Culture, media and sports occupations	610	88	14.5	259	42.5	347	56.9
35 Business and public service associate professionals	2,255	384	17.0	865	38.3	1,249	55.4
41 Administrative occupations	2,811	-159	-5.7	1,176	41.8	1,017	36.2
42 Secretarial and related occupations	945	-327	-34.6	431	45.6	104	11.0
51 Skilled agricultural and related trades	403	-41	-10.2	205	50.7	164	40.6
52 Skilled metal, electrical and electronic trades	1,340	-103	-7.7	419	31.3	316	23.6
53 Skilled construction and building trades	1,116	73	6.6	374	33.5	447	40.1
54 Textiles, printing and other skilled trades	663	-236	-35.5	198	29.8	-38	-5.7
61 Caring personal service occupations	2,212	594	26.9	1,015	45.9	1,609	72.7
62 Leisure, travel and related personal service occupations	647	55	8.5	310	47.9	364	56.3
71 Sales occupations	2,032	-202	-10.0	718	35.3	516	25.4
72 Customer service occupations	666	138	20.8	235	35.3	373	56.1
81 Process, plant and machine operatives	810	-211	-26.1	226	27.9	14	1.8
82 Transport and mobile machine drivers and operatives	1,179	-3	-0.2	504	42.7	501	42.5
91 Elementary trades and related occupations	577	-23	-4.0	194	33.7	171	29.7
92 Elementary administration and service occupations	2,771	-44	-1.6	1,043	37.6	998	36.0
All Occupations	31,926	1,855	5.8	12,501	39.2	14,356	45.0

Source: UKCES Working Futures, 2012-2022.

Notes: a) Numbers may not sum due to rounding.

b) Occupational and Geographical mobility are assumed to be zero in these estimates.

3.7 Replacement demands and net requirements

So far we have concentrated on the total numbers of people who are expected to be employed in particular occupations in the future. Such estimates provide a useful indication of areas of change, highlighting the likely 'gainers' and 'losers'. However, this may give a misleading impression of job opportunities and hence career prospects. Even those occupations where employment is projected to decline may still offer good career prospects, with a significant number of job openings.

This is because, as long as significant numbers are employed in such jobs, employers will need to replace those workers who leave due to retirement, career moves, mortality or other reasons. At any particular time this will include people leaving the employed work force to start a family, etc as well as those permanently retiring because of old age (although over the longer term some of the former may return to the workforce, offsetting the other outflows). Together these outflows are referred to as 'replacement demand'.

Replacement demand is usually much more significant than any net change in the level of jobs and tends to easily outweigh any negative changes resulting from projected employment decline. At a macro level replacement demands typically represent around 2-4 per cent per annum of the employed workforce, although they can be much higher within particular segments, depending on factors like average age.

The net change in employment is referred to as "expansion demand" although where employment is declining this can be negative. The sum of expansion demand and replacement demand is referred to as the net requirement and this is the indicator of projected future job openings that we use in our *Careers of the Future* analysis (see section 4.4).

Box 6: Estimating replacement demands

The estimates of replacement needs are based on quite limited information, using data from the Labour Force Survey (LFS) and should be regarded as indicative rather than precise. Nevertheless, they provide a broad indication of the scale of such demands, compared to the structural changes projected.

The Labour Force Survey provides a sufficiently large sample to obtain rough estimates of the main elements needed to estimate replacement demands at a UK level. The key components are:

- Information on the age and gender structure of occupational employment;

- Information on rates of outflows due to:-
 - Retirement (and other reasons for leaving the workforce);
 - Inter-occupational mobility;
 - Mortality.

Age Structure

Data on age structure are required since many of the flows, especially retirements and mortality, are age specific. Age structures vary significantly by occupation. For some groups such as corporate managers and administrators, experience is a key requirement and this is associated with age. The proportion in the 45-59 year old category is therefore relatively high. In contrast, in many other occupations the age structures are much more heavily biased to younger age groups. In sales occupations, for example, the age structure is much more heavily weighted towards younger age groups. Differences in age structure across occupations will clearly influence likely losses due to mortality and retirement which are age related.

Retirement Rates

Retirement rates vary by gender and by age. By using data for the whole of the UK estimates of likely rates of outflow can be made. Data are not distinguished for different occupational groups since sample numbers are too small to allow for meaningful estimates. The estimates are based on data from the LFS, which show the percentage of those employed one year ago who have retired from employment, either temporarily or permanently. For males the main outflows are associated with retirement *per se*. For females, in particular, there is significant outflow for younger age groups associated with family formation.

Mortality

Another potential outflow is due to mortality. Information on mortality rates is available by age and gender from ONS. While losses due to death are not great for individual age groups up to the age of 65, they can cumulate to produce significant losses over an extended period of time. The rates used are again based on data for the whole of the UK. However, mortality rates are unlikely to vary very much across occupations.

Occupational Mobility

Occupational mobility is an important source of loss for some occupations although not for all. The full occupational mobility flow matrix indicates that some occupations such as

corporate managers and administrators tend to gain employment as people are promoted from other occupations. This means that many of the losses due to retirement are 'automatically' dealt with by the normal process of promotion and upward occupational mobility. However, for those occupational categories which provide the people who are promoted this means that losses due to retirement will understate the overall replacement demands.

Net occupational mobility measures based on turnover of those who change occupations within a 12 month period are available from the LFS. However it has proved impossible to develop a consistent set of such estimates for all the detailed specific sectors and geographical areas in the *Working Futures* database using data from the LFS. This is due to the latter's limited sample size. The estimates presented in *Working Futures* are therefore based just on estimated losses from retirements and mortality.

Replacement Demand

The overall scale of change is obviously dependent upon the length of period considered, as well as the opening stocks and the age structure of the current workforce. For the projections constant rates of flow are assumed.

Source: *Working Futures*, 2012-2022

3.8 Projections of replacement demand, 2012-2022

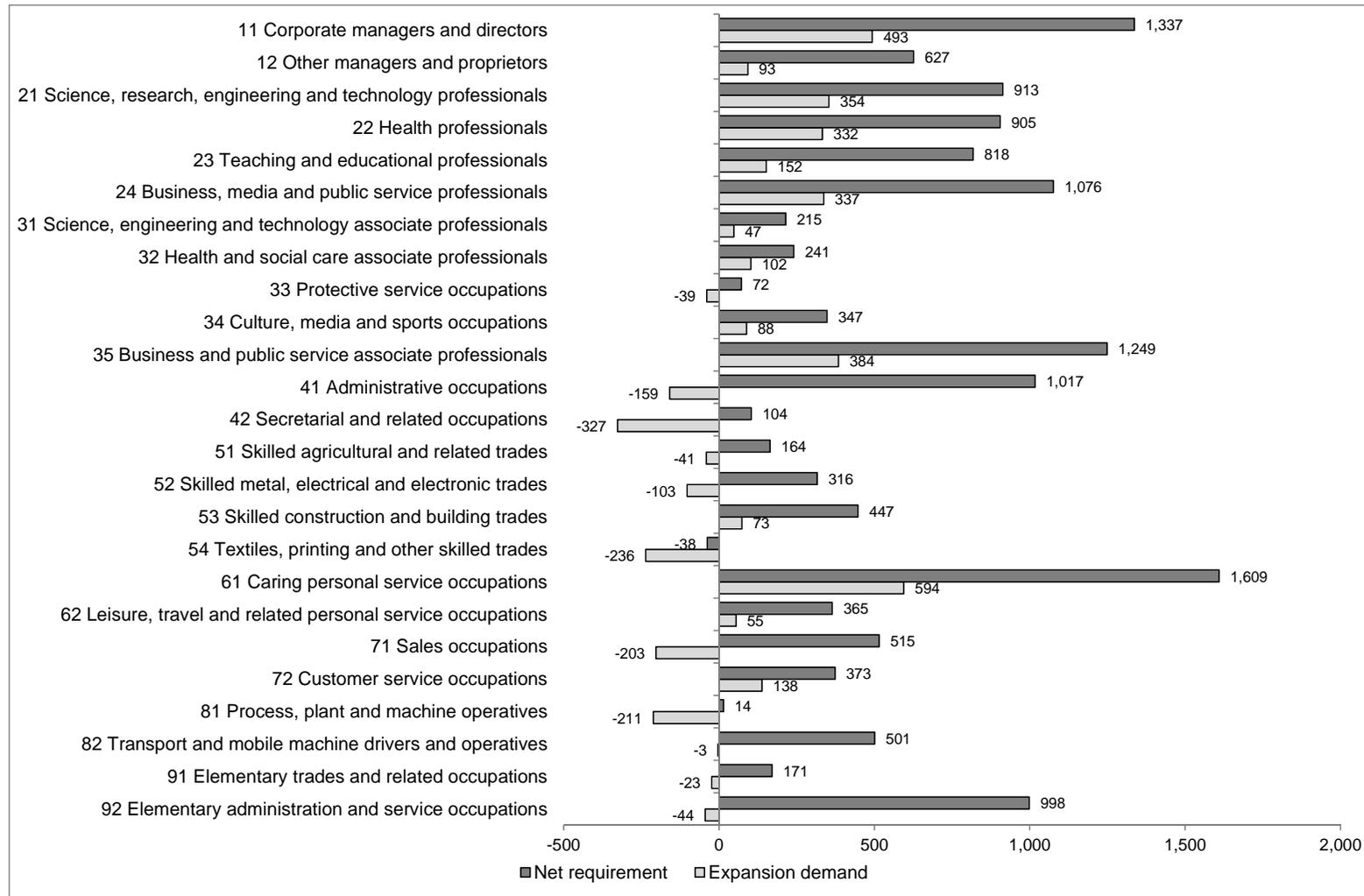
Table 2 and Figure 3 provide an analysis of expansion demand, replacement demand and net requirements for the 25 SOC sub-major groups.

The net requirement for workers is positive in all SOC major groups and all but one sub-major group, the single exception being Textiles, printing and other skilled trades. Replacement demand is substantial and easily outweighs any negative structural (expansion) demand. With regard to the sub-major groups the rates of replacement needs vary from 25 to 51 per cent over the 10 year period. Over the decade as a whole, there is projected to be a net requirement of almost 14½ million new job openings. Replacement demand accounts for 12½ million of these. For all occupations together, replacement demand over the period 2012-2022 is around seven times larger than expansion demand.

In many occupations the “expansion” demand is negative (declining employment levels). These include: administrative and secretarial occupations; skilled trades occupations with the exception of construction trades; sales occupations; and process, plant and machine operatives. Aside from the one exception of Textiles, printing and other skilled trades, the negative structural demand (projected employment decline) is expected to be offset by positive replacement demand (mainly related to retirements from the workforce). Expansion demand is positive in all the other broad occupational groups. In occupations with positive expansion demand, replacement demand will add to positive expansion demand to create even higher net requirements for new entrants.

Substantial changes in employment structure leading to job losses in a number of occupations are expected over the next decade. Nevertheless, there will be a need to recruit and train new entrants into these types of jobs to replace those retiring from the workforce or leaving for other reasons. Where employment is already projected to rise, such replacement demand elements will serve to reinforce this trend and lead to even greater requirements.

Figure 3: Net Requirements by SOC2010 Sub-major Group, 2012-2022



Source: IER estimates, MDM revision 12015.

Notes: Figures for net requirements exclude replacement demands arising from occupational mobility

3.9 Skills mismatches

Employment projections allow us to assess the sectoral and occupational areas in which the potential for future jobs growth is greatest. Although this approach provides us with an understanding of the likely profile of future labour demand it is also useful to examine the interplay between labour demand and supply and the potential for the emergence of skills mismatches and market failures as supply fails to keep up with demand.

In our *Careers of the Future* publication we equate skills mismatch, specifically the phenomenon of skill shortages, with business need, to signify the fact that the ability of firms to access the skilled people they require varies by occupational area. When thinking about careers prospects it makes sense to take account of those employment areas in which business need is greatest.

3.10 Skill shortages

A key measure of business need in this context is the prevalence of skill shortage vacancies.

Skill shortage vacancies are vacancies that employers are unable to fill due a lack of applicants with suitable skills, qualifications or experience. They therefore provide a direct indication of the occupations that face an imbalance between employer needs (demand) and the supply of people with suitable skills, qualifications and experience³.

Perhaps contrary to expectations, the areas of largest net employment growth do not tend to correspond with the areas of most acute shortage. For example, skilled trades occupations are a key focus for shortages but in the longer term are expected to undergo a net decline in employment. The causes of shortages are complex and idiosyncratic and can include poor industry or occupational image, geographical mismatches between demand and supply, an ageing workforce and perceptions of poor pay and conditions.

The UK Commission's Employer Skills Survey 2013 estimated that there were 146,000 skills shortage vacancies with around four per cent of employers being affected by shortages at any given time. However, whilst they are not universal, shortages tend to be concentrated in particular parts of the economy and persistent over time. Moreover, they have a significant impact on the businesses they affect, impeding performance in roles that are critical to the operation of the business.

³ Vacancies can also prove 'hard-to-fill' for other, non skills-related reasons, principally a lack of applicants to the role, issues with applicants' attitude, personality or motivation, or specific issues related to the job role (e.g. poor terms and conditions or unsociable hours) or the organisation recruiting (e.g. remote location or poor transport links).

As the economy and labour market have recovered and recruitment activity has increased there has been a resurgence in skill shortages. Between 2011 and 2013 vacancies increased by 12 per cent whilst skill shortages increased by 60 per cent, according to the results of the UKCES Employer Skills Survey 2013.

The most common types of skills shortages across all occupations relate to shortfalls in technical, practical or job specific skills. These skills are best gained, and can sometimes only be gained, in a workplace setting, illustrating the critical role that employers have to play in overcoming skills shortages. It is no coincidence that the occupations worst-affected by skill shortages, skilled trades and STEM professionals, are also those in which the process of developing the specialist knowledge and skills that employers require can take a number of years of hands-on experience in the workplace.

A longstanding focus for acute skill shortages is intermediate-level skilled trades occupations (see Figure 4). These tend to be concentrated in manufacturing, construction, wholesale and retail, and hotels/restaurants; and SMEs, rather than large firms, are more likely to be affected. This partly reflects longstanding shortages of skilled construction trades workers such as plumbers, electricians and carpenters, and skilled chefs within the hotel/catering industries. Although employment in these occupations is typically in decline there are still significant recruitment difficulties, with close to 40 per cent of vacancies affected by shortages, a situation which could worsen as the recovery proceeds.

There is also a significant prevalence of skill shortages in some higher level occupations. The latest Employer Skills Survey indicates that two-fifths of total shortages pertain to management, professional and associate professional jobs.

The higher level areas that are most striking in terms of the prevalence of shortages are health professionals (primarily reflecting shortages of nurses and medical practitioners) and Science, research, engineering and technology professionals.

