



Department
for Business
Innovation & Skills

BIS RESEARCH PAPER NUMBER 265

Research to understand the extent, nature
and impact of skills mismatches in the
economy

MAY 2016

RES
EARCH

Prepared for the Department for Business, Innovation and Skills

Authors: Lynn Gambin, Terence Hogarth, Liz Murphy, Katie Spreadbury, Chris Warhurst and Mark Winterbotham

Institute for Employment Research

University of Warwick

Coventry, CV4 7AL

Tel: 024 76 52 51 60

Email: lynn.gambin@warwick.ac.uk

www.warwick.ac.uk/fac/soc/ier/

IFF Research

Chart House, Chart Street

London, N1 6DD

Tel: 0207 250 3035

Email:

mark.winterbotham@iffresearch.com

<http://www.iffresearch.com>

The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Business, Innovation and Skills.

Department for Business, Innovation and Skills

1 Victoria

Street

London SW1H 0ET

www.gov.uk/bis

Research paper number 265

January 2016

Contents

Contents	ii
Acknowledgments	vi
Glossary of Key Terms and Acronyms	vii
Executive Summary	viii
Main findings.....	viii
The Study.....	ix
An initial assessment of skill shortages	ix
Causes of and responses to skill mismatches	xi
The special case of skill surpluses	xi
Recommendations	xii
1. Introduction	1
1.1 Skill mismatches and the labour market	1
1.2 Objectives of the study	3
1.3 Method	3
1.4 Structure of the report.....	4
2. Skill Mismatches: Concepts and Measures	6
2.1 Introduction	6
2.2 Mismatches, shortages, and surpluses.....	7
2.3 Definitions and concepts	9
2.3.1 The demand for, and supply of, skills	9
2.3.2 Skill mismatches unravelled	11
2.3.3 Causes of skill mismatches	13
2.3.4 A typology of skill mismatch	14

2.4	Measuring the extent of skill mismatches	15
2.4.1	Employment and unemployment indicators	17
2.4.2	Wage indicators	19
2.4.3	Occupational skill profiles	22
2.4.4	Employer-based measures	23
2.4.5	Individuals' reports of skill mismatches	28
2.5	Conclusion	30
3.	Multidimensional Approaches to Assessing Skill Mismatches	31
3.1	Introduction	31
3.2	Previous multidimensional approaches.....	32
3.3	Combining data to provide an indicator of skill mismatches	35
3.4	An experimental approach: identifying potential skill mismatch clusters.....	39
3.4.1	Assessment of skill shortages	39
3.4.2	Assessment of skill surpluses	44
3.4.3	Further comment on the experimental results	47
3.5	Conclusion	47
4.	The Causes and Consequences of Skill Mismatches from the Employers' Perspective.....	49
4.1	Introduction	49
4.2	The employer case studies.....	50
4.3	A conceptual framework for understanding the causes and consequences of skill mismatches	52
4.4	Vacancies and recruitment	55
4.5	The causes of skill mismatches	57
4.6	The impact of skill mismatches in the workplace	64
4.7	Employer responses to skill mismatches	68

4.8 The special case of skill surpluses.....	75
4.9 Conclusion	77
5. Conclusion and Recommendations	80
5.1 Findings from the Study: Conceptualising and measuring mismatches.....	80
5.2 Findings from the Study: The extent of mismatches based on existing data	81
5.3 Findings from the Study: Causes and responses.....	82
5.4 Implications and recommendations	83
Annex A: Draft semi-structured interview schedule for use with employers	85
Figures	
Figure 2.1 Dimensions of skill mismatches	15
Figure 2.2 Unemployment rates by occupation	18
Figure 2.3a Wage levels by occupation (full-time employees), 2014	20
Figure 2.3b Nominal wage growth (full-time employees), 2011-2014 (%)	21
Figure 2.4a Vacancies as a percentage of employment	25
Figure 2.4b Skill shortage vacancies as a percentage of all vacancies	26
Figure 4.1 Schematic Outline of Employer Demand	52
Figure 4.3 Impacts of Skill Shortages on Organisational Performance	65
Tables	
Table 2.1 Review of skill imbalance indicators	17
Table 2.2 Modal qualification and shares of under- and over-qualified workers	22
Table 2.3 Estimates of over- and under-qualification in the UK and EU (2013)	29
Table 3.1 NILS' criteria for identifying priority occupational skill mismatches	34
Table 3.2 MAC's potential indicators included in measuring mismatches	35
Table 3.3 Occupational skill mismatches: employer reports of skill mismatches, wage data, and occupational employment / unemployment estimates	37

Table 3.3 Occupational skill mismatches: employer reports of skill mismatches, wage data, and occupational employment / unemployment estimates (continued)	38
Table 3.4 Average values of main indicators by cluster, 4-digit SOC	40
Table 3.5 Average values of main indicators by cluster, 3-digit SOC	40
Table 3.6 Occupations in 'skill shortage likely' cluster (Group 1), 4-digit SOC	42
Table 3.7 Occupations in 'skill shortage likely' or 'skill shortage possible' cluster (Group 1 or 2) (3-digit SOC)	43
Table 3.8 Characteristics of clusters of occupations, clusters based on over-qualification and under-qualification only (4-digit SOC)	44
Table 3.9 Characteristics of clusters of occupations based on change in average annual wages (4-digit SOC)	45
Table 3.10 Potential skill surplus occupations (4-digit SOC)	46
Table 4.1 Employers participating in the study	51
Table 4.2 Soft skill sets that needed to accompany technical skills	63

Acknowledgments

This study was conducted jointly by the Institute for Employment Research (IER) at the University of Warwick and IFF Research Ltd. Stefanie Poole at IER arranged the interviews with employers and provided administrative support to the research team.

The research team would like to thank Kate Murphy and Sara Davies along with Verni Tannam, Kathy Murphy and Peter Vallely at the Department for Business, Innovation and Skills for their help and support throughout the study.

At the UK Commission for Employment and Skills, Rosie Sutton kindly and speedily arranged for the research team to have access to the Employers Skills Survey 2013.

Finally, the research team would like to thank all the employers which participated in the research for kindly providing their time to discuss their recruitment and training experiences. Their contribution to the research was much appreciated by the research team.

Lynn Gambin, Terence Hogarth & Chris Warhurst
Institute for Employment Research
University of Warwick
Coventry, CV4 7AL
Tel: 024 76 52 51 60
Email: lynn.gambin@warwick.ac.uk
www.warwick.ac.uk/fac/soc/ier/

Mark Winterbotham, Katie Spreadbury & Liz Murphy
IFF Research
Chart House, Chart Street
London, N1 6DD
Tel: 0207 250 3035
Email: mark.winterbotham@iffresearch.com
<http://www.iffresearch.com>

Glossary of Key Terms and Acronyms

ASHE	Annual Survey of Hours and Earnings
ESS	Employer Skills Survey
HtFV	Hard-to-fill vacancy
LFS	Labour Force Survey
SOC	Standard Occupational Classification
SSV	Skill Shortage Vacancy
STEM	Science, Technology, Engineering and Mathematics
VET	Vocational Education and Training
Skill gap	where the skills required by an employer are not held by their existing workforce
Skill shortage	where the supply of skills falls short of the demand (from employers) for skills
Skill surplus	where the supply of skills is in excess of the demand for skills from employers
Generic skills	skills which are applicable in a variety of occupations, sectors or workplaces and are considered to be transferable
Specific skills	skills which are unique to a particular workplace or employer and thus are not considered (easily) transferrable to other occupations, sectors or workplaces

Executive Summary

Main findings

At the simplest level, skill mismatches refer to a failure of skill supply to meet skill demand. Mismatches, depending upon their intensity and scale, can be damaging: they can act as a drag on economic growth, limit the employment and earnings opportunities of individuals, and prevent companies maximising their performance.

The key findings from the study indicate the following.

1. At any single point in time, the incidence of skill shortages in the economy is modest. An experimental method has indicated the relatively short list of occupations where shortages are likely to exist. Many of these are skilled trade jobs.
2. At most, at any point in time, shortage may account for no more than around 0.2 per cent of employment.
3. Employers are risk averse when they are looking to recruit people. If they are unable to recruit someone with all of the skills and attributes they are looking for, they would prefer not to recruit.
4. Instead they look to develop work-arounds but realise that these are not ideal and may be constraining their organisational performance.
5. Training more people is seen as a medium- to long-term solution in avoiding skill shortages, but employers have concerns about finding training that will meet their, sometimes narrow, job specifications, or being able to retain former trainees or apprentices once they have completed their training.
6. By being able to identify those occupations that are in shortage there is scope to target training in those occupations. In many cases this means Apprenticeships. The list of skill shortage occupations identified in this study are concentrated in skilled trades occupations where an Apprenticeship provides a typical means of entry.
7. Some employers were risk-averse when considering investing in more in training people via programmes such as Apprenticeships. They were worried about retaining staff they had trained. This may point to the need to reduce the amount of risk that employers face when considering investing in training programmes such as Apprenticeships.
8. The low level of shortages may reflect the fact that many employers have product market strategies that are not dependent upon a highly skilled workforce. They are nestled in low value, low productivity segments of the market. If the product market ambitions of employers are raised, the demand for skills will rise accordingly.

The Study

The aim of the study is to improve understanding of the extent and nature of skills mismatches in the economy and the (potential) impact of mismatches on employers, individuals and more widely. There are a number of key questions that the research aims to shed light upon.

- How are skill mismatches to be measured?
- What evidence exists on the existence and extent of skill mismatches?
- What skill mismatches have been identified?
- What has been the impact of the observed mismatches?
- In particular, how have employers responded to skill mismatches?

The study has adopted a mixed methods approach, comprising:

- A review of the literature on skill mismatches (including methodological considerations and evidence on the extent of mismatches);
- review of existing data and statistical analysis of data on potential mismatches with an exploratory assessment of the occupations that are most likely to be associated with skill mismatches (shortages and surpluses);
- employer case studies in the ICT, construction, and engineering sectors – all sectors with skill demand typically at Level 3 and above. The case studies focus on the impact of skill mismatches, their causes, and the employers' responses.

An initial assessment of skill shortages

Using a multi-dimensional approach to identifying skill shortages – that might still be considered to be at an experimental stage - the evidence points to a relatively short-list of occupations that can be considered to be exhibiting shortages (see Table 1). In total, 2.6 million people worked in skill shortage occupations (approximately 10 per cent of all employment). At any point in time during 2013, there were estimated to be 47,000 vacancies in these occupations, 25,600 of which were reported as hard-to-fill by employers, and around 23,500 as being hard-to-fill because applicants lacked the skills the employer sought.

The total number of vacancies here can be taken as an upper bound on the number of jobs that could potentially be filled if the match between the supply of and demand for skills was improved. The 23,500 skill shortage vacancies would indicate a lower bound on the increase in filled jobs that could arise.

Table 1: Skill Shortage Occupations

SOC Major Group	SOC 4-digit code	4-digit occupational job title
Managers and Senior Officials	1132	Marketing and sales directors
	1133	Purchasing managers and directors
	1136	Information technology & telecommunications directors
	1241	Health care practice managers
Professional occupations	2122	Mechanical engineers
	2123	Electrical engineers
	2126	Design and development engineers
	2127	Production and process engineers
	2129	Engineering professionals n.e.c.
	2136	Programmers and software development professionals
	2142	Environment professionals
	2212	Psychologists
	2219	Health professionals n.e.c.
	2221	Physiotherapists
	2429	Business, research & administrative professionals n.e.c.
	2472	Public relations professionals
Associate professional and technical occupations	3115	Quality assurance technicians
	3119	Science, engineering and production technicians n.e.c.
	3217	Pharmaceutical technicians
	3313	Fire service officers (watch manager and below)
	3535	Taxation experts
	3541	Buyers and procurement officers
	3567	Health and safety officers
Administrative occupations	4214	Company secretaries

SOC Major Group	SOC 4-digit code	4-digit occupational job title
Skilled Trades Occupations	5111	Farmers
	5113	Gardeners and landscape gardeners
	5119	Agricultural and fishing trades n.e.c.
	5211	Smiths and forge workers
	5212	Moulders, core makers and die casters
	5214	Metal plate workers, and riveters
	5216	Pipe fitters
	5221	Metal machining setters and setter-operators
	5222	Tool makers, tool fitters and markers-out
	5223	Metal working production and maintenance fitters
	5224	Precision instrument makers and repairers
	5225	Air-conditioning and refrigeration engineers
	5232	Vehicle body builders and repairers
	5234	Vehicle paint technicians
	5235	Aircraft maintenance and related trades
	5245	IT engineers
	5250	Skilled metal, electrical & electronic trades supervisors
	5311	Steel erectors
	5312	Bricklayers and masons
	5313	Roofers, roof tilers and slaters
5330	Construction and building trades supervisors	
5411	Weavers and knitters	
5414	Tailors and dressmakers	
5431	Butchers	
5434	Chefs	
Personal Service Occupations	6123	Playworkers
	6126	Educational support assistants
	6131	Veterinary nurses
	6222	Beauticians and related occupations
Process, Plant and Machine Operatives	7123	Roundspersons and van salespersons

In short, at any single point in time, in 2013, the incidence of skill shortages in the economy accounted for a small percentage of overall employment – no more than 0.2 per cent of total employment according to the experimental method used to produce Table 1.