The Science, research, engineering and technology professionals category has the highest density of skill shortages of any of the 25 occupational groups. At 44 per cent it is almost twice as high as the overall average of 23 per cent and it is the third highest of the occupational groups in terms of overall volume of shortages (with almost 14,000). Data from previous iterations of the Employer Skills Survey, dating back to 2007, suggest that the Science, research, engineering and technology professionals category has been among the worst-affected occupational areas in terms of skill shortages throughout this period, with density levels well above the average.

Higher level shortages are concentrated by sector, with manufacturing most acutely affected, but also business services. In contrast to shortages at intermediate level, skills shortages for higher level occupations are disproportionately concentrated in larger firms and firms seeking to compete in international markets.

Figure 4: Density of skills shortages by occupation (SOC sub-major group)



Note: Density is a measure of skill-shortage vacancies as a proportion of all vacancies

Source: UK Commission's Employer Skills Survey 2013

3.11 Patterns of pay

As we argue below (see section 4.7) pay is a key indicator of job quality. All other things being equal, people would prefer to work in jobs that are well-paid than poorly-paid and on this basis a higher paying job should be more attractive than a job with lower pay.

Clearly, certain occupations pay more than others. Doctors earn more than teachers, who earn more than retail assistants. Most of these wage differentials are the result of educational and training requirements, often referred to as human capital. Doctors require several years of post-secondary education and training to qualify for medical practice, whereas it is possible to enter many occupations immediately after leaving school or even while still at school.

Education and training limit the supply of labour in that they take a certain amount of time to complete and require a certain level of skill and ability. Certainly, there is clear evidence that the better qualified (in terms of formal qualifications) have higher rates of pay than those with low or no qualifications (see Garrett et al, 2010).

Wages are also determined by the demand for the worker, which is in turn determined by the demand for the product or service that the worker produces. The more desirable and in-demand the product or service the higher the wage for a given supply of workers who could do that job.

Some jobs also attract higher rates of pay because they are less desirable in certain respects: they may be hazardous, dirty, involve unsocial hours, or offer sporadic employment patterns. To attract workers into these jobs employers have to offer higher rates of pay.

Box 7: The Annual Survey of Hours and Earnings

The Annual Survey of Hours and Earnings (ASHE) is the most comprehensive source of earnings information in the United Kingdom. It provides information about the levels, distribution and make-up of earnings and hours paid for employees by gender and full-time/part-time working. Estimates are available for various breakdowns including industries, occupations, geographies and age-groups within the UK. ASHE is used to produce hours and earnings statistics for a range of weekly, annual and hourly measures.

ASHE is based on a one per cent sample of employee jobs taken from HM Revenue & Customs (HMRC) PAYE records. Information on earnings and hours is obtained from employers and treated confidentially. ASHE does not cover the self-employed.

The 2013 ASHE is based on approximately 184,000 returns.

The earnings information collected relates to gross pay before tax. Gross pay includes pay before deductions for PAYE, National Insurance, pension schemes, student loan repayments and voluntary deductions. It includes basic, overtime, shift premium, bonus or incentive pay (relating to work carried out in the pay period) and any other pay but excludes expenses, the value of salary sacrifice schemes and payments in kind.

Source: Office for National Statistics

3.11.1 Broad occupational profile of pay

Analysis of official statistics confirms that there are large variations in the pay associated with different occupations. This is illustrated at a broad level by median annual pay levels for the 25 SOC sub-major occupational groups, taken from the Annual Survey of Hours and Earnings (see Figure 5).

The pattern of pay at this level could be said to broadly reflect what we might expect to see, based on our understanding of the notional level of skill associated with the different occupational categories. However, there are some features that perhaps demonstrate that factors other than skills play a part in determining pay levels.

Focusing on full-time jobs, the highest paid occupation of corporate managers, enjoys a median level of pay (£42,805) that is 2.7 times greater than that of sales occupations (£15,825). The figure for corporate managers is also 1.6 times higher than the median for all employee jobs (which stands at £27,000), whereas the figure for sales occupations is around two thirds of the overall median.

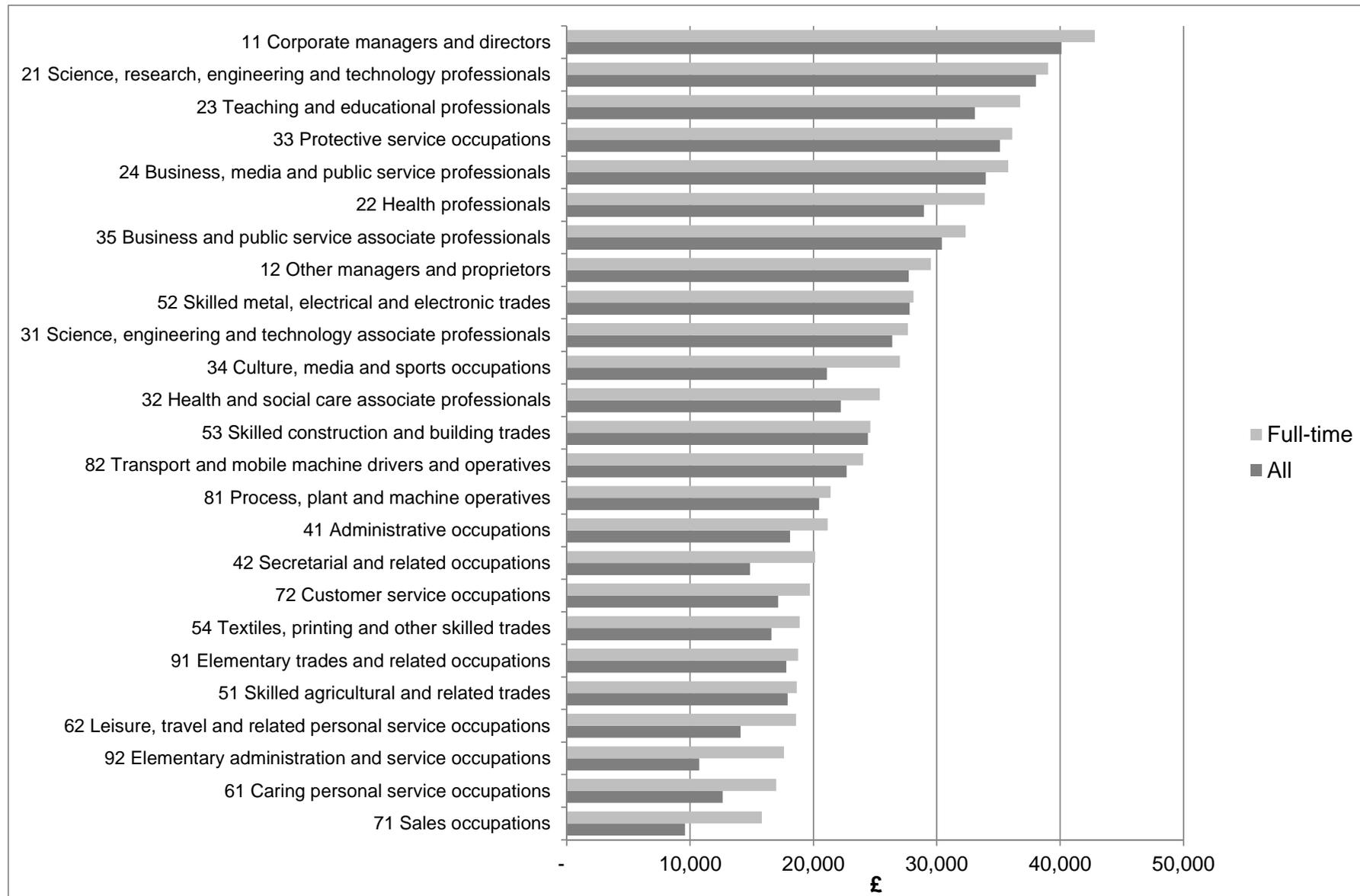
Aside from corporate managers the best paid occupations on this measure are professional occupations, with science, research, engineering and technology professionals the highest paid of these. In addition, protective service occupations, part of the associate professional major group, is ranked within the top five.

The lowest paid occupations are service-related roles; as well as sales roles this includes caring personal service occupations and elementary administration and service roles.

There is a notable disparity in the median pay of the different skilled trades occupations. Whereas skilled metal, electrical and electronic trades enjoy median pay of £28,100, a figure that is higher than a number of associate professional occupations, for skilled agricultural trades the figure is £9,500 lower at £18,600.

Routine semi-skilled manual roles, specifically process, plant and machine operatives and transport and mobile machine drivers and operatives rank fairly highly in terms of median pay. These two occupations are characterised by pay that is slightly higher than for administrative and clerical roles, above the median levels of some skilled trades and significantly higher than the low-paid service roles referred to above.

Figure 5: Median annual pay - Gross (£) by occupation. For employee jobs: United Kingdom, 2013



Note: occupations sorted in descending order by full-time pay level.

Source: Annual Survey of Hours and Earnings, 2013

3.11.2 More detailed patterns of pay

The previous broad analysis conceals a complex pattern of pay differentials that we can observe at a more detailed level of occupational categorisation.

Table 3: Top 10 highest paid detailed occupational unit groups

Median annual pay - Gross (£). For full-time employee jobs: United Kingdom, 2013

Description	SOC code	Median gross annual pay
Chief executives and senior officials	1115	87,475
Aircraft pilots and flight engineers	3512	78,659
Medical practitioners	2211	75,342
Marketing and sales directors	1132	71,656
Legal professionals n.e.c.	2419	69,003
Advertising and public relations directors	1134	61,304
Financial managers and directors	1131	58,735
Senior police officers	1172	57,664
Information technology and telecommunications directors	1136	57,375
Financial institution managers and directors	1150	51,013

Source: *Annual Survey of Hours and Earnings, 2013*

Not surprisingly, in view of the previous analysis of the broad occupational pattern of pay, seven out of ten of the highest paid occupations at the most detailed SOC unit group level fall within the major group relating to managers, with two professional occupations also featured, for doctors and legal professionals. One associate professional role of aircraft pilots is also included in the top 10, which we can regard as exceptional.

Table 4: Top 10 highest paid detailed occupational unit groups – excluding management occupations.

Median annual pay - Gross (£). For full-time employee jobs: United Kingdom, 2013

Description	SOC code	Median gross annual pay
Aircraft pilots and flight engineers	3512	78,659
Medical practitioners	2211	75,342
Legal professionals n.e.c.	2419	69,003
Senior professionals of educational establishments	2317	50,169
IT project and programme managers	2134	48,597
Train and tram drivers	8231	46,795
Higher education teaching professionals	2311	45,240
Research and development managers	2150	45,000
IT specialist managers	2133	44,314
Actuaries, economists and statisticians	2425	44,219

Source: Annual Survey of Hours and Earnings, 2013

If we exclude managers from the ranking we see a top 10 that is dominated by a variety of professional occupations, although in addition to aircraft pilots it now also features train drivers, another transport-related role but one which sits within the semi-skilled major group of process, plant and machine operatives.

Table 5: 10 lowest paid detailed occupational unit groups

Median annual pay - Gross (£). For full-time employee jobs: United Kingdom, 2013

Description	SOC code	Median gross annual pay
Hairdressers and barbers	6221	12,616
Leisure and theme park attendants	9275	13,033
Waiters and waitresses	9273	13,052
Kitchen and catering assistants	9272	13,110
Bar staff	9274	13,180
Launderers, dry cleaners and pressers	9234	13,572
Retail cashiers and check-out operators	7112	14,150
Other elementary services occupations n.e.c.	9279	14,297
Nursery nurses and assistants	6121	14,336
Cleaners and domestics	9233	14,598

Source: Annual Survey of Hours and Earnings, 2013

Note: ranked in ascending order

Looking at the other end of the spectrum, the 10 detailed occupations with the lowest median pay primarily consist of elementary service roles, including hospitality-related staff such as waiters / waitresses, bar staff and kitchen staff, as well cleaning occupations. Other service related roles are also present, with hairdressers ranked lowest of all unit groups on this measure and nursery nurses also falling into the bottom 10.

3.12 Spatial patterns in the labour market

It is important to recognise that there is not just one labour market in the UK. There is a series of occupational labour markets, operating across different spatial areas. Labour markets for many higher-skilled occupations operate at a UK-wide level and increasingly at an international level, as employers seek to attract candidates across a wide geographic area, particularly for posts requiring highly specialised skills. Candidates' job search tends to have the same wide geographic scope, with relocation or extensive commuting being accepted practice. Intermediate and lower-level occupations tend to be grounded in localised travel to work areas.

Careers of the Future provides a UK-wide perspective on careers prospects. This is not to deny the fact that prospects for a particular occupation will vary markedly by location. For some occupations employment opportunities are unevenly distributed geographically, reflecting distinct patterns of economic specialisation across the UK. This means that for some people the number of local job opportunities in their chosen career will be small or even non-existent. Skill shortages and rates of pay can also have a significant local dimension.

Table 6: Occupations with greatest concentration of employment at regional level (descending order)

3532 Brokers
3513 Ship and hovercraft officers
1134 Advertising and public relations directors
8117 Metal making and treating process operatives
6214 Air travel assistants
5235 Aircraft maintenance and related trades
2425 Actuaries, economists and statisticians
8123 Quarry workers and related operatives
1123 Production managers and directors in mining and energy
9112 Forestry workers

Source: Labour Force Survey

The table above provides a ranked list of occupations with the highest concentration coefficient⁴ i.e. their employment is heavily concentrated in certain regions and devolved nations rather than others. For example, around 70 per cent of employment for brokers is located in London; with London also being a major focus for Advertising and public relations directors, Air travel assistants and Actuaries, economists and statisticians. Conversely, London has very little employment for metal making and treating process operatives (along with the South East and East of England), with the bulk of jobs residing in “industrial” regions including the West Midlands, East Midlands and Yorkshire and the Humber.

Table 7: Occupations with the greatest dispersion of employment at regional level (descending order)

9233 Cleaners and domestics
2314 Secondary education teaching professionals
2315 Primary and nursery education teaching professionals
9211 Postal workers, mail sorters, messengers and couriers
4216 Receptionists
3563 Vocational and industrial trainers and instructors
4159 Other administrative occupations nec
1122 Production managers and directors in construction
7111 Sales and retail assistants
1190 Managers and directors in retail and wholesale

Source: Labour Force Survey

At the other extreme, some jobs are relatively evenly distributed across regions and devolved nations. The table above lists the occupations with the greatest dispersion coefficient. These jobs typically employ larger numbers of people than jobs linked to geographically localised industries.

Variations in the geographic distribution of employment by occupation, even at the regional level, demonstrate the importance of local labour market information. Sources of intelligence on local opportunities and vacancies form a key part of the careers information mix and are highlighted as a key requirement by information users (see section 4.3.2). This is where more localised sources of labour market information, such as data on live vacancies, come into play. Internet-based job boards provide the facility to drill-down on of the available opportunities for a given occupation within a preferred geographic area.

⁴ Occupations with employment below 10,000 are excluded from the calculations that underpin both tables in this section.

3.13 New jobs

In our *Careers of the Future* publication we have focused on the prospects for today's jobs, those occupations for which we have statistical data. But just as we can identify job titles today that didn't exist 10 years ago (such as offshore wind farm engineer or social media manager), what about brand new jobs that may emerge over coming years as a result of new technology, changing consumer requirements and other trends? This is a popular topic for public debate and something that one might expect to see examined in a publication dealing with *Careers of the Future*. Why is this not a major feature of our *Careers of the Future* publication?

New jobs are certainly emerging on a constant basis. The index of job titles that forms the basis for the latest version of the Standard Occupational Classification, introduced in 2010, contains over 27,000 job titles, 2,200 of which are new titles added as part of the review process. Since 2010 another 89 titles have been added on the basis of an ongoing review of job vacancy advertisements and careers websites together with official sources such as the Census of Population and Labour Force Survey.

In our [Future of Work](#) study we examined how the world of work of 2030 might be shaped by the trends we can observe now, as well as the potential impact of disruptive developments.

Although it is possible to examine the issue of new jobs using foresight techniques that are primarily qualitative in nature (although even this kind of approach has a strong speculative element) it is much more difficult to assess emerging occupational areas in a quantified manner, in order to gain an impression of the scale of these opportunities. (Although the limited evidence that we have suggests that most are niche in terms of the number of people employed.) A qualitative method essentially based on judgment and a high degree of speculation would be at odds with our chosen data-driven approach for the present exercise and arguably not in keeping with a practical resource designed to inform thinking around specific career paths.

Moreover, there is a strong argument that it is not the emergence of entirely new jobs but the evolution of existing jobs – new tasks, new knowledge and skills requirements, changing work patterns – that is the most important issue to be aware of in this context. For example, as the electrical era has progressed to automation, and now into digitalisation of systems, the role of the engineer has moved from mechanical to encompass electronic, and digital aspects. This means the engineers already in employment must be redeployed, and continually reskilled and upskilled in order to keep pace with technological opportunities. Moreover, the impact of communications technologies means that engineers can increasingly work remotely rather than on-site. This is an aspect that we have sought to address through the content of the job profiles presented in the *Careers of the Future* publication (see section 4.6.2).

4 Analytical approach used for *Careers of the Future*

Chapter Summary

- In this chapter we provide an overview of the analytical approach used to identify the top jobs that are featured in the *Careers of the Future* publication.
- We describe the process by which the indicators used in the occupational model were selected, the method used to compute scores for each occupation, and the approach taken to presenting the results of the analysis in the careers publication.
- The model of occupational prospects uses four indicators relating to future job openings, future net employment change, current average pay and current business need (skill shortages).
- An overall composite score is calculated for each occupation based on the weighted sum of scores for each of the indicators and this is used to rank occupations.
- In order to provide a diverse picture of the career opportunities that are available the overall ranking of top jobs has been segmented using a set of “job families”. This provide the basis for the 40 top jobs in 10 key job families that are presented in the careers publication.

4.1 Introduction

The *Careers of the Future* publication seeks to identify jobs with the most positive career prospects in the years ahead. This chapter examines the analytical approach that was adopted to address this question. It builds on the discussion presented in the previous chapter: in short, to draw upon our wider intelligence, and consider the key trends in the labour market and the way in which they are shaping future career opportunities. Our analytical approach seeks to “operationalise” this analysis by using a small basket of indicators to review varying career prospects across the labour market.

4.2 Background to *Careers of the Future*

The original brief handed to the UK Commission by government was to identify and showcase top jobs that offer attractive careers for young people, based on future level of opportunities and economic value.

The intention was to provide a resource for informed adults (including parents, teachers and careers practitioners) so that they can inspire young people about their career options.

An agreed measure of success was that the “process” for selecting jobs must be objective and demonstrably driven by robust labour market analysis.

A further requirement was that the results of the analysis should incorporate a diverse perspective rather than focusing on a narrow strata of elite jobs. Underlying the requirement for a careers publication is a determination that it should appeal to and inspire a representative cross-section of young people, reflecting the wide range of vocational interests and skillsets that exist.

To summarise, then, the objectives of the analysis are to:

- Identify jobs with the greatest economic significance and growth potential using robust sources and methods. These jobs then needed to be profiled and “brought to life” in more detail within the careers publication.
- Ensure that the selection of jobs to be presented is not confined to limited range of high skilled jobs alone and reflects a range and diversity of career avenues and interests.

4.3 General approach

The following section sets out the general approach taken to the analysis in more depth. In essence, this has centred on identifying a range of indicators which enable us to review how careers prospects vary objectively between one job and another. The different dimensions of the approach are considered in turn, including:

- How we defined jobs or careers
- What factors we considered in developing the indicators
- The actual indicators selected
- Details of the analytical approach, including calculating composite scores and applying weights.

4.3.1 Defining jobs

Clearly, in pursuing a data-driven approach to assessing career prospects it is necessary to employ a standardised classification of occupations as the basis for a consistent analysis. The Standard Occupational Classification (SOC) system, which is maintained by the Office for National Statistics, is the common classification system for occupational information in national statistics and major public surveys and studies (see section 3.4). For this reason it is at the heart of data collection and LMI in the UK. It provides the possibility of aggregation, disaggregation and comparability between sources within the UK, making it the natural choice for the present analysis.

Box 8: The Standard Occupational Classification

The Standard Occupational Classification (2010) assigns 27,000 known job titles to 369 occupational unit groups. Its purpose is to provide a consistent means of classifying jobs. Jobs are defined as a set of tasks or duties to be carried out by one person and are recognised by the associated job title.

Under SOC, jobs are classified into groups according to the concept of 'skill level' and 'skill specialisation'.

Skill level is defined with respect to the duration of training and/or work experience recognised as being normally required in order to perform the activities related to a job in a competent and efficient manner.

Skill specialisation is defined as the field of knowledge required for competent, thorough and efficient conduct of the tasks. In some areas of the classification it refers also to the type of work performed (e.g. materials worked with, tools used, etc.).

The latest version of the Classification, SOC2010, consists of a hierarchical structure with four nested tiers:

- 9 Major groups – top-level, broad definitions of occupation, providing the first digit of the SOC2010 code number
- 25 Sub-major groups – second-level definition of occupation, providing second digit
- 90 Minor groups – third-level definition, providing third digit
- 369 unit groups – lowest, most detailed definition of occupation, providing the complete four-figure SOC2010 code.

The 25 sub-major groups can be assigned to four broad skill levels, ranging from a basic

level, at which jobs simply require a general education typically associated with compulsory schooling, through to professional and high level managerial positions that require a degree or equivalent period of relevant work experience.

SOC is used to classify official statistics relating to employment and the labour market, including:

- Employment; with regard to main job, second job, previous job (Labour Force Survey, Census of Population)
- Earnings and hours worked (Annual Survey of Hours and Earnings).

In addition to official statistics SOC is also used to classify data within a range of other surveys and studies. For example:

- Vacancies, hard-to-fill vacancies and skill shortages (UK Commission's Employer Skills Survey)
- Projected future employment (*Working Futures*)
- Previous job and job sought by Jobseeker's Allowance claimants (Jobcentre Plus administrative system).

The Migration Advisory Committee also uses SOC as the basis for its analysis of the labour market which is used to inform its recommendations around work immigration.

For further details see the [ONS website](#).

The SOC is a hierarchical system but for the *Careers of the Future* analysis we have adopted an approach based on the 369 4-digit unit groups, which provides the most detailed commonly available unit of occupational analysis in national statistics.

Even at this most granular level there is potential for confusion among non-technical audiences: it is necessary to modify the descriptors for some of the categories in order to make them more accessible, whilst some of the categories need more explanation than others in order to make their occupational coverage clearer (see section 4.6, below). The difficulties involved would be multiplied with the use of SOC at either the minor group (90 categories) or sub-major group (25 categories) level, which are far less intuitive to the layperson.

4.3.2 Considerations in selecting the indicators

Our starting point for formulating and selecting an appropriate basket of indicators was a set of key principles, as follows:

- The indicators should reflect the original brief around future opportunities and economic value
- The indicators should be relevant to the concerns and priorities of the audience i.e. reflective of criteria that young people use to assess career options
- Robust data should be available for the indicator
- Items of interest should be susceptible to objective measurement rather than relying on value judgments
- Each indicator should be fairly simple and easy for a non-technical audience to understand
- The overall “basket” of indicators should be coherent but as small as possible to minimise complexity and aid transparency
- Combinations of indicators should be avoided that strongly correlate and simply reinforce each other.

In determining an appropriate set of indicators it is also clearly of central importance to take account of the expressed information requirements of the target audience, in this case young people considering their career options. The UK Commission has undertaken its own primary research to assess the information priorities of careers decision-makers (see, for example, Howat and Sanderson, 2013) and has also reviewed the available literature in this area.

The results of this research indicate a series of information requirements that are consistently identified by users and can be summarized as follows:

- Information on entry routes into occupational areas of interest, including formal qualification requirements and occupational / career pathways.
- Data on future prospects of an occupational area, in relation to the stability of the occupation, the anticipated consistency of demand, and predicted levels of opportunities for employment.
- Data on levels of pay / salary within an occupation.
- Information that could enable the individual to assess the likely level of personal job satisfaction offered by an occupational area.
- Insight into opportunities for career progression within an occupation, especially in relation to CPD, identified career pathways, and also flexibilities to move between roles within an area.

- Information about the day-to-day duties, roles, responsibilities, and general working culture associated with a particular occupation; for example the hours, flexibility, amount of travel etc.
- Intelligence on “where the jobs are” down to the local level, with specific information about current vacancies / opportunities and key employers etc.

The prime purpose of the *Careers of the Future* study is to assess occupational areas in terms of their attractiveness as a potential career choice. To be meaningful, indicators of attractiveness need to have an objective rather than subjective foundation. As such, our approach put the onus on selecting indicators from robust, national information sources, covering all jobs across the economy and which are routinely used as part of the UK’s core official statistics, and associated LMI framework. This included sources such as: the Labour Force Survey, the Annual Survey of Hours and Earnings, and the UK Commission Employer Skills Survey.

When thinking about users’ information requirements in the context of our model it is important to make a distinction between indicators that can be objectively measured and provide an insight into the attractiveness and future prospects of a job and those types of information that are useful to the individual in making a subjective assessment of the suitability of a job for them.

4.3.3 The indicators

Taking into account the various criteria and considerations outlined above we settled on the following four indicators as the basis for our assessment of career attractiveness and prospects:

- Projected job openings by occupation, 2012-2022
- Projected net change in employment by occupation, 2012-2022
- Skill shortage vacancies as a proportion of total vacancies by occupation, 2013
- Gross mean annual wages, 2013.

The rationale for the use of each of the indicators is outlined in Table 8. Details of how each indicator is calculated are provided in the subsequent section.

Details of the indicators that were not included and the reasons for this are provided in Appendix C.

Table 8: Rationale for the indicators used in *Careers of the Future*

Key question	The indicator – what is it?	Why is it important?	How is it estimated?
Which occupations are the best paid?	<i>Gross mean annual wages 2013</i> This is the average wage earned by employees working in the occupation	Most people prefer jobs that pay high wages rather than low wages	The Annual Survey of Hours and Earnings is based on a one per cent sample of employee jobs taken from HM Revenue and Customs PAYE records
Is the number of jobs in the occupation expected to grow?	<i>Net change in employment 2012 – 2022</i> This is the projected net change in the number of jobs in an occupation over the 10 year period. The absolute volume of growth / decline, in terms of the number of jobs, is used rather than the percentage rate.	An occupation with significant job growth is likely to offer good employment prospects in the future	The <i>Working Futures</i> labour market model projects future occupational employment levels taking into account past trends
How many job opportunities are there expected to be in the occupation?	<i>Projected job openings 2012-2022</i> This is the number of job openings that we expect to see in an occupation, taking into account both net growth and replacement demands. The absolute volume of job openings is used rather than a proportion / percentage rate.	An occupation with a high number of job openings has strong "hiring demand" i.e. employers will need to recruit people to fill vacancies	The <i>Working Futures</i> model projects replacement demands using historic data on the number of people who leave the labour force each year due to retirement, maternity leave etc. This is combined with data on net employment change
Are skilled people in short supply in this occupation?	<i>Skill shortages vacancies as % of total vacancies</i> This is the proportion of vacancies in an occupation that employers say are hard to fill because of a lack of skilled candidates	It gives an indication of the balance between the supply and demand of skilled people and hence the job prospects within an occupation	The UK Commission's Employer Skills Survey asks about vacancies that are hard to fill due to a lack of skills. This survey is based on interviews with 90,000 business establishments

4.4 Projected job openings (indicator 1)

The number of job opportunities that are expected to become available in a particular occupation in future is clearly a central indicator of career prospects and is identified by users as an item of information that is of value in assessing careers options.

As Table 8 indicates, the level of future job openings in an occupation is the sum of two elements: net change in employment and replacement demands. In *Working Futures*, our source for this indicator, the term used for total job openings is net requirement. The net requirement for an occupation over a given future period is calculated by adding projected replacement demands to the projected net change in the level of employment for that occupation (see below for an examination of net change).

Replacement demands are the numbers of skilled and qualified entrants that will be needed to 'replace' the existing skills that will be 'lost' as a result of retirements and other aspects of the normal process of labour turnover.

Looking at the UK labour market as a whole, replacement demands make a much greater contribution to job openings than net growth in jobs. The ratio of their respective contributions is around seven to one. For occupations in net decline replacement demands will be the sole source of job openings (see section 3.7 for a more detailed discussion). This is why it is so important to include an indicator that takes account of this dimension.

4.5 Projected net change in employment (indicator 2)

The net change in employment between two points in time, also known as "expansion" or structural demand, arises from growth (or decline) in occupational employment levels. This indicator is an important supplement to the indicator of job openings (considered above) because (all else equal) prospects will be more favourable in an occupation experiencing expanding employment compared with one that is declining, even if the latter is still seeing a steady supply of job openings due to replacement demands.

For both indicators – projected job openings and projected net change in employment – absolute values are used within the model. An alternative option would be to use some form of rate e.g. the projected number of job openings for the period 2012-2022 expressed as a proportion of the opening stock of employment in 2012. However, by using absolute values we ensure that precedence is given to occupations that are expected to generate the greatest *volume* of job opportunities and net additional jobs. It is our judgment that for the purposes of an exercise that is intended to inform careers choice, occupations offering opportunities on a large scale are of greater interest than “niche” areas that are characterised by rapid rates of growth.