The caveat to the above is that where skill shortages occur, they are damaging to organisational performance – nearly all employers with skill shortages report that it has an adverse impact on their organisational performance.

Causes of and responses to skill mismatches

Jobs can be regarded as comprising bundles of skills. Many of these skills are of a general nature insofar as they are transferable between employers. It is the way that employers bundle skills together that can make a job unique to a particular workplace. When employers look to recruit someone to a particular job, this can result in there being a narrow job specification that an applicant needs to fulfil. Whilst employers are willing to be flexible with regard to recruiting someone who does not totally fulfil the job specification, they are looking for assurances or signals that a would-be recruit will be able to fully meet the job specification quickly after being appointed. Hence employers are risk-averse in their recruitment as they fear that the costs of making the wrong appointment could be substantial.

If employers are unable to recruit a person with the combination of skills they seek, they are often willing to forego recruitment and rely upon developing work-arounds to make up for not having the full complement of skills. These work-arounds included:

- requesting existing employees to take on more work;
- using employment agencies to fill vacancies;
- using social networks to find potential recruits;
- using ex-employees to fulfil tasks;
- outsourcing work to other companies.

Some employers who had responded to shortages through work-arounds indicated that there were adverse impacts on their businesses, including constraining growth, placing greater pressure on existing employees leading to job dissatisfaction and retention issues.

Over the longer run some employers wanted to develop training programmes that would help offset the possibility of skill shortages emerging. But there were some concerns about being able to acquire the training that would meet their specific job requirements and being able to retain skilled employees.

The special case of skill surpluses

Where employers faced the prospect of recruiting someone whose skills were in advance of those required two responses were apparent:

- a reluctance to take on someone who gave the impression that they would leave as soon as a job commensurate with their skills became available elsewhere;
- a willingness to recruit where the applicant could provide a reason why they were willing to take a step down or to take a job where the qualifications would suggest that they were over-skilled for the job.

Recommendations

1. A method has been developed for identifying skill shortages and surpluses. The mismatches, it has identified, are likely to change over time so there is a need to routinely re-run the analysis to gauge how the incidence and occupational characteristics of shortages and surpluses are changing over time. Carrying out the analysis on a regular basis would also help assess whether any mismatches are persistent over time.
2. The evidence points to the level of skill shortages being, at best, modest. This results from: (a) employers pursuing low value, low productivity product market strategies that give rise to little demand for skills; and (b) where employers have a demand for skills which they are struggling to meet, they are not always willing to use the external vocational education and training system to acquire those skills. The product market ambitions of employers need to be raised and along with the skills base of their workforce. And employers need to be convinced that where they raise their ambition, the external VET system is able to deliver the requisite skills.
3. It is at an intermediate level where skills supply is not meeting demand. Apprenticeships are well placed to meet this demand but there is prima facie evidence that employers are unwilling to make (what often amounts to) a substantial investment in this type of training because of concerns about it meeting their specific, unique skill needs, and being able to retain the services of the apprentices once they have completed their training. This can be especially the case with SMEs who are faced with a large dominant local employer that is able to soak up much of the skills supply in a local area. Accordingly there needs to be some means of reducing the risk that employers face when investing in programmes such as Apprenticeships.
4. Alternatively, there are other means of ensuring that employers become less risk averse when investing in Apprenticeships. Such an approach is not necessarily dependent upon a levy. This relates to developing a balance within the Apprenticeship that allows employers to obtain the unique bundles of skills that comprise jobs within their workplaces, whilst the apprentice is able to obtain skills that will afford them a degree of labour market mobility. Allowing the employer to develop the unique bundles of skills within Apprenticeships effectively provides a lock between employer and apprentice. If a non-training employer came along and sought to recruit the training employer's fully trained apprentices, they would be faced with meeting a price equivalent to breaking the lock. In this way the risk faced by the employer investing in Apprenticeships is reduced.

1. Introduction

1.1 Skill mismatches and the labour market

Skill mismatches refer, at the simplest level, to a failure of skills supply to meet skills demand. These mismatches may be structural insofar as they result from a systemic failure of some kind, or they may be transitory in that they merely reflect a temporary imbalance resulting from movement through the economic cycle. Mismatches are manifested in skill surpluses (over supply) and shortages (under supply). Depending upon their intensity and scale, skill mismatches can be damaging: they can act as a drag on economic growth, limit the employment and earnings opportunities of individuals, and prevent companies realising their potential. But identifying their extent, causes and implications is far from straightforward. The concept of skill mismatches is bedevilled by definitional and measurement issues. And the evidence base, which encompasses a variety of measures and methodologies, is often inconsistent.

Skill mismatches will occur as a consequence of market failures relating to the supply of training to adequately meet demand. There are three types of market failure of interest:

1. information asymmetries resulting in a financial barrier to training taking place – individuals or employers might wish to invest in training but lenders may lack information about the likely rate of return and thereby not make the finance available to invest in training (i.e. credit constraints);
2. imperfect information where employers and individuals have insufficient information about the likely return on any investment; and
3. externalities, where the employer is unable to capture a return on their investment in training – for example, where the employer is unable to retain the services of the employees they have trained (e.g. due to poaching).

These are not readily measured, so proxy measures of skill mismatches have typically been used. Economists have relied upon wage differentiation and relative wage growth to indicate where there may be shortages (or surpluses). Whilst wages may reflect the balance between skill supply and demand over the long run, there are many reasons why they may not do so in the short- to medium-term.¹

Accordingly, a number of other indicators have been used in analysing mismatches, including:

¹ Bosworth, D.L. (1992) 'Skill Mismatches: Causes and Consequences.' *Scottish Journal of Political Economy*; Richardson, S (2009) 'What is a skill shortage?' *Australian Bulletin of Labour* 35(1): 326-354; Quintini, G. (2011) *Over-qualified or over-skilled: a review of the existing literature*. OECD Social Employment and Migration Working Papers No.121

- comparison of employment / unemployment rates by qualification, typically for those moving from school into work, using a variety of data sources;
- surveys of employees who self-report whether they are sufficiently skilled and trained to undertake their current job, or whether they use the full range of their skills in that job;²
- surveys of employers that capture information on hard-to-fill vacancies and skill gaps.³

While these provide valuable information, all three sources are also imperfect measures of mismatches. Individuals for instance, may be reluctant to report that they lack the skills to undertake their current job, and it may be in employers' interests to overstate the extent of shortages in order to encourage State intervention in skill supply.

There have been approaches to measuring skill mismatches that have sought to combine the various sources of data available. These include the approaches developed in the Migration Advisory Committee's (MAC) *Skilled, Shortage, Sensible*,⁴ and those developed in Australia by Skills Australia,⁵ and the National Institute of Labour Studies (NILS).⁶ These methodological approaches make systematic use of a wide range of data on skill mismatches.

While there are many indicators that provide evidence suggesting skill mismatches of one kind or another, an understanding of how mismatches emerge is less well developed. On the one hand, mismatches may suggest that the signals connecting the demand and supply sides are not sufficiently strong (c.f. the move to a demand-led skills system). On the other, they may reflect various other barriers that prevent individuals acquiring skills that the economy values. This may be especially the case with regard to skills obsolescence where individuals – typically experienced ones – may face a number of constraints to obtaining the skills that will keep them in employment (e.g. lack of information about or access to locally available training).

The interest in identifying the extent and causes of mismatches reflects the cost they pose to individuals, employers, and, in aggregate, the economy overall. The costs

² For example: Felstead, A, Gallie, D, Green, F and Inanc, H (2013) *Skills At Work In Britain: First Findings from the Skills and Employment Survey 2012*, London: LLAKES, Institute of Education; Quintini, G. (2014) *Skills at Work: How skills and their use matter in the labour market*. OECD Social Employment and Migration Working Papers No.158

³ Since the early 1990s, Government has undertaken regular surveys of employers, starting with the Skill Needs in Britain Survey and subsequently from 1999 with the (National) Employers Skills Survey.

⁴ Migration Advisory Committee (MAC) (2008) *Skilled, shortage, sensible: The recommended shortage occupation lists for the UK and Scotland*, UK Migration Advisory Committee

⁵ Skills Australia (2008), 'What does the future hold? Meeting Australia's skill needs', Background Paper One, *Workforce Futures: A paper to promote discussion towards an Australian Workforce Development Strategy*.

⁶ Mavromaras, K., Healy, J., Richardson, S., Sloane, P. Wei, Z. and Zhu, R. (2013). *A System for Monitoring Shortages and Surpluses in the Market for Skills*. National Institute of Labour Studies Skills Australia

for the employer (e.g. lost business) and for the individual (e.g. relatively low wages, increased risk of unemployment) can be high. Government policy has been very much oriented towards ensuring that the education and training system is more responsive to demands of the economy. This has been set out in a number of policy documents over recent years,⁷ and has seen the substantial reform of the further education and skills system in England. It is therefore timely to review the current evidence on the extent, causes and incidence of skill mismatches in England.

1.2 Objectives of the study

The aim of this study is to improve understanding of the extent and nature of skills mismatches in the economy and the impact of mismatches on organisational and economic performance. There are a number of key questions, listed below, that the study considers.

- How are skill mismatches to be measured?
- What evidence exists on the existence and extent of skill mismatches?
- What skill mismatches have been identified?
- What are the drivers of skill mismatches?
- Are there too many graduates for the number of graduate jobs available?
- How is employers' behaviour in relation to skill mismatches determined?
- What is the impact of having skill mismatches?

Given the variety of evidence on skill mismatches – not all of which is consistent, the purpose of the study is to provide, as far as feasible, a coherent narrative about the extent and causes of skill mismatches in England.

1.3 Method

The study comprised two main elements: 1) a literature review and statistical overview; and, 2) qualitative case studies with a number of employers. The literature review has entailed:

- exploring how skill mismatches are defined and measured in existing evidence;

⁷ For example: BIS (2011) *New Challenges, New Investment – Skills Investment Statement 2011-2014: Investing in a world class skills system*. London: Department for Business Innovation and Skills; BIS (2013) *Rigour and Responsiveness in Skills*. London: Department for Business Innovation and Skills / Department for Education

- developing a typology of mismatches;
- providing a summary of the extent, causes and impact of skill mismatches of various kinds in England and assessing their importance.

Given the difficulty of defining and measuring skill mismatches, the literature review has focussed on the various methodologies and measures most commonly used in the literature but also considers empirical information on the extent, causes and impacts of skill mismatches drawn from a large number of studies undertaken over recent years.

The statistical overview selected various indicators of skills mismatch and combined them to show the extent to which, at an occupational level, there was some consistency in findings across the indicators. The second element involved conducting 20 employer case studies with companies in the engineering, construction and IT sectors. These are all sectors with a relatively strong demand for skills at Qualifications and Credit Framework (QCF) Level 3 and above. The case studies captured information about:

- the nature of the skills mismatch that employers face;
- the factors that led to the skills mismatch arising;
- how employers adapted to skill mismatches; and
- the impact of the skills mismatch on organisational performance.

The literature review, along with an overview of recent statistical evidence, provides an assessment of a wide range of information on skill mismatches. The purpose of the case studies is to fill in, as far as possible, some of the gaps identified in the review. Given that the employer case studies are based on a relatively small number of observations, the evidence they provide should be regarded as indicative. The case studies, nevertheless, do provide detailed insights into how, in practice, skill mismatches are defined by employers, their causes and impacts, and the measures taken by employers to avoid future mismatches, and mitigate any negative impacts.

1.4 Structure of the report

Because the concept of skill mismatches and its measurement is somewhat contested, the next chapter (Chapter 2) provides a review of approaches to measuring skill mismatches with discussion of the relative strengths and weaknesses of the various approaches that have been adopted to date. A statistical overview using the latest available data is also provided in Chapter 2 to provide an initial assessment of the extent and volume of skill shortages on the basis of commonly used indicators. Chapter 3 builds upon the initial quantitative assessment and provides a more multi-dimensional perspective. It considers previous approaches which have been developed to identify mismatches and then presents data from multiple sources to illustrate the difficulty of identifying and measuring the extent of mismatches as well as the results of an experimental approach to identifying skill mismatches using existing data. Chapter 4 provides the employer

perspective. It draws on a number of previous research studies as well as evidence collected from the 20 employer case studies. Finally, the overall findings of the study are summarised in Chapter 5.

2. Skill Mismatches: Concepts and Measures

Key findings

The main definitions of skill and skill mismatches are discussed in this chapter drawing on the existing literature in this area. In order to help with understanding the various concepts and to begin to assess the extent of skill mismatches in the UK, the main existing data are also provided for the various measures of skill shortages and surpluses (and skill gaps).

Indicators of **skill** typically relate to occupation, level of educational attainment, qualifications held and specific competencies (e.g. literacy, numeracy, IT). It is acknowledged that skill encompasses various dimensions which are difficult to define and measure in practice.

Skill mismatches refer to the imbalance between the supply of and the demand for skills, either in aggregate or within any particular occupation or sector.

Skill shortages can be considered according to the circumstances from which they arise, such as:

- where supply is less than demand in aggregate (i.e. an overall shortage of people with the skills sought in the labour market);
- where the supply of skills may be sufficient overall, but individuals with particular skills are not necessarily employed in the jobs requiring these skills (e.g. in particular sectors);
- where there is sufficient supply of skills but employers find other qualities lacking.

Skill surpluses refer to the situation where a worker's skills are considered to be in excess of those required to carry out their current job or tasks which they are reasonably expected to fill within an organisation.

Commonly used **measures of mismatch** include the following (typically by occupation):

- employment and unemployment rates;
- relative wage levels and growth rates;
- occupational skill profiles; individual (employee) reports of the mismatch between their skills and job requirements; and,
- employer-reported recruitment difficulties related to skill mismatches and reports on skill gaps within their existing workforces.

On the basis of currently available data for a variety of these indicators of skill mismatch, the evidence suggests that there is a relatively modest level of shortages in the labour market. The assessment of individual indicators of potential mismatch presented in this chapter illustrates the need to consider a variety of dimensions and labour market indicators in order to get a better understanding of the nature and extent of skill mismatches.

2.1 Introduction

This chapter provides a review of approaches to measuring skill mismatches with discussion of the relative strengths and weaknesses of the various approaches that have been adopted to date. Various definitions and measures of skill mismatches are considered with a view to developing a typology of the different types and characteristics of skill mismatches. Using the existing data available, an initial

assessment of the extent and volume of skill shortages is also provided by considering a number of commonly used indicators of mismatches.

2.2 Mismatches, shortages, and surpluses

For the most part, the debate about skill mismatch has been mostly on concerned with skill shortages and how they can be avoided. More recently, those concerns have extended to potential skill surpluses within workplaces. Both shortages and surpluses constitute skill mismatches.

Over much of the 1990s and 2000s, the economy experienced a period of sustained growth and consequently the debate about skill shortages was, focused on whether skills supply was sufficiently efficient in meeting the skill needs of the economy rather than on the incidence of skill shortages. Following the 2007-08 financial crisis, there was *prima facie* evidence that employers may have been hoarding skills so that they would be well placed to meet demand once the recovery began.⁸ This practice is one of the many reasons why unemployment did not rise to a level that previous recessions would have predicted given the magnitude of the fall in output. Accordingly, it might have been expected that the impact of the economic recovery on the level of skill shortages would have been muted. To some extent it has been, if the trend in real wage growth can be seen as a gauge, but employers continue to report difficulties in recruiting the skills that they need.

As early as 2010, when the economy was still in the doldrums after the financial crisis, the *Guardian* newspaper ran the following headline: “Skills shortage is getting worse, bosses warn: It's tough finding staff with science and technology skills, and as the recovery sets in, it's going to get even harder...” drawing attention to the shortage of people qualified in science, technology, engineering and mathematics (STEM) subjects.⁹ More recently, reporting on various surveys of employers' recruitment difficulties, headlines have drawn attention to the potential for skill shortages to constrain growth. A recent article in the *Guardian*, commenting on a CBI survey, noted: “UK jobs market set for upbeat 2015 but skills shortage remains”¹⁰. Similarly, a BBC headline from 2014, commenting on a UKCES survey, stated: “Warning of worsening in UK skills shortage.”¹¹

Such headlines importantly draw attention to the potentially damaging impact of skill shortages on economic and employment growth. It is, however, at once apparent that the concept of skill shortage tends to be narrowly defined – that is, with respect to employers' reports of difficulties recruiting people with the skills they want. This is not to decry this particular definition – it is, after all, a tried and tested indicator of skill shortages – but it is a single measure that ignores other potential indicators, such as the movement in real wages. Moreover the timing of reports – when the economy is

⁸ Hogarth, T., Owen, D., Gambin, L., Hasluck C., Lyonette, C., and Casey, B. (2009) *The Equality Impacts of the Current Recession*. Equality and Human Rights Commission Report no 47, 1 - 217,

⁹ Guardian 18 May 2010

¹⁰ Guardian 22 December 2014

¹¹ BBC News Website 30 January 2014

in recovery – means that one may be observing nothing more than the effects of the economic cycle on the demand for, and supply of, skills rather than some structural failing in the operation of the skills system which may require intervention.

The headlines tend to focus too on shortages, though more recently, concerns have emerged regarding skill surpluses. If the skills system is failing to supply sufficient skills of a particular type, then there is a likelihood that this may be at the cost of producing an excess of other skills that are in less demand.¹² As noted above, much of the policy emphasis in England over recent years has been on the efficiency with which the skills supply system is able to meet employer demand and thereby produce skills that obtain a higher return (however defined) in the labour market.¹³ For some commentators it is skills surpluses, rather than shortages, that pose the greatest risk to individual and national prosperity¹⁴ and more broadly across Europe¹⁵.

Mismatches can also be viewed with respect to the ratio between vacancies and unemployment. Across the EU as a whole over recent years the evidence points to both the level of unemployment and vacancies increasing.¹⁶ Whilst the problem is relatively less pronounced in the UK,¹⁷ it is suggestive of a deterioration in the match between labour supply and labour demand. The UK's job vacancy rate in the last quarter of 2014 was 2.4 per cent and unemployment rate was 5.5 per cent compared to 1.7 per cent and 9.8 per cent, respectively, for the EU28.¹⁸ Whilst the outward shifting of the Beveridge Curve suggests decreasing efficiency in the labour market, through potential mismatch between unemployed individuals and the jobs available, the role of skills in explaining such change is a complex issue. In the evidence presented below a variety of indicators are used, singularly and in combination, to help reveal the extent of skill mismatch in the economy.

Much of the debate about surpluses has centred on higher level skills, particularly relating to graduate numbers. In the UK, a target was set to have 50 per cent of young people attending higher education. This expansion is premised on a long-term trend of work becoming more complex and on the goal of creating a high-skill economy. There is concern though that demand for graduates has not kept pace

¹² Green, F. (2013) *Skills and Skilled Work: An economic and social analysis*. Oxford: Oxford University Press

¹³ BIS (2014) *Rigour and Responsiveness in Skills*. London: Department for Business Innovation and Skills

¹⁴ Cedefop (2010) *The skill matching challenge: analysing skill mismatch and policy implications*. Luxembourg: Publications Office; Cedefop (2012) *Skill mismatch: The role of the enterprise*. Cedefop Research Paper No. 21. Luxembourg: Publications Office; World Economic Forum (2014) *Matching Skills and Labour Market Needs Building Social Partnerships for Better Skills and Better Jobs*. Davos: World Economic Forum Global Agenda Forum on Employment; Wolf, A (2012). *Review of vocational education: the Wolf report*. London: BIS/DfE

¹⁵ Cedefop (2010) *The skill matching challenge: analysing skill mismatch and policy implications*. Luxembourg: Publications Office;

¹⁶ Arpaia, A., Kiss, A. and Turrini, A. (2014) 'Is unemployment structural or cyclical? Main features of job matching in the EU after the crisis' *European Economy / Economic Papers*. 527

¹⁷ In 2013 there was indication that the UK's Beveridge Curve was moving outward whilst this shift was much clearer for other EU states (e.g. Spain, Portugal)

¹⁸ Eurostat website (Accessed 27 May 2015)

with their increased supply.¹⁹ The consequence is that graduates report being over-skilled for, and under-employed in, work. Using Elias and Purcell's classification of graduate jobs,²⁰ data from the UK Government's Office for National Statistics demonstrates that graduates now work in a range of occupations, not all of which would be thought of as best suited to graduates' skill levels. For some commentators this marks a radical change in the employment composition of graduates in the UK since the 1990s.²¹ As a consequence, there is opportunity for some employers to make more and better use of skills possessed by some employees – hence the increased policy focus on skill utilisation in the UK and elsewhere.

Taking both skill shortages and surpluses into account, a better focus would be on skill mismatches. As will be explored in greater detail in the remainder of this chapter, shortages and surpluses are different sides of the same mismatch coin and therefore warrant joint consideration.

2.3 Definitions and concepts

2.3.1 The demand for, and supply of, skills

As noted above, definitions matter when trying to grasp the nature and extent of skill mismatches. The starting point is how to define skill and though this is not the focus here, it is useful to note that the concept of skill is one with various dimensions.²² At a relatively simple level, skill refers to the ability to carry out the tasks that comprise a particular job, though an issue that is too often sidestepped is the level of this ability and, put bluntly, whether this ability relates to 'mundane accomplishment' or 'virtuosity' in the task.²³

In labour economics, the neoclassical concept of human capital has had much influence on the conceptualisation of skill, distinguishing between skills that are company specific and general ones.²⁴ This distinction is an important one insofar as it has implications for who should pay for – and by implication who should take responsibility for – the supply of each respective set of skills. This distinction of the

¹⁹ Okay-Somerville, B. and Scholarios, D. (2013) 'Shades of grey: Understanding job quality in emerging graduate occupations', *Human Relations*, 66:4, 555-585.

²⁰ Elias, P. and Purcell, K. (2013) 'Classifying occupations for the knowledge society', Futuretrack Working Paper. http://www2.warwick.ac.uk/fac/soc/ier/futuretrack/findings/elias_purcell_soche_final.pdf.

²¹ Purcell, K. Purcell, K., Elias, P., Atfield, G., Behle, H., Ellison, R. and D. Luchinskaya (2013) *Transitions into employment, further study and other outcomes, The Futuretrack stage 4 Report*. Manchester/Coventry: HECSU/Warwick Institute for Employment Research. http://www2.warwick.ac.uk/fac/soc/ier/futuretrack/findings/stage_4_report_final_06_03_2013.pdf

²² Green, F. (2011) *What is Skill? An Inter-Disciplinary Synthesis* Centre for Learning and Life Chances in Knowledge Economies and Societies: <http://www.llakes.org>; Green, F., Machin, S. and Wilkinson, D. (1998) 'The meaning and determinants of skill shortages', *Oxford Bulletin of Economics and Statistics* 60(2): 165-187.

²³ Attewell, P. (1990) 'What is skill?' *Work and Occupations*, 17: 4, 422-448; Spenner, K. (1990) 'Skill: Meanings, Methods and Measures', *Work and Occupations*, 17: 4, 399-42.

²⁴ Becker, G.S. (1962) "Investment in Human Capital: A Theoretical Analysis." *Journal of Political Economy* Vol. 70, no. 5, pt. 2 (October): 9-49.

nature of skills has been elaborated upon by various authors to provide variations along the following lines:

1. company-specific, non-transferable skills;
2. technical job-specific skills which are transferable between employers though not necessarily across all occupations and / or sectors;
3. generic skills that are transferable across occupations and sectors.