Box 9: Estimating net employment change and replacement demands at the 4-digit SOC level

The main basis of the *Working Futures* database is projections by occupation at a 2-digit level of SOC2010 (see section 3.4). In the course of the development of the UK Commission’s LMI for All database it was determined that projections at a more granular 4-digit level were essential for careers purposes.

In principle, more detailed projections at the 4-digit level are technically feasible but this is limited by the quality of the available data upon which the analysis is based, primarily drawn from the Labour Force Survey. Some occupations have small cell sizes and there is a limited consistent timeseries of 4-digit data available from the Labour Force Survey, due to the switch to SOC 2010 in 2011.

To overcome this, an approach based on the application of common growth factors to all 4-digit unit groups within a 2-digit category (i.e. assuming fixed shares) was implemented for LMI for All and this is the approach used for the *Careers of the Future* analysis.

A similar approach is taken to projections of replacement demand. Again, common replacement rates are applied to all 4-digit unit groups within a 2-digit category.

These results should be seen as projections based on simple assumptions rather than precise predictions. This is the spirit in which even more detailed occupational projections are made in the US by the Bureau of Labor Statistics.

4.6 Skill shortage vacancies as a proportion of total vacancies (indicator 3)

Ideally, our model would incorporate a forward-looking indicator of business need and the balance between supply and demand for workers in particular occupations. However, we considered and discounted the use of projections of occupational imbalances in supply and demand based on modelling techniques (see Appendix C). We have therefore settled on a survey-based indicator of skill shortages as a measure of current imbalances in the supply and demand of occupational skillsets. The value of skill shortage as a labour market indicator in this context is considered in section 3.10. The principal shortcoming of this indicator is that it focuses on the current labour market rather than being forward-looking. However, historic evidence indicates that many instances of shortage, such as for skilled trades roles for example, are persistent over time reflecting structural weaknesses in the supply of labour.

In its assessment of occupational shortages the Migration Advisory Committee uses a fuller range of top-down indicators to assess shortage, including indicators based on trends in pay and hours worked, together with vacancy patterns. For reasons of simplicity we have limited ourselves to one indicator; and this also reflects the fact that unlike MAC our sole aim is not to provide a technical assessment of shortages but to give a wider picture of career prospects.

Data on the prevalence of skill shortages within an occupation is theoretically available from the Employer Skills Survey down to the level of 4-digit occupational unit group. However, in practice the data available for many unit groups and minor groups (3-digit) is not sufficiently robust to enable its use in this kind of modelling approach. Therefore, as with the *Working Futures* data we have applied estimates of skill shortage rates for each of the 25 sub-major groups to their component unit groups. An alternative would have been to use a “cascade” approach i.e. to apply specific estimates relating to unit groups in those instances where reliable data are available, using estimates drawn from the next level of aggregation only where robust data at the preferred level are not available. However, on the grounds of clarity and consistency we have applied sub-major group level estimates to all SOC unit groups.

4.7 Gross mean annual wages (indicator 4)

As has already been highlighted pay levels do not give a complete picture of job quality and the rewards associated with a job. Nonetheless, pay is a key information requirement for people considering their career options, even though we cannot present a fuller range of indicators of job quality due to a lack of robust data. The size of the sample of the Annual Survey of Hours and Earnings means we are able to access robust data on mean annual earnings for virtually all 369 SOC unit groups in the occupational landscape.

We have chosen to use the mean wages indicator within our model. This is in spite of the fact that median rather than mean pay is generally regarded as the headline indicator because unlike the mean it does not have the potential to be skewed by the effect of a relatively small number of highly paid individuals at the top of the earnings distribution. However, we have selected mean pay as our chosen indicator because of the availability of data for this indicator for a greater number of occupational unit groups. Our general approach to capping scores for individual indicators to take account of outliers is explained below.

4.4 The analysis

Having selected our indicators we then developed the analytical process. This comprised of three parts:

- To enable an assessment of variation between jobs across the different indicators we calculated a composite score for each occupation
- We also applied weights to each indicator to reflect their varying importance in the assessment
- Finally we took the approach to a challenge panel to review and independently verify the analytical process and what was done.

4.41 Calculating the composite score for occupations

We sought to develop an overall ranking of jobs based on our chosen selection of indicators by calculating a composite score for each occupation.

To create a single composite score it was firstly necessary to convert data into a 'common currency' so that they could be added together on a consistent basis. This standardisation is achieved by converting the scores for individual variables into z-scores which measure the difference between a data point and its respective average, measured in terms of standard deviations.

Z-scores have been capped at three standard deviations above or below the average to avoid any distortions that might otherwise be caused by extreme results. This is a prudent approach and reduces the risk of an occupation achieving an extremely high or low ranking based on a single data point. This is particularly pertinent in view of the fact that job openings and net job growth are expressed in absolute terms and some larger occupations register values for each of these indicators that are many times the size of other occupations. Similarly, a number of occupations attract high levels of pay that are several times greater than low-paid occupations. The use of a cap within each indicator seeks to ensure that the overall composite score is based on a balanced picture across the range of indicators.

4.4.2 Weightings applied to individual indicators

As part of the process of calculating the overall composite score, weights were then applied to each of the indicators to reflect their perceived importance to the overall outcome of the analytical exercise.

The decision as to the relative weight that should be assigned to the indicators was essentially a judgment-based process. It is acknowledged that sensible arguments can be presented for alternative weighting approaches to the one adopted here. The process of identifying suitable weights also had an iterative element with the Challenge Panel suggesting modifications to an initial proposal prepared by the UK Commission (see below).

The weights applied to each of the indicators are set out below.

- Average pay – 30%
 - Future job opportunities – 50%; of which:
 - Projected net employment growth – 30% (i.e. 15% of total)
- Projected future job openings – 70% (35% of total)
- Skill shortages – 20%.

The rationale for the weighting approach that was ultimately adopted can be summarized as follows:

- The greatest combined weight (50 per cent in total) is assigned to the indicators dealing with future job opportunities. This reflects the fact that these are forward-looking indicators designed to provide an insight into occupational prospects in the medium to longer-term and that this aligns with the overall purpose of the study which is to assess *Careers of the Future*. Future job prospects are also seen as a key consideration by people making career choices. Greater weight is given to projected future job openings since this, rather than net job growth, is the primary indicator of the supply of future job opportunities within an occupation, although the latter is still an important supplementary indicator of future job prospects.
- We have already noted that the prevalence of skill shortages within an occupation is a valuable indicator of business need and the balance between supply and demand. It gives an additional perspective on demand in the labour market and emphasises those occupations that although not necessarily growing in employment terms face shortages of appropriately skilled people. However, this indicator is given relatively low weight because it is not a forward-looking measure of need since it is not feasible to extrapolate future areas of shortage, although it is reasonable to assume that historically persistent areas of shortage will continue to be an issue some time into the future.
- Like skills shortages average pay is not a forward looking indicator since a highly complex model would be required to forecast occupational pay levels at the required level of detail. However, it is given more weight within the model than shortages since it is a central indicator of economic significance and job quality. It can be a decisive factor in an individual's career decision and it is also a reflection of a worker's value in the labour market in terms of their contribution to business performance and productivity.

4.4.3 Challenge Panel

A key element of the analytical approach to assessing top careers was the convening of a Challenge Panel.

The purpose of the panel, with regard to its scrutiny and challenge function, was threefold:

- To review the proposed methodological approach to identifying top jobs
- To consider and “sense check” the draft results generated by this approach, presented in the form of a ranked list of top jobs.

- To consider the most appropriate way to present the results in order to meet key requirements, including the need to present a diverse picture of career opportunities.

The composition of the panel was intended to be representative of three key constituencies: employers, trade unions and labour market experts. The intention here was to provide a broad range of perspectives on the different aspects of the approach and to verify the objectivity of the approach. The full membership of the panel is set out in Appendix G.

The Challenge Panel firmed up and agreed a number of areas in the final approach, as follows:

Method

- That we should retain the proposed indicators (these were as per the final model). Although there was interest in broadening the scope of the indicators to build in additional measures of job quality, suitable indicators / sources were not identified.
- That the modelling should be conducted again with a reduced pay weight (the original proposal was for a weight of 30 per cent).
- That we should incorporate a minimum employment threshold in the analysis of 10,000 in order to exclude niche occupations from the analysis.
- That we should apply a Top 100 “lens” to the analysis to ensure that only relatively high ranking jobs could feature within “job families” (see section 4.6 for a discussion of presentation).

Presentation

- That the “job families” approach to presenting the top jobs was the preferred one rather than a straight ranking in order to provide diversity to the top jobs.
- That the rankings of individual jobs should not be made explicit within the presentation of the job families within the main careers publication.

4.5 The results

The results of the analysis are presented in Appendix A in the form of two tables. The first table presents the underlying data for each of the indicators; the second contains the model scores computed for each occupation. In both tables the jobs are ranked in descending order according to their overall weighted score from the model.

In conducting this analysis we are ultimately seeking to produce an assessment of career prospects that is understandable and has resonance for young people and the adults who advise them. With this in mind, we made the decision also systematically to exclude a number of types of occupation from our Top 100 ranking. These exclusions are set out in Appendix D together with the reasoning behind their omission.

4.6 Presenting the results

The following section provides a detailed explanation of the way in which the results of the occupational modelling are presented in the *Careers of the Future* publication. It also provides further background to the sources and methods underlying the 12 job profiles that are featured in the document. The results are presented in two ways and these are outlined in turn below:

- The top 40 jobs with 10 broad occupations, and
- 12 illustrative job profiles.

4.6.1 Presenting the 40 Top Jobs across 10 broad occupations

As well as assessing occupations according to their growth potential and economic significance one of the key objectives of the analysis is to present a diverse range of career options to reflect the variety of vocational interests that exist among young people.

A simple ranking of the top 20 or even top 40 occupations drawn from the analysis fails to satisfy this criterion since the coverage at this level is relatively narrow in occupational terms, with the primary focus being on higher skilled jobs. As a consequence an alternative approach to presentation of the results is required in order to provide a diverse picture that is more likely to appeal to a wide range of young people.

The approach used in the *Careers of the Future* publication centres on the application of “job families” or “broad occupations” which can be used to organise the Top 100 jobs. In essence, this provides segmented mini-rankings that give a greater degree of diversity to the 40 top jobs that are presented. In the careers publication “job families” are described as occupations in order to aid ease of understanding.

The process is described in broad terms in the careers publication: “we identified 100 top jobs, based on future job opportunities, pay and business need and from this list selected the top jobs in each of 10 key occupations to form our 40 top jobs.” The steps in the process were as follows:

- A set of job families was developed as the basis for further segmentation of the ranking of top jobs. All jobs in the top 100 ranking were assigned to a family. Appendix E contains a description of the process by which the families were developed, together with a breakdown of the occupational coverage of the families. In developing the job families we sought to link them to the broader categories of the Standard Occupational Classification in a commonsense way, while applying descriptors that are simple and easy to understand for a non-technical audience.
- The highest ranking jobs from each family were drawn from the top 100 list for presentation within the *Careers of the Future* publication. The number selected for each family is proportionate to the weight of the family within the top 100. A total of 40 jobs were selected on this basis.
- For each of the 40 jobs the title of the job is presented (simplified from the official title where necessary) together with a one sentence strapline describing the types of specific job titles that fall within the job area and in simple terms the nature of the job (see pp 4-5 of the *Careers of the Future* document).
- Only jobs ranked in the top 100, based on their overall score from the model, were eligible for inclusion in job families presented in the careers publication. This decision was based on advice from the Challenge Panel. An alternative would have been to use all 270 jobs as the basis for the selection process. However, this latter approach would have led to the inclusion of job families entirely comprised of low ranking jobs. In order to keep the focus on jobs with the most positive prospects, it was felt that jobs lying outside the top 100 should be excluded from consideration.
- The 40 jobs drawn from 10 job families / occupations, as presented in the careers publication, are set out below (see Table 9).
- Although it is not made explicit in the *Careers of the Future* publication, the jobs within each family are ranked in descending order within the document and within the table below.

Table 9: 40 top jobs in 10 key occupations

<p>Science, engineering and technology</p> <ul style="list-style-type: none"> • Mechanical engineers* • Research and development managers • Physical scientists e.g. Geologist, Physicist • Design and development engineers • Biological scientists and biochemists 	<p>Information Technology</p> <ul style="list-style-type: none"> • Programmers and software developers* • IT specialist managers e.g. IT support manager, data centre manager • IT business analysts, architects and systems designers* • IT project and programme managers • Web designers and developers
<p>Business and finance</p> <ul style="list-style-type: none"> • Sales accounts and business development managers e.g. sales manager* • Business and financial project management professionals e.g. Chief knowledge officer, project manager • Finance and investment analysts and advisers e.g. Financial adviser, Financial analyst • Chartered and certified accountants • Management consultants and business analysts 	<p>Health and care</p> <ul style="list-style-type: none"> • Doctors • Nurses* • Nursing auxiliaries and assistants • Care workers and home carers* • Dentists
<p>Construction</p> <ul style="list-style-type: none"> • Carpenters and joiners • Architects • Construction project managers* • Plumbers and heating and ventilating engineers • Chartered surveyors 	<p>Manufacturing, installation, maintenance</p> <ul style="list-style-type: none"> • Electricians and electrical fitters* • Metal working production and maintenance fitters e.g. Engineering machinist, bench fitter • Pipe fitters • Aircraft maintenance and related trades • Telecommunications engineers
<p>Education</p> <ul style="list-style-type: none"> • Secondary education teachers* • Teaching assistants • Primary and nursery education teachers • Senior professionals of educational establishments 	<p>Transport and logistics</p> <ul style="list-style-type: none"> • Aircraft pilots and flight engineers • Large goods vehicle drivers • Ships officers • Train and tram drivers*
<p>Agriculture</p> <ul style="list-style-type: none"> • Farmers* 	<p>Protective Services</p> <ul style="list-style-type: none"> • Police officers*

*Job is featured in a job profile in *Careers of the Future*.

4.6.2 The job profiles

The *Careers of the Future* publication explores 12 of the 40 top jobs in more detail in the form of concise job profiles. The purpose of these profiles is to provide examples of exciting opportunities that can serve to inspire young people to find out more about specific career paths and to explore a wider range of career options.

The process by which the 12 jobs were selected for profiling was straightforward and largely based on judgment. At least one job was selected from each of the featured job families (two each from information technology and health and care) to provide a broadly representative occupational picture. Each job was selected from its respective family based on an assessment of its likely interest to young people.

The commentary contained within each profile in terms of entry routes / requirements, work tasks etc is based on a synthesis of authoritative material available online from existing careers services and professional bodies. This is in keeping with the stated objective of signposting existing content rather than generating new material. The key sources are those flagged as links under each profile within the *Careers of the Future* publication.