These different types of skills can be difficult to distinguish in practice. In relation to generic skills, it is not always clear whether the discussion is about skill or personal attributes (such as possessing a sunny disposition). Lazear goes so far as to suggest that all skills are in fact general ones, though employers that train (and the employees they train) may be able to obtain a relatively high economic rent from them in certain organisational settings.²⁵ Consequently, employers are able to retain the employees they train.

As the human capital model assumes, subject to the law of diminishing returns, additional incremental increases in the skills held by an individual will be rewarded through increased wages. Wages, or the price of skills, should then reflect the demand for skills. In a perfect labour market, an equilibrium level of skills will be achieved as over time, market forces will result in the cost and benefit of education and training changing so that labour shortages in a particular area will push up wages. Individuals are then more inclined to acquire the skills in these shortage areas. In practice, labour markets tend not to be perfectly competitive, or they tend to respond too slowly to signals about relative levels of demand and supply thus inefficient levels of skills supply may be observed.²⁹

Other perspectives view skill as a social construct, with variations on this theme. The value society and the economy attach to skill can be socially determined. In other words, social norms dictate what constitutes a valued skill.²⁶ Others note that what is labelled 'skill' reflects how tasks are bundled together to comprise a job and this bundle of tasks can be altered or amended by management. These days management in particular has a degree of choice in over the bundle of tasks, and consequently the requisite skills, encompassed by jobs and how to reward the incumbents in those jobs.²⁷

Whether the discussion of management discretion in determining a job's skill content is so far removed from human capital theory as some suggest is a moot point as it appears to have much in common with Lazear's skill weights human capital variant. Nevertheless, this does focus attention on the task bundles that comprise a job and

²⁵ Lazear, E.P. (2005) 'Firm-Specific Human Capital: A Skill-Weights Approach'. *The Journal of Political Economy*, Vol. 117, No. 5 (October 2009), pp. 914-940

²⁶ Daniels, A. K. (1987) 'Invisible Work', *Social Problems*, 34:5, 403-415.

²⁷ Warhurst, C., Till, C. and Gatta, M. (2015) 'A New Social Construction of Skill' in C. Warhurst, K. Mayhew, D. Finegold and J. Buchanan (eds) *Oxford Handbook of Skills and Training*, Oxford: Oxford University Press

what particular tasks may give rise to mismatches. A substantial amount of research has been conducted into identifying: (a) the various tasks that comprise a job; and (b) the skills associated with undertaking those tasks. This has resulted in the development of typologies that relate to task domains - encompassing both technical and generic skill domains – that are rated according to their level of complexity to provide a picture of the demand for, and supply of, skills.²⁸ The approach seems more readily able to identify generic skills (e.g. communication, IT use, team working, etc.) than the technical skills often associated with reports of skill shortages. The most important aspect of this type of approach is perhaps more in the weight it attaches to the organisational context in which employer demands for skill arise.

Whilst the features discussed above are important aspects underlying the definition of skill, trying to identify and measure skills faces practical constraints. In practice, largely due to data availability, skill is typically measured with respect to:

- occupation (based on occupational classifications such as SOC);
- level of educational attainment (e.g. according to the Qualifications and Credit Framework - QCF);
- qualifications held (either by level and / or by subject);
- competence in specific skills or task domains (e.g. numeracy, literacy, IT, non-verbal reasoning, etc.).

The discussion in the remainder of this chapter focuses mainly on these definitions or practical indicators of skill.

2.3.2 Skill mismatches unravelled

Skill shortages can be divided between those that arise because:

- supply is less than demand in aggregate (i.e. there is an overall shortage of people with the skills sought in the labour market). This may be further broken down by:
 - skills that take a long training time to develop;
 - skills that require a short time to develop
- the supply of skills may be sufficient overall, but people with particular skills are not necessarily using these in the jobs that require them (e.g. there may be shortages in some sectors of the economy);

²⁸ See for example Felstead, A., Gallie, D., Green, F. and Inanc, H. (2013) *Skills At Work In Britain: First Findings from the Skills and Employment Survey 2012*. London: Centre for Learning and Life Chances in Knowledge Economies and Societies, Institute of Education

- the supply of skills is sufficient but there are other qualities that employers look for that may be in short supply. Whether the relative lack of these other qualities constitutes a skill shortage is a moot point.

These can be further categorised as shortages that exist in the external labour market and those in internal labour markets. The former typically refers to the difficulties employers encounter in recruiting people from the external labour market, and the latter to the extent to which existing employees are sufficiently skilled to carry out their current job.

Skill surpluses refer to the situation where the workers' skills are considered to be in excess of those required to carry out tasks which they are reasonably expected to fill in their current job within an organisation. Surpluses may be divided between:

- an overall surplus at an aggregate level (i.e. total over supply of skills);
- surpluses in particular sectors / occupations without there being an overall surplus (suggesting shortages elsewhere).

Whilst the above provide static concepts of mismatches, the dynamics of skill mismatches also require consideration. There are a number of issues to consider in this regard:

1. the extent to which mismatches are cyclical or structural;
2. longer-term structural changes in skill demand;
3. how the balance between the demand for, and supply of, skills plays out over time and the level at which equilibrium is achieved.

If labour demand accelerates there is likely to be a lag in the supply side being able to satisfy that demand but it may be expected that shortages will attenuate as labour demand slows. It takes time for both sides of the labour market to adjust. There may also be structural changes in the economy which may skew the demand for skills in a particular direction that the supply side may take time to accommodate. It is important to consider how both, demand and supply side forces, can generate mismatches. From a dynamic perspective it is possible to conceive of differing situations where demand and supply may be misaligned, such as where:

- demand for skills is increasing, but supply is falling;
- demand for and supply of skills are both increasing but the rate of increase is slower for supply than demand;
- demand for and supply of skills are both falling, but supply is falling faster;

- demand for skills is falling, but supply continues to increase.

There is also an issue of ensuring that the equilibrium between the supply of, and demand for, skills settles at an optimal level.²⁹ In Britain, there has been concern that a low level of skill demand from employers, and a correspondingly low level of supply from the VET system, feed off one another and effectively drive down the equilibrium of skills. The problem of the 'low-skills equilibrium' may well reflect a particular variant of skill mismatch.

2.3.3 Causes of skill mismatches

Before exploring the measures of the extent of skill mismatches, it is perhaps worth considering, from a theoretical perspective, their likely causes. This can have potential implications for the way in which skill mismatches are conceptualised and measured. The causes of skill mismatches relate to both supply-side and demand-side issues and include:

1. phases in the economic cycle resulting in, at least over the short-term, skill mismatches occurring;
2. actors in the labour market making sub-optimal choices because of a lack of information regarding what might be best for them;
3. capital constraints which prevent individuals or employers making investments in training;
4. privately rational behaviour resulting in sub-optimal training investments in aggregate. For example, employers may be reluctant to invest in training because trained employees may quit (i.e. risk of poaching);
5. immobility in the labour market – by sector, occupation, geography, etc. - where it is difficult for people to move between sectors or between regions;
6. skills obsolescence arising from either (a) structural change in the economy or (b) within an organisation where workers are not supported to adapt to change;³⁰
7. institutional barriers, such that training systems, do not respond efficiently to changes in skill demand. This may be further divided between:
 - extent to which the skills system is able to deliver, in time, the skills the labour market demands;

²⁹ Wilson, R. A. and Hogarth, T. (2003). *Low Skill Trajectories: a review of the evidence and additional analysis*. London: Department for Trade and Industry; Finegold, D. and Soskice, F. (1988), 'The failure of training in Britain: analysis and prescription', *Oxford Review of Economic Policy*, vol. 4, no. 3, pp. 21-53.

³⁰ De Grip, A.; Van Loo, J. (2002). 'The economics of skills obsolescence: a review' in De Grip, A. et al. (eds). *The economics of skills obsolescence: theoretical innovations and empirical applications*. Bingley: Emerald, p. 1-26 (Research in Labor Economics, Vol. 21).

- the way in which the skill system incentivises investments in skills and the extent to which the costs are shared between the State, individuals, and employers.

The way in which actors respond to the sources of skill mismatches has implications for estimating their extent and for interpreting the statistical evidence from various sources. To illustrate: employers often indicate that they respond to difficulties in recruiting skilled labour by increasing the workloads of existing employees.³¹

Should, therefore, the additional work undertaken by existing workers (perhaps reflected in extra hours of work) be included in the quantum of skill mismatches? Similarly, where employers perceive skill shortages, they may choose not to recruit but rather to pursue other solutions such as transferring work to other organisations perhaps abroad. Such circumstances may reflect a form of hidden or latent skill mismatch which, depending upon how closely one can estimate its incidence, results in downwardly biased estimates of skill shortages. The causes and implications of skill mismatches, particularly from the employer's perspective, are revisited in later chapters.

2.3.4 A typology of skill mismatch

Based on the commentary provided above, Figure 2.1 provides a typology of skill mismatches applicable. It assumes in the first instance that it is possible to identify jobs that are associated with skill mismatches (either shortages or surpluses) and then classifies them according to their causes. In order for a job to be considered in scope of a skill shortage, it is assumed that there is a skill threshold – e.g. people typically require a qualification at Level 3 or above to enter the occupation – below which a job cannot be considered as experiencing a skill shortage.

³¹ Winterbotham, M., Vivian, D., Davies, B., Spreadbury, K. and Shury, J. (2014) *Employers Skills Survey: UK Findings*. UK Commission for Employment and Skills, Evidence Report

Figure 2.1 Dimensions of skill mismatches

Mismatches	Skill Surplus SUPPLY > DEMAND		Skill Shortage SUPPLY < DEMAND
Jobs / skills affected by mismatch	Occupations in which mismatches are concentrated		
Type of skills (e.g. measured by qualification / educational attainment)	Level of Skill (vertical mismatch)	Subject Area (horizontal mismatch)	Generic / Technical skills (skill gap)
Time of occurrence	At entry to labour market		During career (i.e. skills obsolescence)
Cyclical versus structural causes	Structural (barriers to skill development)	Transitory (e.g. due to rapid technical change)	Cyclical (along economic cycle and temporary)

The dimensions of the typology relate to:

- the match between the skills possessed by individuals (which can be proxied by educational attainment and qualification level, ideally disaggregated by subject);
- when the skill mismatches occur – does it relate to entry level jobs for new labour market entrants or later on in the career of the individual;³²
- whether the cause is structural or cyclical; and
- impact in relation to employment or output levels. There is also a need to consider cross-national comparisons here to indicate whether the impact of the mismatch is greater or less than observed in other competitor countries.³³

2.4 Measuring the extent of skill mismatches

The main unit of measurement for the analysis of skill mismatches is the job. In other words, that particular bundle of skills that the employer wants in order to fulfil various tasks in the workplace. The best measure of a job is in at provided by occupation, but occupation and job are not synonymous. The latter is a statistical construct used to measure the volume and content of the variety of jobs that comprise employment. The more disaggregated the measure of occupation the nearer it is to approximating a job.

³² Desjardins, R. and K. Rubenson (2011). 'An Analysis of Skill Mismatch Using Direct Measures of Skills', OECD Education Working Papers, No. 63, OECD Publishing. <http://dx.doi.org/10.1787/5kg3nh9h52g5-en>

³³ This is the approach taken in UK Commission for Employment and Skills (2010).

Moving on from some of the underlying definitions, concepts and causes of skill mismatch, attention now turns to how mismatches may be identified and measure using various sources of data. First, a summary of the main indicators is provided in Table 2.1 which elaborates on the review of skill imbalances by Meagher et al³⁴. This summary has been elaborated on in Table 2.1. These indicators are discussed and illustrated further using recent available data in the remainder of this chapter.

For most proxy measures of skills, data are typically readily available to allow for examination of the extent of mismatches between supply and demand - the key issue is how to determine whether, in relation to each of these measures, there is excess demand or supply. One means of doing this is by looking at the following indicators in relation to skill measures (e.g. by occupation):

- employment / unemployment rates;
- wage differentiation and relative wage growth;
- employer reports of vacancies that prove hard-to-fill; and,
- individuals' reports of the extent to which they have an excess or a surfeit of skills in undertaking their current job.