For each of the 12 job profiles an “at a glance” panel is included that details vital statistics about each of the featured jobs. Some of the information presented is taken directly from the underlying modelling work, and hence is derived from national sources. However, other indicators relate to additional sources, as detailed in the following table.

Table 10: Statistics presented in the job profiles

Indicator used in profile	Definition	Source
How many work in this job?	The number of jobs in 2012, the base year of the 2012–22 employment projections	<i>Working Futures</i> https://www.gov.uk/government/publications/working-futures-2012-to-2022
Job openings, 2012-2022	The projected number of job openings that we expect to see, taking into account net growth / decline in the number of jobs but also the projected number of workers leaving the occupation due to retirement and other reasons (replacement demand)	<i>Working Futures</i>
Employment Change, 2012–22	The projected net change in the number of jobs between 2012 and 2022	<i>Working Futures</i>
Starting salary	The estimated salary level that one can expect to receive when starting in a job.	This information is mainly taken from the National Careers Service website and is intended as a guideline only. See Appendix F for further details.

Indicator used in profile	Definition	Source
Average gross salary	<p>The median annual gross pay for the job earned by employees.</p> <p>The mean figure for pay is used in the modelling but the median indicator is generally regarded as the headline figure and is therefore used in the profiles.</p>	<p>Annual Survey of Hours and Earnings, 2013. Office for National Statistics.</p> <p>http://www.ons.gov.uk/ons/rel/ashe/annual-survey-of-hours-and-earnings/2013-provisional-results/index.html</p>
Weekly gross pay	The median annual gross pay for the job earned by employees	Annual Survey of Hours and Earnings, 2013. Office for National Statistics.
Average hours (full-time)	The mean weekly paid hours worked by employees in full-time jobs. This figure does not cover unpaid overtime, which is a common feature of some jobs. Full-time defined as employees working more than 30 paid hours per week (or 25 or more for the teaching professions)	Annual Survey of Hours and Earnings, 2013. Office for National Statistics.

Appendix A: Top Jobs Data

Table 11: Top 100 jobs: underlying data used in the model

Jobs ranked in descending order according to their overall weighted composite score from the occupational model (see Table 12)

Rank	Title	Job family	Current employment (000s)	Projected net change in employment (000s)	Projected job openings (000s)	Mean earnings (£)	Skill shortage vacancies as % of total vacancies
1	Medical practitioners	Health, care and welfare	253	63	172	70,648	32
2	Sales accounts and business development managers	Business and finance	436	74	241	47,862	29
3	Programmers and software development professionals	Information technology	277	56	146	40,165	43
4	Nurses	Health, care and welfare	628	157	427	26,158	32
5	IT specialist managers	Information technology	210	43	111	48,384	43
6	Business and financial project management professionals	Business and finance	217	43	137	50,038	23
7	Nursing auxiliaries and assistants	Health, care and welfare	314	84	228	15,618	26
8	Secondary education teaching professionals	Education	420	42	228	33,407	14
9	Care workers and home carers	Health, care and welfare	729	196	530	12,804	26
10	Teaching assistants	Education	364	98	265	11,796	26
11	Primary and nursery education teaching professionals	Education	409	41	222	29,268	14
12	Finance and investment analysts and advisers	Business and finance	188	32	104	46,797	29
13	Chartered and certified accountants	Business and finance	221	44	140	37,850	23
14	IT business analysts, architects and systems designers	Information technology	113	23	60	43,848	43
15	Management consultants and business analysts	Business and finance	174	34	110	42,811	23
16	IT project and programme managers	Information technology	72	15	38	49,128	43
17	Mechanical engineers	Science, engineering and technology	94	19	50	44,176	43
18	Aircraft pilots and flight engineers	Transport and logistics	18	3	10	78,482	29
19	Research and development managers	Science, engineering and technology	42	9	22	49,590	43
20	Physical scientists	Science, engineering and technology	25	5	13	52,470	43
21	Solicitors	Business and finance	135	27	85	44,787	23
22	Design and development engineers	Science, engineering and technology	76	15	40	39,890	43
23	Biological scientists and biochemists	Science, engineering and technology	87	18	46	37,627	43
24	Civil engineers	Science, engineering and technology	81	17	43	38,236	43
25	Financial accounts managers	Business and finance	133	23	74	40,952	29
26	Electrical engineers	Science, engineering and technology	47	10	25	44,439	43
27	Dental practitioners	Health, care and welfare	40	10	27	53,567	32
28	Business sales executives	Business and finance	163	28	90	32,880	29
29	Actuaries, economists and statisticians	Business and finance	35	7	22	61,584	23
30	Marketing associate professionals	Business and finance	168	29	93	30,051	29
31	Nursery nurses and assistants	Health, care and welfare	194	52	141	11,580	26
32	Production and process engineers	Science, engineering and technology	53	11	28	38,475	43
33	Vocational and industrial trainers and instructors	Business and finance	167	28	92	26,490	29

Rank	Title	Job family	Current employment (000s)	Projected net change in employment (000s)	Projected job openings (000s)	Mean earnings (£)	Skill shortage vacancies as % of total vacancies
34	Large goods vehicle drivers	Transport and logistics	319	-1	136	25,602	25
35	Electronics engineers	Science, engineering and technology	40	8	21	36,751	43
36	Web design and development professionals	Information technology	70	14	37	29,870	43
37	Human resources and industrial relations officers	Business and finance	132	23	73	28,999	29
38	Chemical scientists	Science, engineering and technology	32	7	17	35,492	43
39	Quality assurance and regulatory professionals	Business and finance	77	15	48	42,898	23
40	Electricians and electrical fitters	Manufacturing, installation, maintenance	297	-23	70	30,055	42
41	Environment professionals	Science, engineering and technology	40	8	21	33,220	43
42	Pharmacists	Health, care and welfare	58	15	40	36,739	32
43	Senior professionals of educational establishments	Education	103	10	56	49,495	14
44	Carpenters and joiners	Construction	235	15	94	24,029	29
45	Architects	Construction	57	11	36	44,024	23
46	Construction project managers and related professionals	Construction	64	13	41	42,066	23
47	Taxation experts	Business and finance	29	5	16	45,360	29
48	Plumbers and heating and ventilating engineers	Construction	181	12	73	27,832	29
49	Metal working production and maintenance fitters	Manufacturing, installation, maintenance	214	-16	50	29,173	42
50	Financial and accounting technicians	Business and finance	31	5	17	44,038	29
51	Skilled metal, electrical and electronic trades supervisors	Manufacturing, installation, maintenance	47	-4	11	35,316	42
52	Pipe fitters	Manufacturing, installation, maintenance	11	-1	3	36,637	42
53	Higher education teaching professionals	Education	135	14	73	39,076	14
54	Public services associate professionals	Business and finance	98	17	54	28,430	29
55	Aircraft maintenance and related trades	Manufacturing, installation, maintenance	33	-3	8	34,511	42
56	Ship and hovercraft officers	Transport and logistics	17	3	9	44,283	29
57	Insurance underwriters	Business and finance	34	6	19	40,723	29
58	Telecommunications engineers	Manufacturing, installation, maintenance	68	-5	16	32,253	42
59	Vehicle technicians, mechanics and electricians	Manufacturing, installation, maintenance	231	-18	54	25,238	42
60	Farmers	Agriculture and related	162	-16	66	24,520	39
61	Police officers	Protective services	193	-17	31	39,346	34
62	Cleaners and domestics	Elementary roles	594	-9	206	8,067	13
63	Journalists, newspaper and periodical editors	Business and finance	74	15	47	35,117	23
64	Brokers	Business and finance	47	8	26	37,139	29
65	Hairdressers and barbers	Leisure, travel and personal services	192	16	108	10,174	31
66	Estimators, valuers and assessors	Business and finance	71	12	39	32,185	29
67	Social and humanities scientists	Science, engineering and technology	17	3	9	29,984	43
68	Social workers	Health, care and welfare	102	20	65	28,182	23
69	Chartered surveyors	Construction	71	14	45	35,480	23
70	Barristers and judges	Business and finance	26	5	17	45,571	23
71	Train and tram drivers	Transport and logistics	29	0	12	45,489	25
72	Conservation professionals	Science, engineering and technology	16	3	8	28,956	43
73	Educational support assistants	Education	132	36	96	11,569	26
74	Psychologists	Health, care and welfare	33	8	22	34,174	32

Rank	Title	Job family	Current employment (000s)	Projected net change in employment (000s)	Projected job openings (000s)	Mean earnings (£)	Skill shortage vacancies as % of total vacancies
75	Buyers and procurement officers	Business and finance	66	11	36	31,454	29
76	Childminders and related occupations	Health, care and welfare	125	34	91	12,949	26
77	Midwives	Health, care and welfare	44	11	30	30,020	32
78	Health and safety officers	Business and finance	51	9	28	33,445	29
79	Physiotherapists	Health, care and welfare	51	13	35	27,814	32
80	Quantity surveyors	Construction	43	8	27	38,855	23
81	Arts officers, producers and directors	Culture, media and sports	63	9	36	35,825	24
82	Legal associate professionals	Business and finance	66	11	37	29,492	29
83	Precision instrument makers and repairers	Manufacturing, installation, maintenance	30	-2	7	29,334	42
84	Elementary storage occupations	Transport and logistics	429	-7	149	18,430	13
85	Book-keepers, payroll managers and wages clerks	Admin and clerical	446	-25	161	20,646	13
86	Metal machining setters and setter-operators	Manufacturing, installation, maintenance	64	-5	15	27,223	42
87	Welding trades	Manufacturing, installation, maintenance	70	-5	17	26,735	42
88	Medical radiographers	Health, care and welfare	30	7	20	31,505	32
89	Air-conditioning and refrigeration engineers	Manufacturing, installation, maintenance	17	-1	4	28,770	42
90	Gardeners and landscape gardeners	Agriculture and related	172	-17	70	17,595	39
91	IT engineers	Manufacturing, installation, maintenance	39	-3	9	27,064	42
92	Boat and ship builders and repairers	Manufacturing, installation, maintenance	14	-1	3	28,032	42
93	NCOs and other ranks	Protective services	76	-7	12	35,082	34
94	Customer service managers and supervisors	Sales and customer service	155	32	87	28,718	6
95	Construction and building trades supervisors	Construction	60	4	24	33,036	29
96	IT operations technicians	Information technology	111	10	45	29,815	24
97	Van drivers	Transport and logistics	213	-1	90	18,744	25
98	Advertising accounts managers and creative directors	Business and finance	33	7	21	37,636	23
99	Taxi and cab drivers and chauffeurs	Transport and logistics	230	-1	98	16,416	25
100	Veterinarians	Health, care and welfare	18	5	12	32,374	32

Sources: Annual Survey of Hours and Earnings, 2013; Working Futures; UK Commission's Employer Skills Survey 2013

Table 12: Top 100 jobs: indicator scores and overall weighted score

Jobs ranked in descending order according to their overall weighted score

Rank	Title	Job family	Net change in employment	Job openings	Average pay	Skill shortages	Overall weighted score
1	Medical practitioners	Health, care and welfare	2.47	2.30	3.00	0.65	2.20
2	Sales accounts and business development managers	Business and finance	2.93	3.00	1.45	0.38	2.00
3	Programmers and software development professionals	Information technology	2.18	1.84	0.89	1.80	1.60
4	Nurses	Health, care and welfare	3.00	3.00	-0.13	0.65	1.59
5	IT specialist managers	Information technology	1.61	1.24	1.49	1.80	1.48
6	Business and financial project management professionals	Business and finance	1.61	1.69	1.61	-0.22	1.27
7	Nursing auxiliaries and assistants	Health, care and welfare	3.00	3.00	-0.90	0.03	1.24
8	Secondary education teaching professionals	Education	1.58	3.00	0.40	-1.15	1.18
9	Care workers and home carers	Health, care and welfare	3.00	3.00	-1.10	0.03	1.17
10	Teaching assistants	Education	3.00	3.00	-1.18	0.03	1.15
11	Primary and nursery education teaching professionals	Education	1.53	3.00	0.10	-1.15	1.08
12	Finance and investment analysts and advisers	Business and finance	1.14	1.12	1.38	0.38	1.05
13	Chartered and certified accountants	Business and finance	1.64	1.74	0.72	-0.22	1.03
14	IT business analysts, architects and systems designers	Information technology	0.76	0.35	1.16	1.80	0.95
15	Management consultants and business analysts	Business and finance	1.25	1.23	1.09	-0.22	0.90
16	IT project and programme managers	Information technology	0.41	-0.02	1.55	1.80	0.88
17	Mechanical engineers	Science, engineering and technology	0.60	0.19	1.19	1.80	0.87
18	Aircraft pilots and flight engineers	Transport and logistics	-0.08	-0.50	3.00	0.38	0.79
19	Research and development managers	Science, engineering and technology	0.15	-0.29	1.58	1.80	0.76
20	Physical scientists	Science, engineering and technology	0.01	-0.44	1.79	1.80	0.74
21	Solicitors	Business and finance	0.92	0.80	1.23	-0.22	0.74
22	Design and development engineers	Science, engineering and technology	0.44	0.02	0.87	1.80	0.69
23	Biological scientists and biochemists	Science, engineering and technology	0.54	0.12	0.71	1.80	0.69
24	Civil engineers	Science, engineering and technology	0.49	0.07	0.75	1.80	0.68
25	Financial accounts managers	Business and finance	0.75	0.60	0.95	0.38	0.68
26	Electrical engineers	Science, engineering and technology	0.19	-0.24	1.20	1.80	0.66
27	Dental practitioners	Health, care and welfare	0.21	-0.20	1.87	0.65	0.65
28	Business sales executives	Business and finance	0.96	0.88	0.36	0.38	0.64
29	Actuaries, economists and statisticians	Business and finance	0.08	-0.28	2.45	-0.22	0.60
30	Marketing associate professionals	Business and finance	1.00	0.93	0.16	0.38	0.60
31	Nursery nurses and assistants	Health, care and welfare	1.99	1.76	-1.19	0.03	0.56
32	Production and process engineers	Science, engineering and technology	0.24	-0.19	0.77	1.80	0.56
33	Vocational and industrial trainers and instructors	Business and finance	0.99	0.92	-0.10	0.38	0.51
34	Large goods vehicle drivers	Transport and logistics	-0.25	1.67	-0.17	0.00	0.50
35	Electronics engineers	Science, engineering and technology	0.13	-0.31	0.64	1.80	0.47
36	Web design and development professionals	Information technology	0.39	-0.03	0.14	1.80	0.45
37	Human resources and industrial relations officers	Business and finance	0.74	0.59	0.08	0.38	0.42
38	Chemical scientists	Science, engineering and technology	0.07	-0.38	0.55	1.80	0.40

Rank	Title	Job family	Net change in employment	Job openings	Average pay	Skill shortages	Overall weighted score
39	Quality assurance and regulatory professionals	Business and finance	0.43	0.16	1.09	-0.22	0.40
40	Electricians and electrical fitters	Manufacturing, installation, maintenance	-1.18	0.53	0.16	1.72	0.40
41	Environment professionals	Science, engineering and technology	0.13	-0.31	0.39	1.80	0.39
42	Pharmacists	Health, care and welfare	0.40	0.01	0.64	0.65	0.39
43	Senior professionals of educational establishments	Education	0.23	0.29	1.57	-1.15	0.38
44	Carpenters and joiners	Construction	0.44	0.95	-0.28	0.32	0.38
45	Architects	Construction	0.27	-0.05	1.17	-0.22	0.33
46	Construction project managers and related professionals	Construction	0.32	0.03	1.03	-0.22	0.32
47	Taxation experts	Business and finance	-0.01	-0.40	1.27	0.38	0.32
48	Plumbers and heating and ventilating engineers	Construction	0.29	0.58	-0.01	0.32	0.31
49	Metal working production and maintenance fitters	Manufacturing, installation, maintenance	-0.91	0.20	0.09	1.72	0.30
50	Financial and accounting technicians	Business and finance	0.01	-0.37	1.17	0.38	0.30
51	Skilled metal, electrical and electronic trades supervisors	Manufacturing, installation, maintenance	-0.37	-0.48	0.54	1.72	0.28
52	Pipe fitters	Manufacturing, installation, maintenance	-0.25	-0.63	0.64	1.72	0.28
53	Higher education teaching professionals	Education	0.36	0.59	0.81	-1.15	0.28
54	Public services associate professionals	Business and finance	0.49	0.26	0.04	0.38	0.25
55	Aircraft maintenance and related trades	Manufacturing, installation, maintenance	-0.32	-0.54	0.48	1.72	0.25
56	Ship and hovercraft officers	Transport and logistics	-0.09	-0.51	1.19	0.38	0.24
57	Insurance underwriters	Business and finance	0.03	-0.35	0.93	0.38	0.24
58	Telecommunications engineers	Manufacturing, installation, maintenance	-0.44	-0.39	0.32	1.72	0.23
59	Vehicle technicians, mechanics and electricians	Manufacturing, installation, maintenance	-0.96	0.27	-0.20	1.72	0.23
60	Farmers	Agriculture and related	-0.91	0.46	-0.25	1.41	0.23
61	Police officers	Protective services	-0.92	-0.14	0.83	0.84	0.23
62	Cleaners and domestics	Elementary roles	-0.60	2.88	-1.45	-1.29	0.23
63	Journalists, newspaper and periodical editors	Business and finance	0.41	0.13	0.52	-0.22	0.22
64	Brokers	Business and finance	0.13	-0.22	0.67	0.38	0.22
65	Hairdressers and barbers	Leisure, travel and personal services	0.48	1.20	-1.29	0.58	0.22
66	Estimators, valuers and assessors	Business and finance	0.30	0.00	0.31	0.38	0.22
67	Social and humanities scientists	Science, engineering and technology	-0.07	-0.52	0.15	1.80	0.21
68	Social workers	Health, care and welfare	0.65	0.44	0.02	-0.22	0.21
69	Chartered surveyors	Construction	0.38	0.10	0.55	-0.22	0.21
70	Barristers and judges	Business and finance	0.01	-0.38	1.29	-0.22	0.21
71	Train and tram drivers	Transport and logistics	-0.22	-0.46	1.28	0.00	0.19
72	Conservation professionals	Science, engineering and technology	-0.08	-0.53	0.08	1.80	0.19
73	Educational support assistants	Education	1.29	0.98	-1.19	0.03	0.19
74	Psychologists	Health, care and welfare	0.13	-0.29	0.46	0.65	0.19
75	Buyers and procurement officers	Business and finance	0.26	-0.04	0.26	0.38	0.18
76	Childminders and related occupations	Health, care and welfare	1.21	0.89	-1.09	0.03	0.17
77	Midwives	Health, care and welfare	0.25	-0.16	0.15	0.65	0.16
78	Health and safety officers	Business and finance	0.15	-0.19	0.40	0.38	0.15
79	Physiotherapists	Health, care and welfare	0.32	-0.08	-0.01	0.65	0.15
80	Quantity surveyors	Construction	0.15	-0.20	0.80	-0.22	0.15

Rank	Title	Job family	Net change in employment	Job openings	Average pay	Skill shortages	Overall weighted score
81	Arts officers, producers and directors	Culture, media and sports	0.17	-0.06	0.58	-0.20	0.14
82	Legal associate professionals	Business and finance	0.27	-0.04	0.11	0.38	0.14
83	Precision instrument makers and repairers	Manufacturing, installation, maintenance	-0.31	-0.55	0.10	1.72	0.14
84	Elementary storage occupations	Transport and logistics	-0.49	1.90	-0.69	-1.29	0.13
85	Book-keepers, payroll managers and wages clerks	Admin and clerical	-1.29	2.11	-0.53	-1.32	0.12
86	Metal machining setters and setter-operators	Manufacturing, installation, maintenance	-0.42	-0.41	-0.05	1.72	0.12
87	Welding trades	Manufacturing, installation, maintenance	-0.44	-0.38	-0.09	1.72	0.12
88	Medical radiographers	Health, care and welfare	0.10	-0.32	0.26	0.65	0.11
89	Air-conditioning and refrigeration engineers	Manufacturing, installation, maintenance	-0.27	-0.60	0.06	1.72	0.11
90	Gardeners and landscape gardeners	Agriculture and related	-0.95	0.53	-0.75	1.41	0.10
91	IT engineers	Manufacturing, installation, maintenance	-0.34	-0.51	-0.06	1.72	0.09
92	Boat and ship builders and repairers	Manufacturing, installation, maintenance	-0.26	-0.61	0.01	1.72	0.09
93	NCOs and other ranks	Protective services	-0.49	-0.46	0.52	0.84	0.09
94	Customer service managers and supervisors	Sales and customer service	1.15	0.83	0.06	-1.97	0.09
95	Construction and building trades supervisors	Construction	-0.04	-0.25	0.37	0.32	0.08
96	IT operations technicians	Information technology	0.21	0.10	0.14	-0.14	0.08
97	Van drivers	Transport and logistics	-0.23	0.89	-0.67	0.00	0.07
98	Advertising accounts managers and creative directors	Business and finance	0.07	-0.31	0.71	-0.22	0.07
99	Taxi and cab drivers and chauffeurs	Transport and logistics	-0.24	1.01	-0.84	0.00	0.07
100	Veterinarians	Health, care and welfare	-0.02	-0.46	0.32	0.65	0.07

Source: UKCES Occupational Model

Appendix B: Caveats and limitations

In undertaking this challenging exercise it is not surprising that there are a number of significant limitations inherent within our chosen approach. It is important to be transparent about these, some of which have been alluded to earlier in this chapter. The following section provides an overview of the key points.

- **Limitations inherent in projections.** Much of the analysis that underpins *Careers of the Future* is drawn from projections of future labour market structure and performance, specifically *Working Futures*. Clearly, there are caveats and limitations inherent in this kind of approach. The models upon which forecasts and projections are based are highly simplified versions of reality. Nobody can predict the future and past patterns of performance and behaviour can be disrupted by novel developments. The limitations of projections are reviewed in more detail in section 3.3.
- **Use of indicators that relate to current performance.** In an analysis that is seeking to assess future prospects it would clearly be preferable to use forward-looking indicators across all dimensions of interest. As previously noted this is not considered to be feasible with regard to business need (skill shortages) and pay. However, these dimensions are so central to careers choice that their inclusion is deemed essential and it has been felt necessary to compromise and focus on the current picture.
- **Limitations of data quality.** All four indicators used in the *Careers of the Future* model rely, either directly or indirectly upon, survey data. *Working Futures* estimates of historic and current employment (and therefore the projections of future jobs levels and job openings) draws principally upon data from the Labour Force Survey, as well as the Business Register and Employment Survey. Estimates of skills shortages and pay are each based on large-scale surveys of employers. For the level of occupational granularity at which we have conducted our analysis, significant issues of data quality come into play. These issues have contributed to the exclusion of some indicators, such as unemployment, and a reliance on assumptions within some of the indicators we have used e.g the application of common growth factors derived from 2-digit SOC categories as the basis for projections at the 4-digit level.

Appendix C: Indicators that were not included in the model

Taking into account users' information requirements and also our wider knowledge of labour market indicators with potential value in this area, we compiled a list of indicators that were felt to merit initial consideration and scrutiny. In the following appendix we consider potential indicators with regard to their potential value and contribution in a data-driven model designed to assess career attractiveness and prospects.

Occupational entry routes

We know that information on entry routes is valued by careers decision-makers. In theory it is possible to categorise occupations according to the nature of their entry route, using the level of qualification required for entry, for example. However, this is not a hard science since many occupations do not have clear, formal entry requirements. A majority of people working in a qualification may hold a qualification of a particular type and level but others may have entered the occupation on the basis of experience gained working in a related occupation. More importantly, in assessing the attractiveness of jobs / occupations it is not clear whether we should regard stringency of entry requirements as a positive or negative characteristic, since more testing requirements are typically associated with higher skilled, better-paid jobs, which many people aspire to, whilst others may be attracted to occupations with lower barriers to entry. Consequently, it is not feasible to incorporate an indicator relating to entry requirements into our model without applying subjective value judgments.

Indicators of the future balance between demand and supply

As we have seen *Working Futures* provides projections of future employment by occupation. It could be argued that it would be useful to couple this with an analysis of future occupational labour supply in order to assess potential future imbalances between demand and supply. This would be of interest to those making careers decisions because it could highlight occupational areas facing emerging issues of labour under-supply within which prospects and earnings would be particularly attractive and also areas of likely over-supply within which the converse would be true.

Although the *Working Futures* model contains a module focusing on projections of labour supply by qualification level it does not seek to forecast supply by occupation. Other studies have examined demand and supply trends for discrete elements of the occupational landscape (see Bosworth, 2013, for example), however there have been no recent studies that have sought to provide a comprehensive picture of demand and supply trends across occupations. An absence of existing data and the extensive lead-in time required to develop such a modelling approach, means that it has not been possible to consider this kind of method for the present exercise.

Moreover, the experience of other nations who employ this kind of approach suggests that it presents significant challenges, which partly explains why it has not previously been adopted in the UK. For example, the Canadian Occupational Projection System seeks to estimate ex-ante labour market imbalances at the occupational level by comparing the number of projected job seekers by occupation with the number of job openings. This approach faces major conceptual and technical challenges including the need to develop an educational to occupation transition matrix in order to model the supply side. Moreover, the model makes a major assumption that there will be no feedback between demand and supply via wages or employment adjustment over the relevant forecast period.

Unemployment rates

Occupational unemployment rates, which are based on the previous / usual occupation of unemployed people, provide an insight into the balance of supply and demand in the labour market for occupational skillsets. This is useful from a careers perspective because it provides information on the likelihood of securing employment.

While the Labour Force Survey can be used to calculate unemployment rates for SOC 4-digit occupations, there are many gaps in the data and the results for many categories are based on sample sizes too small for the results to be reliable.

Progression opportunities

The potential for career progression is clearly an important dimension when considering the relative attractiveness of different career options. In particular, the inclusion of an indicator relating to progression might serve to bring to the fore jobs that are readily accessible as entry level opportunities for young people but which offer good prospects for moving into higher paid and higher skilled jobs, via established career pathways, for example.

In theory it should be possible to model this dimension using longitudinal data from sources like the Labour Force Survey. In practice, however, this represents a highly complex technical exercise and the finite sample sizes of the relevant surveys mean that robust data are not available at a sufficient level of occupational detail to implement such an approach in the context of our assessment of *Careers of the Future*.

Job satisfaction / job quality

A key indicator of job quality, pay, is relatively easy to measure. However, we know that individuals look beyond pay to other forms of reward when considering career options. To a large degree this is a subjective process, with individuals looking for jobs that meet personal requirements, such as the opportunity to work with children. Personal job satisfaction is highly subjective. On the other hand it is possible, in theory, to measure job satisfaction or job quality in an objective way.

For example a job satisfaction index could be calculated based on interviews with job-holders. This could take into account factors like stress levels and work-life balance. However, at the time of writing no such study exists and it would be a major undertaking to implement one of sufficient size to generate results at the required level of detail⁵.

There are also objective measures of job quality that merit consideration. These include the following:

- Opportunity to use skills within the job
- Level of autonomy within the job
- Level of effort required within the job
- Level of security in the job
- Work-life balance (based on hours of work).

⁵ There are data available relating to a subjective indicator of personal well-being that have been analysed by detailed occupation. These are taken from the Annual Population Survey (APS) Personal Well-being dataset. However, the indicators used pertain to general well-being both in and out of work rather than specific aspects of job quality.

A key source of data with regard to these indicators of job quality is the Skills and Employment Survey. This survey provides a comprehensive range of measures that are based on workers' own perceptions of their situation. It is possible to analyse job quality by occupation using this source. However, in practice, small sample sizes mean that it is not feasible to produce reliable estimates at a sufficient level of occupational detail for use within a model of the kind under consideration here.

Robust, detailed data are available on hours of work from the Annual Survey of Hours and Earnings. These provide a valuable source of consistent data on working patterns. However, for purposes of measuring work-life balance they have a key weakness in that they take account only of paid hours. We know that in some occupations, including high pressure roles, that people work well in excess of their contracted hours. In the absence of a data source that provides comprehensive occupational coverage of unpaid hours we are not able to measure work-life balance on this basis.

Appendix D: Occupations excluded from the results

Niche occupations

By placing a strong emphasis on absolute numbers (rather than growth rates etc) in the indicators relating to future employment, the model we have developed seeks to give precedence to occupations that offer opportunities on a significant scale. Nonetheless, the vagaries of the model mean that a very small number of niche occupations, such as air traffic controllers, make their way into the upper reaches of the job ranking unless a suitable threshold is applied. Therefore a minimum current employment threshold of 10,000 has been applied to the results of the analysis with all occupations falling below this level being excluded. The reasoning behind this is that the inclusion of niche occupations of this kind would be potentially misleading since they can only offer a very small number of job openings to prospective entrants. This decision partly reflects the input of the Challenge Panel (see below).

Managers, directors and senior officials

This exclusion covers all SOC unit groups falling within the major group of managers, director and senior officials (major group 1). This category mainly comprises corporate managers whose primary function is strategic control of resources (financial, material or human) rather than day to day tasks. A judgment was made to exclude occupations in this category on the grounds that the aspirations of young people do not generally centre on this kind of role. An additional factor in this decision is the strong representation of corporate manager roles in the upper reaches of the occupational ranking if they are not omitted. Four out of the top 10 ranked jobs are corporate management roles when this exclusion is not applied and this dominance presents a picture that seems unsuited to young people.