In reviewing evidence on skill mismatches, the focus here has mainly been on those data sets and studies which are concerned with England and the UK.³⁵ In this section, as a starting point, the latest data available are drawn from three large-scale surveys, namely:

- 1 the UK Commission Employer Skills Survey (UK ESS) (2013);
- 2 the Labour Force Survey (LFS) (2014); and
- 3 the Annual Survey of Hours and Earnings (ASHE) (2014).

These surveys contain a number of potential indicators of skill mismatch which are especially useful when examined together (as will be considered in Chapter 3). In the following sections, different indicators are considered in turn.

³⁴ Meagher, G.A., Wilson, R.A. and Yerushalmi, E. (2014) *Modelling skills mismatch – further development of the MLME*. Report to Cedefop.

³⁵ Evidence from other countries is also included where it addresses issues which are particularly relevant.

Table 2.1 Review of skill imbalance indicators

Indicator group	Issues
Wages	<p>Rationale: Positive changes in pay may indicate a tightening of the labour market</p> <p>Limitations: Wages change for many other reasons (not least general inflation). Even when skill shortages do exist employers may be reluctant to raise wages and adjustments often occur instead in non-wage elements of the work package.</p>
Employment / hours	<p>Rationale: increases in employment or average hours worked for a particular occupation is a signal of rising demand (and therefore an indirect indicator of possible skill shortages).⁷ (Other indicators such as overtime working, recruitment intensity, and labour turnover can also provide useful signals).</p> <p>Limitations: Employment and hours may rise for many reasons and neither are definite indicators of a shortage.</p>
Unemployment	<p>Rationale: The most commonly used indicator of a surplus</p> <p>Limitations: unemployment can coexist with vacancies; it can fall for reasons unconnected to skill shortages (for example a general upturn in the economy). Occupational unemployment rates typically relate to a person's last paid job, not to the kinds of jobs for which they are currently searching.</p>
Individuals' reports of skill utilisation	<p>Rationale: individuals will be able to give an indication of the extent to which they use the skills they possess in their current job, or the extent to which they lack the skills to fully carry out their current job.</p> <p>Limitations: individuals may over-state the extent to which they possess skills therefore providing an upward bias to estimates of skill surpluses and a corresponding downward bias on shortages.</p>
Vacancies	<p>Rationale: The most commonly used indicator of skill shortage - a proxy for Demand less Supply.</p> <p>Limitations: vacancies can persist for many reasons other than a skill shortage (for example, poor working conditions and low pay). Employers have an incentive to exaggerate skill shortages to encourage the state to intervene and bear the costs of training. Distinctions can be made between all reported vacancies; hard-to-fill vacancies (HTVs); and skill shortage vacancies (SSVs).</p>
Occupational skill profiles	<p>Rationale: a means of looking at the extent to which people working in an occupation have the average qualification profile – thus indicating the proportions who fall above and below the average (or \pm one standard deviation of the average)</p> <p>Limitations: May provide misleading results depending upon the factors that give rise to the average.</p>

Source: Based on Meagher et al. (2014)

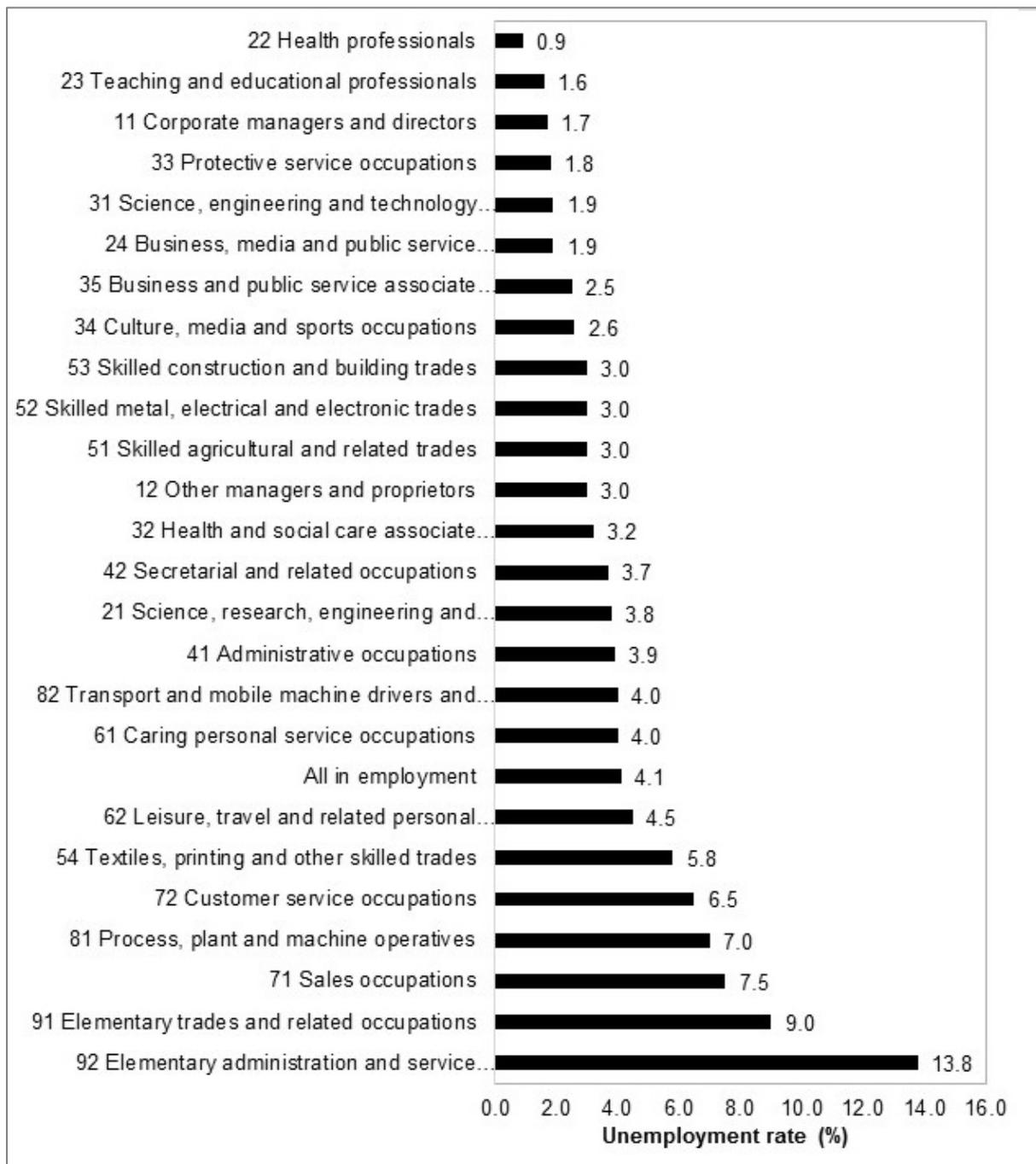
2.4.1 Employment and unemployment indicators

Increasing employment levels (by occupation) may be indicative of rising demand for workers in particular occupations. This can be taken as an indirect indication of potential skill shortages. Similarly, unemployment is a widely used indicator for surpluses. It should be noted though that changes in employment or unemployment can take place for a variety of reasons that are unrelated to skills. When combined with wage data however, more nuanced insights can be obtained into the demand for, and supply of, skills and the match between them.

Occupational unemployment figures can be derived from Labour Force Survey (LFS) data by assuming the occupation for unemployed individuals to be the same as the occupation in which the person last worked. A possible shortcoming of such an

assumption is that an unemployed individual may not necessarily be seeking employment in the same occupation as their last job and this could have implications for how well the occupational unemployment rate may reflect potential skill shortages. Bearing in mind this potential limitation, Figure 2.2 shows unemployment rates by occupation. It reveals that those jobs that have relatively high unemployment rates attached to them are relatively less skilled ones, and that most of the occupations with relatively low unemployment rates are higher skilled ones.

Figure 2.2 Unemployment rates by occupation



Source: Labour Force Survey 2014; own calculations

Increases in employment (unemployment) associated with a particular occupation may also indicate that there is increasing demand (surplus) but, as with the other indicators (employer reported shortages and average wages) discussed above, other factors may drive such changes, too. Though the unemployment rate is a commonly used indicator of skill surpluses unemployment can persist even where there are vacancies and of course there are other non-skills-related reasons why unemployment may be increasing or decreasing.

2.4.2 Wage indicators

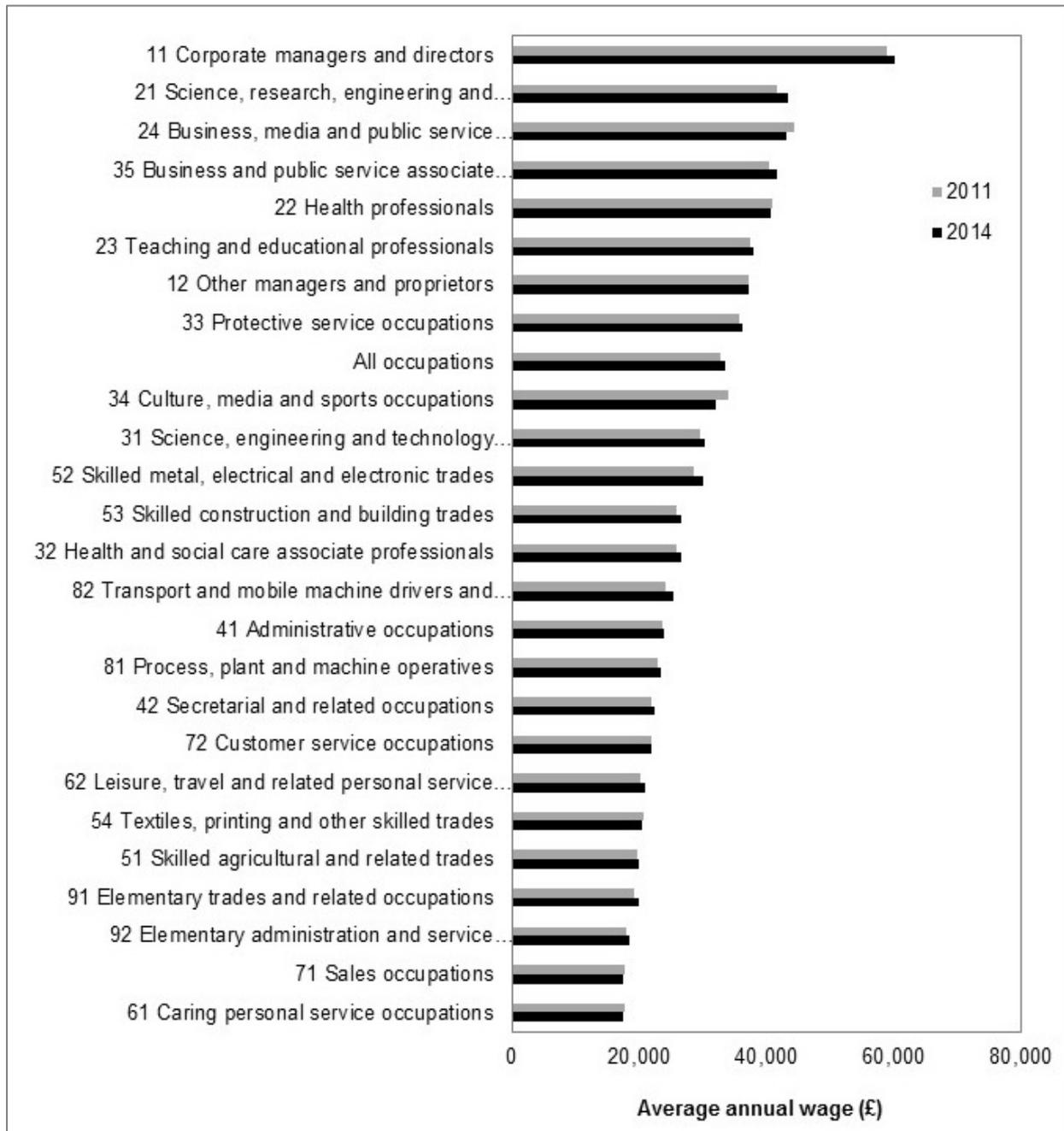
Wage levels provide a measure of the value the labour market attaches to human capital (however defined). If skills are scarce then, other things being equal, this should be reflected in the market bidding up the price for such skills (and conversely, the wage falling in the case of skill surpluses). The evidence suggests that wage signals can bring supply and demand in line over the long-term but much less so over the short- to medium-term.³⁶ There are a number of reasons for this:

- in general, labour markets are not so flexible that they rapidly adjust to changes in the supply and demand for labour (and skills);
- the wage bargaining process can affect short-term changes in wages levels;
- employers in general may be reluctant to raise / lower wages of new recruits because of wage differential problems this might bring about in the workplace.