As is evident from the ranking of top jobs this exclusion does not affect all jobs with manager in the title. For example, project management roles are assigned to the professional major group (major group 2) in the classification system.

Residual categories – “not elsewhere classified”

Many minor (3-digit) groups within the standard occupational classification include a residual 4-digit unit group that acts as a catch-all for a heterogeneous range of job titles that cannot be readily assigned to the other unit groups. These “not elsewhere classified” unit groups have been excluded from the results because of the difficulty in describing them in an intelligible, non-technical way to our target audience.

Appendix E: Definition of job families

The use of job families was proposed as a means of bringing diversity to the presentation of the analytical results in the *Careers of the Future* publication. To be fit-for-purpose the definition of the families needed to have an objective basis whilst at the same time being understandable to a non-technical audience.

We have sought to do this through the creation of families which have an explicit link to the Standard Occupational Classification (SOC).

In most cases this link is made at the broad sub-major group level (2 –digit) but in others the link is at the 3-digit level to bring out additional granularity felt to be helpful to our target audience.

The titles of the job families have been simplified from the original SOC description to make them more suitable for the present purpose.

The definitions are set out below.

SOC sub-major group / minor group	Job family
11 Corporate managers and directors	N/A
12 Other managers and proprietors	N/A
21 Science, research, engineering and technology professionals	Science, engineering and technology
213 Information technology and telecommunications professionals	Information technology
22 Health professionals	Health
23 Teaching and educational professionals	Education
24 Business, media and public service professionals	Business and finance
243 Architects, town planners and surveyors	Construction
244 welfare professionals	Care and welfare
31 Science, engineering and technology associate professionals	Science, engineering and technology
313 IT Service Delivery Occupations	Information technology
32 Health and social care associate professionals	Health
33 Protective service occupations	Protective services
34 Culture, media and sports occupations	Culture, media and sports
35 Business and public service associate professionals	Business and finance
351 Transport associate professionals	Transport and logistics
41 Administrative occupations	Admin and clerical
42 Secretarial and related occupations	Admin and clerical
51 Skilled agricultural and related trades	Agriculture and related
52 Skilled metal, electrical and electronic trades	Manufacturing and maintenance
53 Skilled construction and building trades	Construction
54 Textiles, printing and other skilled trades	Manufacturing and maintenance
61 Caring personal service occupations	Care and welfare
62 Leisure, travel and related personal service occupations	Leisure, travel and personal services
71 Sales occupations	Sales and customer service
72 Customer service occupations	Sales and customer service
81 Process, plant and machine operatives	Operatives
82 Transport and mobile machine drivers and operatives	Transport and logistics
91 Elementary trades and related occupations	Elementary roles
92 Elementary administration and service occupations	Elementary roles

Appendix F: Specific sources for starting salary information contained in job profiles

The following table provides links to the third-party job profiles used to source starting salary information.

Job profile	Starting Salary	Source	Title of profile / link
Mechanical engineers	£22,000	National Careers Service	Mechanical Engineer https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/mechanicalengineer.aspx
Programmers and software developers	£22,000+ Starting salaries for graduates can be between £22,000 and £26,000 a year	National Careers Service	Software developer https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/softwaredeveloper.aspx
IT business analysts, architects and systems designers	£20,000+	National Careers Service	Systems analyst https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/SystemsAnalyst.aspx
Sales accounts and business development managers	£18,000+ £18,000 to £25,000 a year plus commission	National Careers Service	Sales manager https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/SalesManager.aspx
Nurses	£21,388	National Careers Service	Adult nurse https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/adulturnurse.aspx
Construction project managers	£27,000	National Careers Service	Construction manager https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/constructionmanager.aspx
Electricians and electrical fitters	£17,000 and £20,000	National Careers Service	Electrician https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/Electrician.aspx
Care workers and home carers	£12,000+	National Careers Service	Care Assistant https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/careassistant.aspx
Train and tram drivers	Trainee trainee drivers can earn between £18,000 and £22,000 a year.	National Careers Service	Train driver https://nationalcareersservice.direct.gov.uk/advice/planning/

Job profile	Starting Salary	Source	Title of profile / link
	Trainee tram drivers can earn from £14,500 to £19,000 a year.		jobprofiles/Pages/traindriver.aspx Tram drivers https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/TramDriver.aspx
Secondary education teacher	£22,023+	National Careers Service	Secondary school teacher https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/secondaryschoolteacher.aspx
Farmer	£13,000	National Careers Service	Farm worker https://nationalcareersservice.direct.gov.uk/advice/planning/jobprofiles/Pages/farmworker.aspx
Police officer	£23,000	Police Recruitment	Police officer http://www.policecouldyou.co.uk/police-officer/pay-and-benefits/index.html

Appendix G: Membership of Challenge Panel

Chair: Jeremy Anderson (CBE) – KPMG and UKCES commissioner

Guy Parker (Confederation of British Industry)

Dan Hooper (Federation of Small Businesses)

Susannah Clements (Chartered Institute of Personnel Development)

Iain Murray (Trade Union Congress)

Verity O'Keefe (EEF)

Ian Mulheirn (Oxford Economics)

Jim Hillage (Institute for Employment Studies)

Andrew Battarbee and Frank Bowley – Department for Business, Innovation and Skills

Nick Lawrence – Department for Education

Michael Davis, Simon Perryman, Vicki Belt, Susan Kirby, Peter Glover – UK Commission for Employment and Skills

Appendix H: SOC2010 Major Groups and Sub-major Groups

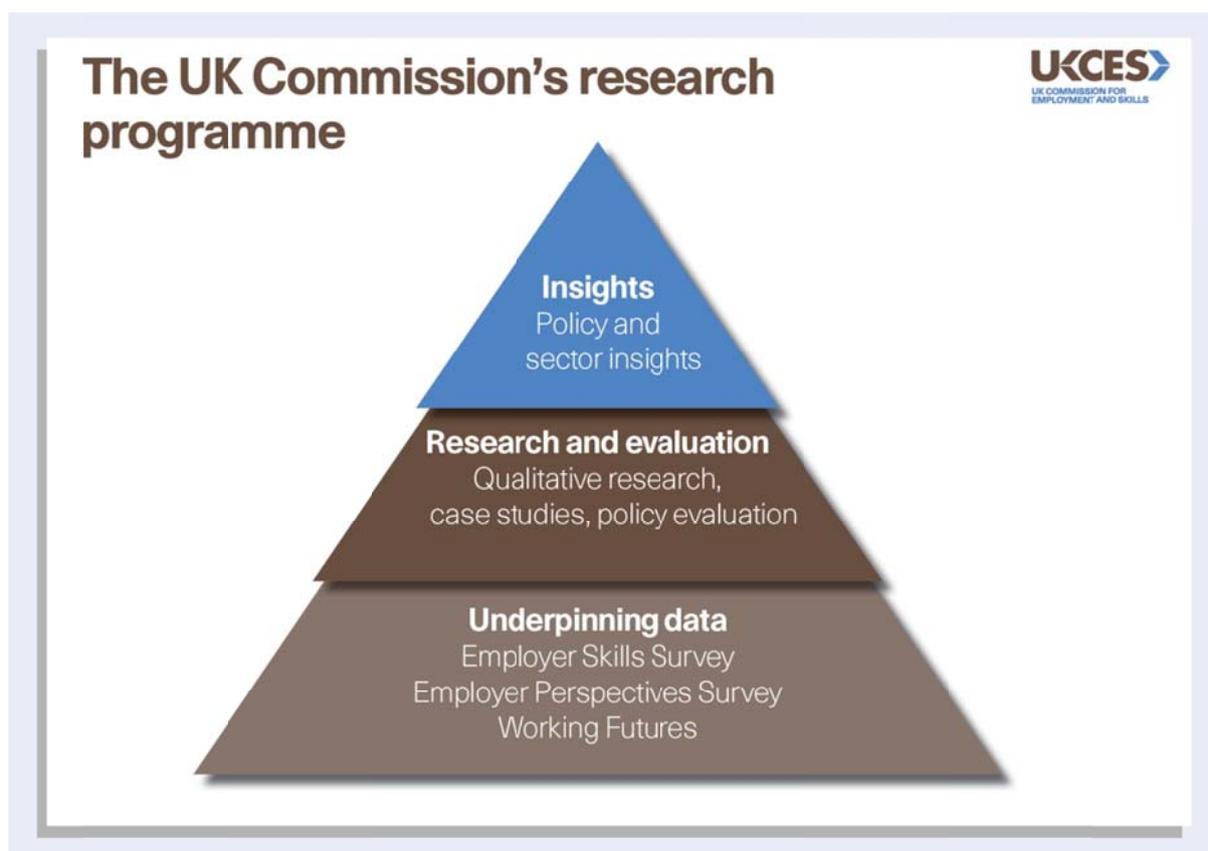
Major group	Sub-Major Groups	Skill level
1 Managers, directors and senior officials	11 Corporate managers and directors	4
	12 Other managers and proprietors	3
2 Professional occupations	21 Science, research, engineering and technology professionals	4
	22 Health professionals	4
	23 Teaching and educational professionals	4
	24 Business, media and public service professionals	4
3 Associate professional and technical occupations	31 Science, engineering and technology associate professionals	3
	32 Health and social care associate professionals	3
	33 Protective service occupations	3
	34 Culture, media and sports occupations	3
	35 Business and public service associate professionals	3
4 Administrative and secretarial occupations	41 Administrative occupations	2
	42 Secretarial and related occupations	2
5 Skilled trades occupations	51 Skilled agricultural and related trades	3
	52 Skilled metal, electrical and electronic trades	3
	53 Skilled construction and building trades	3
	54 Textiles, printing and other skilled trades	3
6 Caring, leisure and other service occupations	61 Caring personal service occupations	2
	62 Leisure, travel and related personal service occupations	2
7 Sales and customer service occupations	71 Sales occupations	2
	72 Customer service occupations	2
8 Process, plant and machine operatives	81 Process, plant and machine operatives	2
	82 Transport and mobile machine drivers and operatives	2
9 Elementary occupations	91 Elementary trades and related occupations	1
	92 Elementary administration and service occupations	1

Source: SOC2010: Volume 1: Structure and Description of Unit Groups

Appendix I: The UK Commission's research products

The UK Commission for Employment and Skills offers a wide range of business and labour market intelligence products.

The following diagram provides an overview of the structure of the research and intelligence programme. Our focus here is on the underpinning data products that form the foundation for our analytical work around the labour market, together with the products that seek to draw together evidence and analysis as the basis for generating insights into the world of work.



There are three key products that form the underpinning basis for the intelligence work of the UK Commission and are used more widely by the analytical community.

The Employer Skills Survey (ESS) helps us to understand employer investment and skills challenge, for example it can be used to:

- Monitor changes in employer investment
- Assess employer skills needs
- Understand recruitment practices.

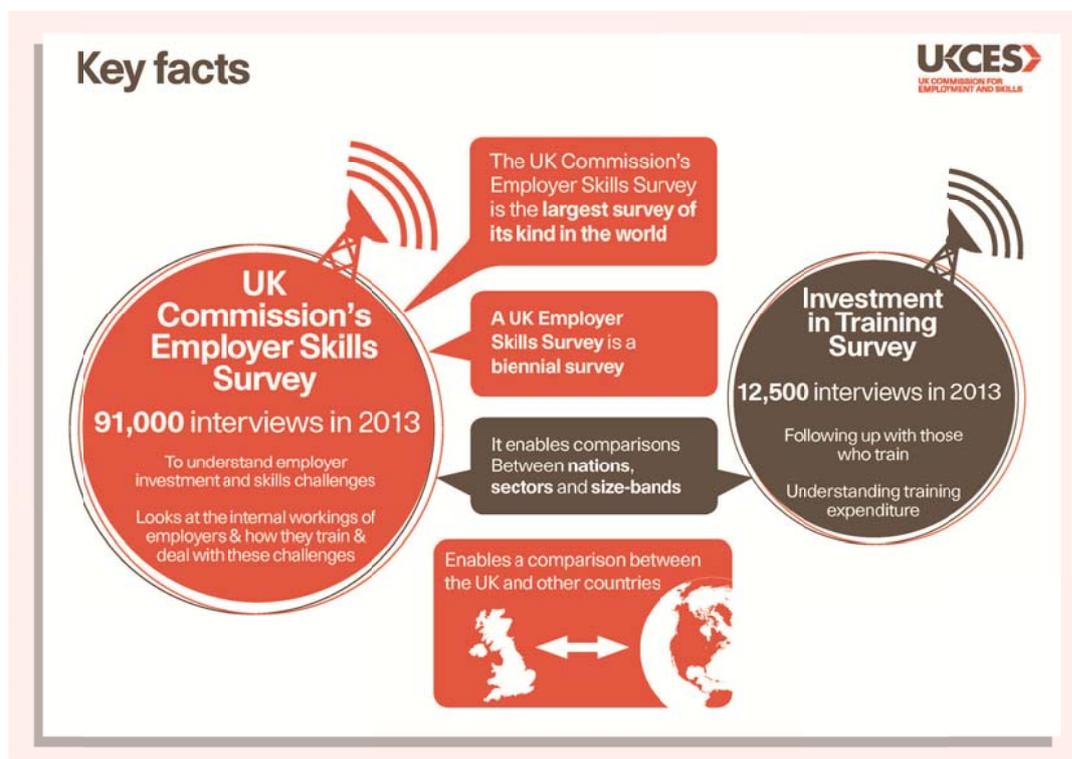
The Employer Perspective Survey (EPS) helps us understand how employers fulfil their skills needs, for example it can be used to:

- Understand employer behaviour in relation to publicly and privately provided services
- Inform evaluation of key aspects of the employment, skills and business support systems.

Working Futures helps us understand labour market prospects for next ten years. For example it can be used to:

- Input to careers and skills advice
- Inform policymakers at national and local levels
- Inform curriculum strategies.

The UK Commission's Employer Skills Survey



The UK Commission's Employer Skills Survey is a **UK-wide** skills survey and one of the largest telephone employer skills surveys in the world. The forthcoming 2015 survey will be the third iteration of the survey, contributing to a well-established UK-time series.

The survey builds on a series of legacy surveys conducted in the four nations of the UK; so, for example, in England we have robust time series going back a decade.

In 2013 we interviewed over 91,000 UK employers (equal to five per cent of all establishments in scope).

The survey covers all public and private sectors and the interviews are carried out with senior managers with responsibility for training and HR. On average we spoke to each employer for 22 minutes. Interviews take place between the March and July of the relevant year.

The survey is sampled at the establishment (branch/location) level (so large enterprises with multiple sites can appear many times). That means detailed information is available on local skills and we can break down the data into fine-grained geographies.

In addition, as part of the survey methodology we followed up 12,500 of those that said they had trained their staff and collected further details on training expenditure.

The survey covers: vacancies, skills deficiencies, retention of staff, workforce development, business strategies, high performance working practices, training expenditure.

In particular – we measure:

- **Skills shortage vacancies** - where a business fails to recruit applicants due to not having the right skills or work experience.
- **Skills gaps** - where an employer reports that employees do not have the right skills to be fully proficient in their role.
- **Skills under-use** – where businesses report that the skills and qualifications of at least one of their staff are greater than required for their current role.

More information: <https://www.gov.uk/government/collections/ukces-employer-skills-survey-2013>

Employer Perspectives Survey (EPS)

The graphic features a light blue border. At the top left, the title 'Employer Perspectives Survey 2014' is in a large, bold, dark blue font. Below it, the subtitle 'Robust UK wide survey of 18,000 businesses providing detailed insight into:' is in a smaller, bold, dark blue font. In the top right corner is the UKCES logo, which includes the text 'UKCES' in a large, bold, dark blue font and 'UK COMMISSION FOR EMPLOYMENT AND SKILLS' in a smaller, dark blue font below it. The main content is a white box with a blue header. The header contains two numbered points: '1. What employers think of the skills system' and '2. How and why they behave in the way they do in terms of recruitment and training'. Below the header is a list of three bullet points: 'Representative coverage of all sectors and sizes of employer', 'Geographically representative down to sub-regional levels (LEP in England)', and 'Themes: Recruitment, work experience, providers of training, vocational qualifications, Apprenticeships, employer collaboration'. To the right of the text is a stylized map of the United Kingdom in a light brown color, with several small icons of people in business attire placed over different regions of the map.

Employer Perspectives Survey 2014

UKCES
UK COMMISSION FOR
EMPLOYMENT AND SKILLS

**Robust UK wide survey of 18,000 businesses
providing detailed insight into:**

1. What employers think of the skills system
2. How and why they behave in the way they do in terms of recruitment and training

- Representative coverage of all sectors and sizes of employer
- Geographically representative down to sub-regional levels (LEP in England)
- Themes: Recruitment, work experience, providers of training, vocational qualifications, Apprenticeships, employer collaboration

The latest iteration of EPS was published in November 2014. With over 18,000 interviews the survey is large at the UK level and offers a very comprehensive view across businesses in all UK countries (e.g. with just over 4,000 interviews carried out with Scottish establishments).

The survey is representative of all workplaces of more than two employees, making it possible to analyse the results by size, sector, and region. Like the Employer Skills Survey, it is an 'establishment' survey

It covers all sectors and the interviews are carried out with senior managers with responsibility for training and HR. Interviews lasted around 20 minutes.

EPS provides a representative, UK-wide picture of vacancies, recruitment activity, work experience placements and internships, apprenticeships, training activity and use of National Occupational Standards and vocational qualifications.

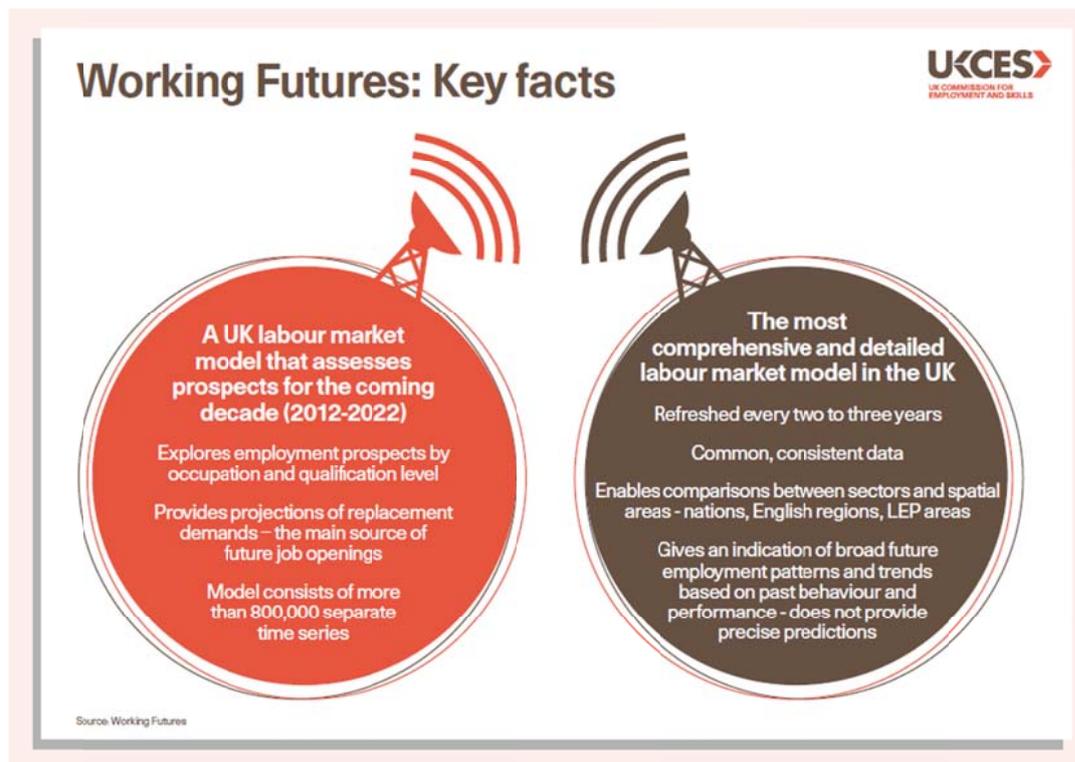
Broadly its coverage splits into the three areas:

- Vacancies, recruitment, work experience placements and internships
- Approaches to people development and training
- Perspectives on vocational qualifications and Apprenticeships.

For 2014 we have new information about the extent of collaboration between schools, colleges and employers, and what employers make of the experience of this kind of engagement. We also have trend data showing how the training market is shifting over time, with an increasingly greater proportion of external training being delivered by commercial providers rather than colleges and universities.

Further information: <https://www.gov.uk/government/collections/employer-perspectives-survey>

Working Futures



Working Futures is a model of the UK labour market, the main purpose of which is to assess future prospects for employment and address the question of where will jobs come from in the future. It provides a picture of employment, developed on a consistent basis, covering the past 20 years and extended forward to 2022.

The model is comprehensive in its coverage of the different aspects of the labour market but is also detailed in terms of the level of sectoral and geographic analysis. As an indication of the scale and complexity of the model, it comprises over 800,000 separate time series.

As with all UK Commission research products we aim for transparency i.e. the sources, methods and assumptions are clearly set out in a detailed technical report. The model is based on data from a wide range of official sources, including:

Macro-economic model

- UK National Accounts
- Input-output tables
- Regional Accounts
- Annual Business Survey.

Employment projections

- Business Register and Employment Survey

- Labour Force Survey
- Census of Population.

The model has stood the test of time. It is now in its fifth iteration and has been around for more than a decade. However, the roots of the model go back to projections undertaken in the 1980s.

Scope of analysis from Working Futures 5

The underlying organising framework for *Working Futures* consists of the sectoral and geographic dimensions. It allows us to run analysis down to the 75 industry level, which is broadly equivalent to the level of SIC 2007 2-digit division.

In geographic terms, each region and nation is modelled separately. So we can examine the performance of 75 industries at the regional level.

Analysis of employment and replacement demand by occupation, gender and status is then available down to the 75 industry level for each of the UK regions and nations. The main occupational analysis uses the Standard Occupational Classification down to the level of the 25 sub-major groups, although additional analysis has been conducted to take this down to the level of 4-digit unit groups for the purposes of LMI for All and the *Careers of the Future* study.

In addition to the UK and national / regional model, employment projections at the local level are also available for all four nations, including for Local Enterprise Partnership areas in England, Regional Skills Assessment Areas in Scotland and Economic Regions in Wales.

Further information: <https://www.gov.uk/government/publications/working-futures-2012-to-2022>

Labour Market Story

Generating insights about the labour market is key to our role in the field of business and labour market intelligence. Central to this is the work we do to provide an holistic overview of the labour market, drawing on a comprehensive synthesis of the available evidence. This plays a vital role in informing the thinking of our commissioners and driving our evidence-led policy advice.

A key contribution in this area is our Labour Market Story report.

The Labour Market Story is an assessment by UKCES of how the UK labour market is working following recession. It draws on research by UKCES, other UK organisations and international sources to identify how the UK is performing relative to international competitors.

The Labour Market Story is an overarching narrative paper that summarises employment and skills in the UK, and is accompanied by four thematic briefing papers. These are:

The UK following recession

This paper analyses current and recent performance of the UK economy and its position internationally, drivers of growth, and the contribution of skills to growth. It explores changes in the labour market and identifies challenges and opportunities for the UK.

The state of UK skills

This paper covers the supply of skills and mismatches between supply and demand for skills. It provides an analysis of the stock of skills in the labour market and identifies skills gaps, shortages, under-use and mismatches in an increasingly polarised labour market. It explores the nature and extent of skills mismatches, considers how employers, individuals and the state are investing to overcome these. The paper argues that employers need to be more involved in designing education and training courses.

Skills use at work

This paper assesses how skills are used in the workplace. It considers whether employer demand for skills is of sufficient quality and quantity to effectively utilise the skills available and move businesses up the value chain. It considers approaches to management and skills use at work, and suggests ways of raising employer demand for skills.

Skills for the future

This paper draws on recent quantitative and qualitative research to provide an analysis of future employment trends and associated skills requirements. It considers potential drivers of skills demand in the future, including globalisation, economic trends, science and technology, environmental change, and changing societal values.

Further information: <https://www.gov.uk/government/publications/skills-and-employment-in-the-uk-the-labour-market-story>

Sector insights

An ongoing stream of the UK Commission's work programme is sector insights. These studies examine skills and performance issues in specific industry sectors.

They provide strategic labour market intelligence on how changes in the sector, particularly technological advances, have impacted on the skills needs of the workforce, and how responding to these challenges can ensure that the sector maximises the opportunities for growth and productivity in the future.

Recent studies feature the logistics, retail and wholesale, aerospace and automotive, digital and construction sectors. However, earlier studies provide extensive coverage of the different sectors of the UK economy.

The objectives of each sector study are tailored to the particular priorities for individual sectors, but typical examples include the following:

- To review and consolidate existing intelligence and literature on the current and future impact of the drivers of change within sectors
- To understand the existing and emerging technologies influencing the skills needs within sectors
- To determine the range of skills required to meet the demands of the drivers of change
- To understand the future skills needs of specific job roles
- To evaluate the different opportunities and challenges present in sectors, taking account of the four UK nations and their regions, and businesses of different sizes.

The methodology for the studies typically relies on a combination of depth interviews and focus groups with sector employers and stakeholders, combined with a detailed and extensive literature review.

These studies add to the existing evidence base by bringing sector employer views together with existing evidence to help understand employer behaviour and the current and future drivers affecting their competitiveness and growth. The findings from this enhanced intelligence on the sector can be used to inform future skills policies, advise employers on the skills they need to be investing in and helping government, education and training providers respond to those needs. It links directly to the UKCES mission to 'work with and through our partners to secure a greater commitment to invest in the skills of people to drive enterprise, jobs and growth'.

Further information: <https://www.gov.uk/government/organisations/uk-commission-for-employment-and-skills/about/research>

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List of previous publications

Executive summaries and full versions of all these reports are available from www.ukces.org.uk

Evidence Report 1

Skills for the Workplace: Employer Perspectives

Evidence Report 2

Working Futures 2007-2017

Evidence Report 3

Employee Demand for Skills: A Review of Evidence & Policy

Evidence Report 4

High Performance Working: A Synthesis of Key Literature

Evidence Report 5

High Performance Working: Developing a Survey Tool

Evidence Report 6

Review of Employer Collective Measures: A Conceptual Review from a Public Policy Perspective

Evidence Report 7

Review of Employer Collective Measures: Empirical Review

Evidence Report 8

Review of Employer Collective Measures: Policy Review

Evidence Report 9

Review of Employer Collective Measures: Policy Prioritisation

Evidence Report 10

Review of Employer Collective Measures: Final Report

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The Economic Value of Intermediate Vocational Education and Qualifications

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UK Employment and Skills Almanac 2009

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National Employer Skills Survey 2009: Key Findings

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Strategic Skills Needs in the Biomedical Sector: A Report for the National Strategic Skills Audit for England, 2010

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Strategic Skills Needs in the Financial Services Sector: A Report for the National Strategic Skills Audit for England, 2010

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Strategic Skills Needs in the Low carbon Energy generation Sector: A Report for the National Strategic Skills Audit for England, 2010

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Horizon Scanning and Scenario Building: Scenarios for Skills 2020

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High Performance Working: A Policy Review

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The Value of Skills: An Evidence Review

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National Employer Skills Survey for England 2009: Main Report

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Perspectives and Performance of Investors in People: A Literature Review

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The Role of Career Adaptability in Skills Supply

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The Impact of Higher Education for Part-Time Students

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International approaches to high performance working

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The Role of Skills from Worklessness to Sustainable Employment with Progression

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Skills and Economic Performance: The Impact of Intangible Assets on UK Productivity Growth

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A Review of Occupational Regulation and its Impact

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Working Futures 2010-2020

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International Approaches to the Development of Intermediate Level Skills and Apprenticeships

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Engaging low skilled employees in workplace learning

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Developing Occupational Skills Profiles for the UK

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UK Commission's Employer Skills Survey 2011: UK Results

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UK Commission's Employer Skills Survey 2011: England Results

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Understanding Training Levies

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Sector Skills Insights: Advanced Manufacturing

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Research to support the evaluation of Investors in People: Employer Survey

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Technology and skills in the Digital Industries

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Technology and skills in the Construction Industry

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Secondary analysis of employer surveys: Urban/rural differences in access and barriers to jobs and training

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Technology and Skills in the Aerospace and Automotive Industries

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Supply of and demand for High-Level STEM skills

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A Qualitative Evaluation of Demand-led Skills Solutions: Growth and Innovation Fund and Employer Investment Fund

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A Qualitative Evaluation of Demand-led Skills Solutions: standards and frameworks

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Forecasting the Benefits of the UK Commission's Programme of Investments

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UK Commission's Employer Skills Survey 2013: Technical Report

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The Future of Work: Jobs and skills in 2030

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UK Skill Levels and International Competitiveness: an update

Evidence Report 86

Understanding Skills and Performance Challenges in the Logistics Sector

Evidence Report 87

Understanding Skills and Performance Challenges in the Wholesale and Retail Sector

Evidence Report 88

Employer Perspectives Survey 2014: UK results

Evidence Reports present detailed findings of the research produced by the UK Commission for Employment and Skills. The reports contribute to the accumulation of knowledge and intelligence on skills and employment issues through the review of existing evidence or through primary research.

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