Based on data from the Annual Survey of Hours and Earnings (ASHE), Figure 2.3a shows average annual wage levels by occupation and Figure 2.3b shows wage growth over time by occupation. Across all occupations, the average annual wage in 2014 was £33,475. Average wages were higher for a number of occupations including, managers, directors and senior officials, professional occupations and associate professional and technical occupations.

³⁶ Bosworth, D.L. (1992) 'Skill Mismatches: Causes and Consequences.' *Scottish Journal of Political Economy*

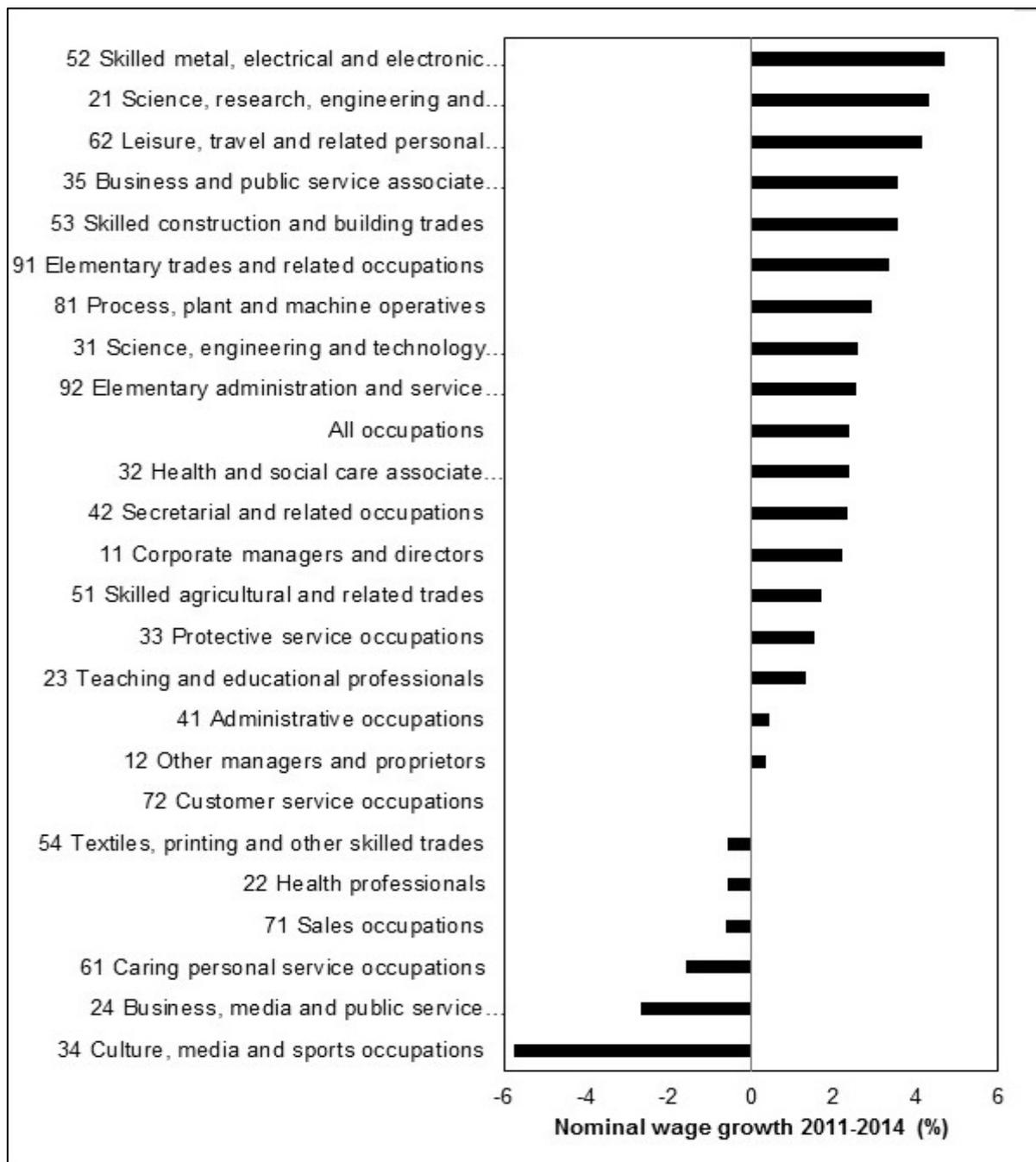
Figure 2.3a Wage levels by occupation (full-time employees), 2014



Source: ASHE 2011, 2014

In most occupations, wages have grown, both year on year (2013-2014) and also over the longer term between 2011 and 2014 (see Figure 2.4b). Wages grew most, year on year, for other managers and proprietors (5.2 per cent increase) but total wage growth for this occupation between 2011 and 2014 was just 0.4 per cent. This illustrates the difficulties of using short-run changes over time to indicate where skill mismatches may be occurring.

Figure 2.3b Nominal wage growth (full-time employees), 2011-2014 (%)



Source: ASHE 2011, 2014

There are a group of occupations in which nominal wage growth between 2011 and 2014 was negative. This includes a number of relatively skilled occupations, such as, culture media and sports professionals, business media and public service professionals, and health professionals. Though in theory this change in wages would suggest potential skill surpluses in these occupations, as noted previously, drawing such conclusions requires a degree of caution as the wage rates may be driven by a range of factors other than the demand for skills (e.g. collective wage agreements). Whilst not without such limitations, when considered in conjunction with other mismatch indicators, wage data can provide important insights into the skill mismatch data jigsaw.

In interpreting the wage-related evidence about skill mismatches it should be kept in mind that qualification, educational attainment or occupation may not necessarily encapsulate the skills embodied in a particular job. Post-entry training may, for example, be a major determinant of skill levels. Moreover, as noted earlier, jobs often consist of bundles of skills and it is the way that they are bundled together that determines the reward. So even within the same occupation there will likely be varied bundles of skills with consequences for the way in which they are rewarded.³⁷ There are a number of other factors too (e.g. collective bargaining, minimum wage legislation, etc.) which may drive changes in wages which should be borne in mind when drawing conclusions about skill mismatches.

2.4.3 Occupational skill profiles

Data on occupations and qualifications (two measures of skills themselves) can be combined to give an indication of mismatches. It is possible to measure the extent to which people in an occupation are under- or over-qualified relative to the modal level of qualification within the occupation. Ideally, such data need to be age-adjusted given that over time levels of educational attainment have changed. This classification is used by Eurostat and it considers the extent to which people in an occupation are over- or under-qualified by one level of qualification, or by two or more levels of qualification.

Table 2.2 summarises the modal levels of qualification within occupations at 3-digit SOC level and provides an indication of over- and under-qualification based on these modal values. In 46 of the 117 3-digit occupations, the modal level of qualification is a degree or equivalent. Within these occupations, 38 per cent of workers, on average are underqualified relative to this level of education, but this figure ranges between 2 per cent and 72 per cent across these occupations. GCSE grades A*-C is the modal level of qualification in 28 occupations. Within these occupations, the overall average proportion of workers who are classified as being underqualified is 27 per cent (ranging between 7 and 43 per cent) and 41 per cent are overqualified (ranging between 19 and 62 per cent).

Table 2.2 Modal qualification and shares of under- and over-qualified workers

Modal qualification	Number of occupations	% of occupations	% Underqualified			% Overqualified		
			Mean	Min	Max	Mean	Min	Max
Degree or equivalent	46	39	38%	2%	72%	--	--	--
Higher education	1	1	50%	--	--	20%	--	--
GCE, A-level or equivalent	35	30	40%	12%	59%	24%	7%	44%
GCSE grades A*-C or equivalent	28	24	27%	7%	43%	41%	19%	62%

³⁷ In the literature these types of skill mixes are sometimes referred to as hybrid skills, where employers are looking for a mix of differing types of technical skills (e.g. those relating to different vintages of a technology) and / or specific combinations of technical and generic skills.

Modal qualification	Number of occupations	% of occupations	% Underqualified			% Overqualified		
			Mean	Min	Max	Mean	Min	Max
Other qualifications	6	5	16%	8%	27%	51%	46%	57%
No qualification	1	1	--	--	--	72%	--	--

Source: LFS 2014

There are dangers in using such an approach to examine skill shortages and surpluses. If, for example, there is an excess supply of skills which results in the qualification profile of an occupation increasing rapidly over a short-space of time, this may well suggest that there is a stock of people (typically those who entered the occupation many years ago) who are less qualified and therefore are considered to be under-skilled in some way (i.e. indicating a skill shortage or gap). In such a situation though, there is no evidence that such individuals are under-skilled, rather, all that is being measured is a change in the supply of skills. There are other instances too where the results of measuring mismatches in this way can be misleading.

2.4.4 Employer-based measures

Vacancies, or the rate of change in the incidence of vacancies by occupation, provide an indication of the changing pattern of skill demand. There is always the danger that vacancies are not notified or are filled informally such that this measure may under-estimate the total volume of vacancies. In relation to mismatches this is perhaps less of a problem insofar as the main interest is in those vacancies that have proved hard-to-fill because applicants do not possess the skills required by the employer. This has tended to focus attention on employer reports of recruitment difficulties rather than just on all vacancies.

In relation to employers the emphasis here has been upon understanding whether or not vacancies have been filled, i.e. the number or percentage of vacancies that are hard-to-fill because applicants lacked the skills, qualifications, or experience employers required.³⁸ Typical measures which rely on employer reports include:

- the extent to which employers have problems filling vacancies due to applicants not possessing the skills, qualifications, or experience required by the job on offer;
- the extent to which the existing workforce does not fully possess the skills required by the employer to meet their product market strategies.

The Employers Skills Survey (ESS) contains a number of survey questions which aim to identify where employers face difficulties in recruiting or filling vacancies and where current employees do not fulfil all of the employer's skill requirements. The focus is on three main indicators from the ESS:

³⁸ For example: Winterbotham, M. et al. (2014) *Employers Skills Survey: UK Findings*. UK Commission for Employment and Skills, Evidence Report

- 1 hard-to-fill vacancies (HtFVs) (vacancies which the employer indicates are proving difficult to fill); and
- 2 skill shortage vacancies (SSVs) (vacancies considered to be hard-to-fill because of a shortage of applicants with the appropriate skills, qualifications, or experience the employer wants).
- 3 Skill gaps (employer's views on areas where their existing workforce does not fully possess the skills the employer requires).

These again are imperfect measures insofar as recruitment difficulties, even where an employer says they are due to applicants lacking the required skills, qualifications, or experience, may result from other factors (e.g. the terms and conditions of employment being such that employees are unwilling to take that particular job). Further bias in measuring skill mismatches on the basis of employer reports could arise as employers may have cause to exaggerate the number of hard-to-fill vacancies to encourage the State or individuals to invest in certain types of skill.³⁹ Employer-reported skill mismatches as conveyed through measures of skill gaps and SSVs may also reflect the underlying product market strategies of employers. This can raise further questions on the interpretation of such measures. A study from the early 2000s in the UK demonstrated that skill gaps at the firm level could be an indicator of relatively advanced product market strategies and, in a sense, were an indicator of relatively good practice.⁴⁰ Some degree of mismatch may be inevitable and some level of mismatch may stimulate the adjustment processes which can lead to long run productivity growth.

In 2013, 13 per cent of workplaces reported that they were currently experiencing hard-to-fill vacancies (HtFVs) and 11 per cent reported skill shortage vacancies (SSVs) (i.e. their vacancies were hard-to-fill because of difficulties finding applicants with the skills, experiences, or qualifications required). The number of SSVs in the economy equates to around 1 per cent of total employment in England.⁴¹

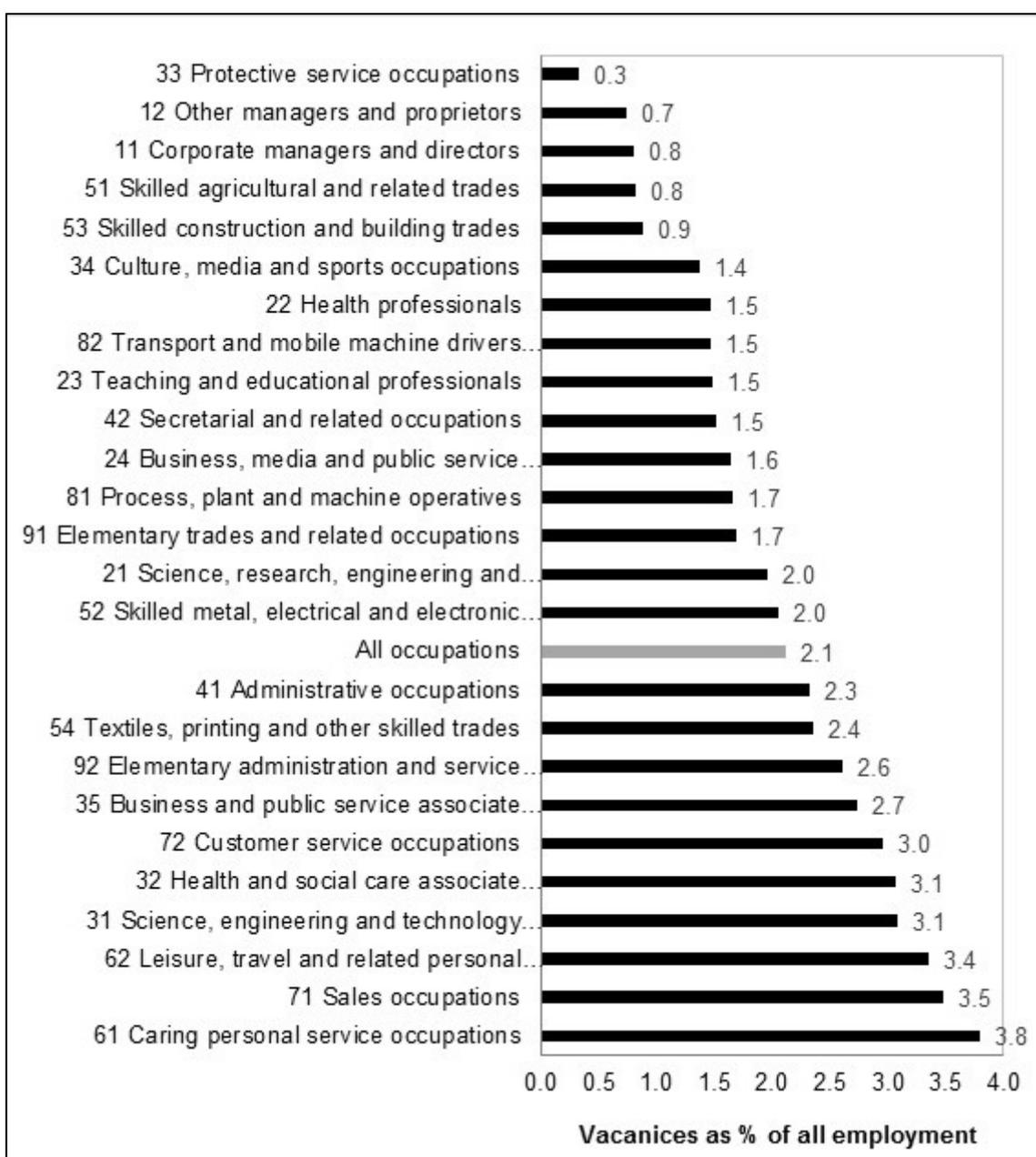
Figure 2.4a shows vacancies as a percentage of employment by occupation. It is immediately apparent that amongst those occupations that report a relatively high number of vacancies relative to employment, there are a number where the level of skills required can be relatively modest (e.g. caring and personal service; leisure travel and related services). In many respects, these occupations can be eliminated from the assessment of skill mismatches as it is more likely that the employer is recruiting for these occupations on the basis of personal attributes rather than skills *per se*.

³⁹ Richardson, S. (2009) 'What is a skill shortage?', *Australian Bulletin of Labour* 35(1): 326-354

⁴⁰ Bosworth, D.L., Davies, R., Wilson, R.A. and Hogarth, T. (2002). *Employers Skills Survey: Statistical Report*. Nottingham: National Skills Task Force / Department for Education and Employment

⁴¹ Winterbotham, M. et al., (2014) *Employers Skills Survey: UK Findings*. UK Commission for Employment and Skills, Evidence Report

Figure 2.4a Vacancies as a percentage of employment

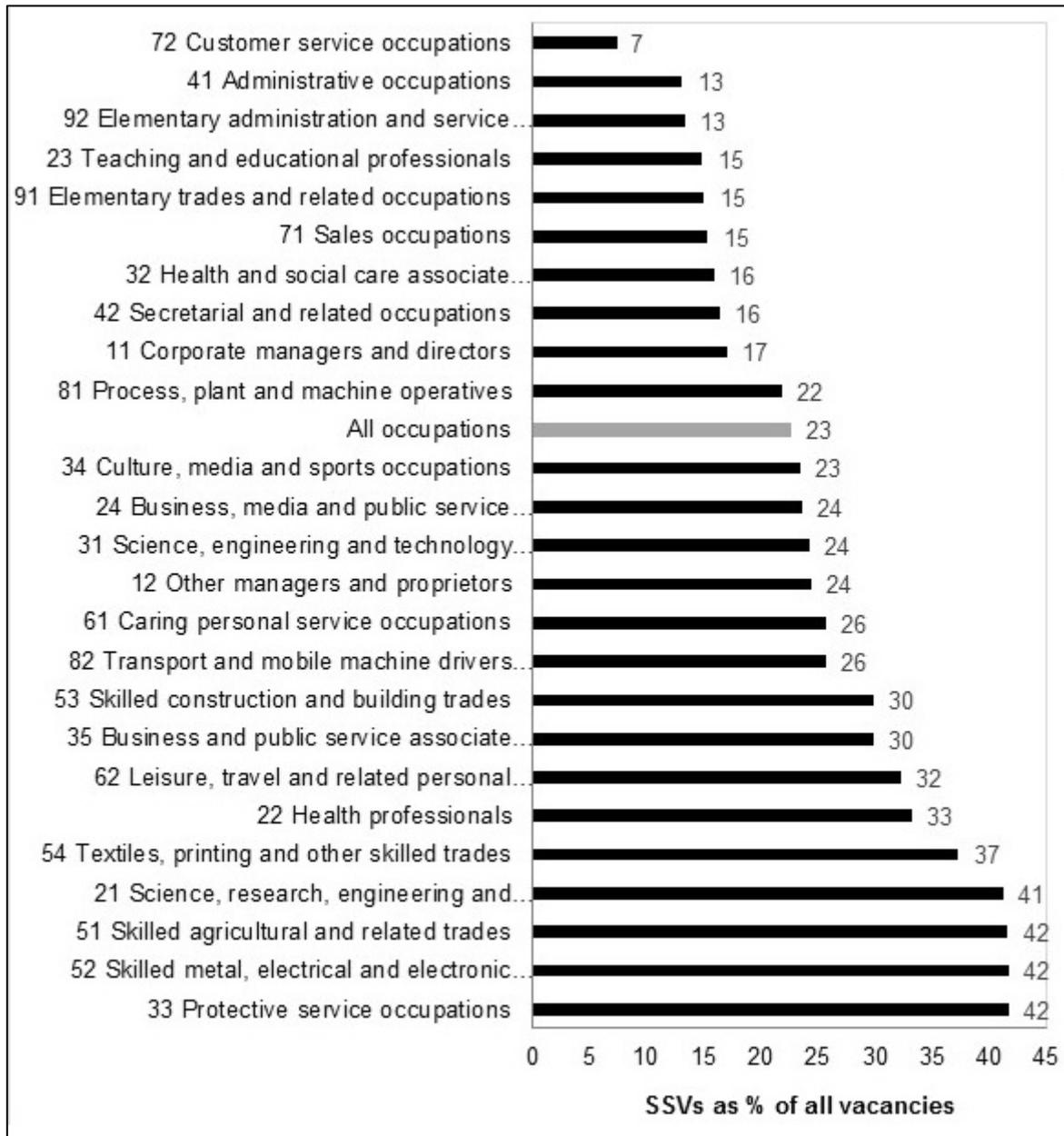


Source: ESS 2013, LFS 2013; own calculations

Figure 2.4b complements 2.4a by showing the percentage of vacancies that are reported as SSVs by employers. Figure 2.5b shows that the occupations in which SSVs are concentrated are predominantly skilled ones in that many typically require a prolonged period of training in order to achieve competency (i.e. various managerial, professional, associate professional and skilled trades occupations). At the same time, there are a number of occupations with relatively high incidence of SSVs as a percentage of vacancies that are relatively less skilled occupations (e.g. leisure, travel and related personal services). Again, it may be questioned whether these really constitute skill shortages since in many instances the skills required in those jobs can be quickly obtained (e.g. through short training). As reported by Winterbotham *et al.* (2014), the relatively high density of SSVs for skilled trades and professionals have persisted over time, but there are also a number of other areas

where SSVs are emerging, including: professionals in the health and social care sector; and associate professionals in business services.

Figure 2.4b Skill shortage vacancies as a percentage of all vacancies



Source: Employers Skills Survey 2013; own calculations

The ESS also includes employers' views on skill gaps within their current workforces – that is, how the skills of their existing employees match the business' requirements and about the types of skills existing employees may lack. Between 2011 and 2013,

the percentage of employers reporting skills gaps⁴² decreased for most occupations. Gaps for associate professionals and skilled trades increased (from 4.9 to 5.3 per cent for associate professionals and from 5.4 to 5.5 per cent for skilled trades). Skills gaps were more evident for sales / customer service occupations (reported by 7.8 per cent of employers) and elementary occupations (7.3 per cent), and are least common for managers (3.0 per cent).

The CBI/Pearson education and skills survey (2014) captured responses from 291 employers.⁴³ It should be kept in mind that this survey represents a relatively small sample of employers, though the total number of people employed by those surveyed was around 1.4 million (5.5 per cent of all employees in the UK). The survey asked employers about the adequacy of their current employees' skills for their jobs, that is, about the presence of skills gaps within the business. More than 90 per cent of employers indicated that their employees' skills were 'satisfactory' or 'good' and this was found across low-skilled, intermediate-skilled, and high-skilled roles within workplaces. More than two-thirds (68 per cent) of employers rated the skills of their employees engaged in high-skilled roles as 'good'. Despite relatively high levels of employer satisfaction with their staff's skills, more than half of the employers surveyed indicated that at least some of their employees had weaknesses in relation to: IT skills (61 per cent of employers); literacy (54 per cent); and numeracy⁴⁴ (53 per cent). Employers in retail and hospitality; transport, distribution and other services; construction; and, manufacturing were more likely to report gaps in these core skills. More than half of employers expecting to increase difficulties in recruiting individuals with STEM skills and knowledge at some level.

Another form of mismatch of skills in the workplace involves the under-use of employees' skills. The ESS also captures information on this 'under-use'⁴⁵ which can be considered as form of skill surplus. In 2013, nearly half (47 per cent) of employers reported that they employed people whose skills were not being fully utilised - this equates to 16 per cent of all employees being in roles where they were considered to be over-qualified and over-skilled. The data indicates that under-use of skills tends to be more prevalent in smaller businesses (where 30 per of staff are over-qualified and over-skilled) and in the hotel and restaurants sector (60 per cent of establishments report skills under-use and 24 per cent of employees are reported as being over-qualified and over-skilled). Such surpluses are less common in public administration (9 per cent of staff over-qualified and over-skilled) and manufacturing (10 per cent).

⁴² According to the ESS definition, a "skills gap" occurs where an employee is not fully proficient, i.e. is not able to do their job to the required level (Winterbotham et al, 2014, p. 6)

⁴³ CBI / Pearson (2014) *Gateway to Growth: CBI/Pearson Education and Skills Survey 2014*. London: CBI / Pearson

⁴⁴ In the latest PIAAC survey (2012), England's performance in numeracy was significantly below the OECD average

⁴⁵ According to the ESS definition, "an employee is 'under-used' if the employer reports they have both more skills and more qualifications than are required to perform the job role they are currently in". A "skills gap" occurs where an employee is not fully proficient, i.e. is not able to do their job to the required level (Winterbotham et al, 2014, p. 6)

2.4.5 Individuals' reports of skill mismatches

Self-reported information by employees about their skill use on the job is also often used in assessing the level and nature of skill mismatches.⁴⁶ Sample surveys of individuals typically ask questions around issues such as:

- whether their qualification was required to obtain their current job;
- whether the skills acquired in obtaining their qualification are used in their current job;
- the extent to which individuals use their current stock of skills in their job.

The problem with such measures - though they do offer valuable insights - is that they may be capturing individuals' transitions through the labour market (i.e. taking a low paid job initially and gradually moving upwards until a job commensurate with their qualifications is obtained) rather than reflecting mismatches which would be problematic. There are also problems about the extent to which respondents to surveys may overstate their current stock of skills thereby upwardly biasing estimates of skill surplus and, correspondingly, under-estimating the extent of skill shortages (or gaps). There were concerns that the first Employers Skills Survey in 1999 tended to under-report the number of skill gaps associated with managers because it was a manager that answered the questions in the survey.⁴⁷

The Skills and Employment Survey (SES) series of surveys provide an additional perspective on skill mismatches by collecting the views of individual employees on the extent to which they regard themselves as having skills in excess of those required in undertaking their current job.⁴⁸ The SES series have consistently reported the over-supply of skills (as measured with reference to qualification). The data for 2012 indicates that there were around 5.9 million jobs that required no qualification for entry, but that only 1.9 million people in the labour force have no qualifications. Similarly, only 6.8 million jobs required a degree for entry, but there are 8.2 million people who possess a degree level qualification.⁴⁹ Similar evidence

⁴⁶ Elias, P. and K. Purcell (2004) 'Is Mass Higher Education Working? Evidence from the Labour Market Experiences of Recent Graduates', *National Institute Economic Review*, No. 90, October 60-74; Felstead, A. et al. 2013. *Skills at work in Britain: First findings from the Skills and Employment Survey 2012*. London: Centre for Learning and Life Chances in Knowledge Economies and Societies, Institute of Education.

⁴⁷ Mason, G. and Wilson, R.A. (2003) *Employers Skill Survey New Analyses and Lessons Learned*. Nottingham: Department for Education and Skills.

⁴⁸ The 2012 SES was the latest and sixth in the series that covered a representative sample of 3,200 employed individuals who were between 20 and 65 years of age. Previous to 2006, the SES covered individuals aged 20-60 years. These surveys have considered the broad skills and qualifications individuals possess as well as the skills and qualifications required for job entry and for fulfilling the requirements of the job. See Felstead et al. (2012).

⁴⁹ Felstead, A. Gallie, D., Green, F. and Inanc, H. (2013) *Skills at Work in Britain First Findings from the Skills and Employment Survey, 2012* Cardiff: University of Cardiff

indicates that graduates are increasingly entering a wider range of jobs than hitherto, some of which do not necessarily require a degree to gain entry.⁵⁰

There is always an element of the demand side taking time to catch up with changes in the supply of skills. The massive increase in the number of graduates from 1992 was always likely to create a degree of mismatch in the economy as employers would have required time to adapt their organisational structures to the changing patterns of skill supply. It is notable that the SES indicates that the proportion of graduates in 'matched' jobs (where their level of qualification held was the same as that required to enter the job) increased from 69 per cent to 74 per cent between 2006 and 2012.

Another, softer indicator of potential mismatches between the skills of workers and job requirements that is captured in by SES asks respondents about the opportunities to use their knowledge and skills at work. In 2012, 87 per cent of all respondents indicated that their job provided them with 'enough opportunities to use the knowledge and skills' they possessed. This proportion had increased from 82 per cent in 2002. To some extent this is consistent with other data. Eurostat, for example, estimated the extent to which people were employed in occupations had qualifications that were matched to the job being undertaken based on the modal qualification approach (see section 2.4.3 above) and distinguishing between ordinary imbalance (the percentage of employees who were qualified at either one level above or below the modal level) and severe imbalance being two or more levels above or below the modal value).⁵¹ Table 3.6 shows Eurostat's results for the UK and the EU. Compared to the EU, the data suggests that the UK faces relatively more problems with under-skilling rather than over-skilling of employees. As noted in the previous chapter though, this method of estimating shortages and surpluses sometimes reflects nothing more than the changing levels of educational attainment in the workforce over time where younger people are more likely to have qualifications.

Table 2.3 Estimates of over- and under-qualification in the UK and EU (2013)

	Ordinary imbalance (% one level above or below modal qualification in occupation)		Severe imbalance (% two or more levels above or below modal qualification in occupation)	
	Under-qualified	Over-qualified	Under-qualified	Over-qualified
UK	28%	14%	15%	8%
EU	21%	15%	8%	9%

Source: Eurostat (2013)

⁵⁰ Purcell, K., Elias, P., Atfield, G., Behle, H., Ellison, R., Luchinskaya, D. (2013) 'Transitions into employment, further study and other outcomes, The Futuretrack Stage 4 Report', Manchester/Coventry: HECSU/Warwick Institute for Employment Research

⁵¹ Eurostat (2013) *Skills Mismatches and Labour Mobility* - http://ec.europa.eu/europe2020/pdf/themes/27_skills_gaps_and_labour_mobility.pdf

The relatively high level of under-qualification in the UK was also found by Ghignon and Verashchagina⁵² who adopted a similar approach to Eurostat's using data from the 2003 EU LFS ad hoc module on lifelong learning. They used an empirical measure of the education required for an occupation based on the distribution of schooling years for workers in a given occupation or group of occupations. They classified an individual as over-qualified where their years of education were higher than the mode for the occupation, under-qualified where years of schooling were lower than the mode in the occupation; and properly matched where the person's years of education were about equal to the mode. Their results found the UK to have one of the highest incidence of under-qualification and relatively low incidence of over-qualification amongst the ten European countries considered. More than 40 per cent of men and around 43 per cent of women were estimated to be under-qualified and around 20 per cent of both men and women were over-qualified in the UK. In total, educational mismatch was evident for more than half of all men and women (around 60 per cent and 64 per cent, respectively). Ghignon and Verashchagina noted that the trend in the UK, and also observed in Germany, was towards decreasing levels of over-qualification.

2.5 Conclusion

Skill mismatches are inherently difficult to define. A number of different approaches can be taken not only to defining and measuring skill itself but also to identifying and measuring mismatches between the demand for and supply of skills. There are a number indicators which can be used to draw inferences about skill demand, supply and potential mismatches and data are readily available for many of these. Each individual indicator and approach to its use in assessing skill mismatches have limitations which are particularly severe when any variable is considered on its own to be a complete indicator of mismatch (or match). Despite the various limitations attached to different approaches, this chapter has outlined a number of key issues relating to the conceptual framework and measurement issues pertaining to skill mismatches. Considering a variety of indicators of skill mismatch, the evidence discussed thus far suggests that there is a relatively modest level of shortages in the labour market. This provides a good basis on which the extent of mismatches can be drawn together and further assessed in the next chapter. What is perhaps most apparent when looking at the data presented above, is that the various indicators mark out a relatively small number of occupations characterised by experiencing skill shortages. This is an issue returned to in the next chapter.

⁵² Ghignoni, E. and A. Verashchagina (2014). 'Educational qualifications mismatch in Europe. Is it demand or supply driven? *Journal of Comparative Economics*, 42: 670-692.

3. Multidimensional Approaches to Assessing Skill Mismatches

Key findings

This chapter considers multidimensional approaches to examining the nature and extent of skill mismatches by considering existing examples of this type of approach along with simultaneous analysis of a number of the indicators of mismatch that were introduced (singularly) in Chapter 2. The results from an experimental approach using existing data is also presented to illustrate a systematic way to assess the numerous indicators of skill mismatches which can overcome potential biases encountered when any one indicator is considered in isolation. Combining indicators helps to provide a more complete picture though this approach also has its limitations.

Through combining various indicators, the analysis has generated an initial list of occupations in which skill shortages (and surpluses) are considered likely to arise. Within the list of skill shortage occupations, most occupations are associated with relatively high skill requirements. Many are also in STEM/STEM-related areas. Graduate occupations also feature.

The analysis also provides a list of occupations which look to be particularly affected by skill surpluses however the information on these is not entirely conclusive. This can highlight areas where there is a potential issue and may be able in helping to target policies to promote better use of skills within the workplace for some occupations and sectors. In total, the 4-digit occupations listed as potential skill shortage occupations account for employment of nearly 2.6 million, about 47,000 vacancies of which around 25,600 are reported as hard-to-fill and around 23,500 as skill shortage vacancies.

The mismatches it has identified are likely to change over time so there is a need to routinely update the analysis to gauge how the incidence and occupational characteristics of shortages and surpluses are changing over time.

Whilst the approach developed here has many advantages over assessing skill mismatches through only one indicator, the potential groups of skill shortage and skill surplus occupations requires some judgement about their importance (from a public policy perspective) in order to decide whether intervention is required, and if so, how it should be targeted.

3.1 Introduction

Chapter 2 provided an overview of how skill mismatches have been defined in the economics literature, providing a typology of the various dimensions of skill mismatches, and summarised recent data for each of the main measures of skill mismatch. This chapter explores the incidence of mismatches in the UK in more detail and aims to provide a more multi-dimensional approach to assessment of skill shortages and surpluses. There is much to gain from adopting a multi-dimensional approach to assessing mismatches wherein data for a number of different indicators can be combined to provide a more complete picture of potential mismatches and their extent in the labour market.

In this chapter, various multi-dimensional approaches to measuring skill mismatches are considered, along with a discussion of their relative strengths and weaknesses. The indicators of mismatch described in Chapter 2 are then considered in combination to illustrate the potential issues encountered in taking a multi-dimensional approach to measuring mismatches. Finally, an experimental approach which takes into account data on number of different indicators is outlined and illustrated using data for the UK. This experimental approach has much to recommend it respect to measuring mismatches in a more systematic manner than hitherto.

3.2 Previous multidimensional approaches

Analysts have sought to combine the various measures of skills mismatch described above to provide multi-dimensional measures of skill mismatches. Examples include those undertaken by:

1. Skills Australia;
2. National Institute of Labour Studies (NILS);
3. Migration Advisory Committee (MAC).

Each of these approaches to identifying and measuring mismatches is summarised below.

Skills Australia (2008) developed a methodology based around four criteria for identifying skill mismatches:⁵³

1. lead times (i.e. lead times for developing skills are relatively long);
2. high use (i.e. skills possessed by individual are essential to fulfilling the demands of the job)
3. high disruption (i.e. skills not being available has high impact)
4. high information (i.e. information is available about future demand and that allows 1 to 3 above to be evaluated).

Important in these is the information about the time taken to produce skills, whether or not those skills are essential to an occupation, and the impact of not having those skills. Emphasis is therefore placed on looking at those jobs or occupations where there is a genuine skill requirement which employers may not be able to obtain to fill a potential vacancy. In other words, this approach rules out those occupations

⁵³ Skills Australia (2008), 'What does the future hold? Meeting Australia's skill needs', Background Paper One, Workforce Futures: A paper to promote discussion towards an Australian Workforce Development Strategy. <http://www.tda.edu.au/resources/Workforce-Futures-Background-paper-one.pdf> (accessed January 2015)

where reports of 'skill shortages' may be a result of people lacking certain attributes rather than skills because the skills required can be acquired relatively quickly.

The method developed at **NILS** by Mavromaras and his colleagues⁵⁴ is also based on four criteria. These relate to:

- 1 the state of the labour market (i.e. the extent of cyclical demand);
- 2 the recruitment experience (i.e. the difficulties employers experience recruiting people to specific occupations);
- 3 the education experience (i.e. the extent to which students/pupils respond to labour market signals in making educational choices that reflect labour market demand);
- 4 labour market entrants (e.g. the labour market outcomes for students / pupils who made different educational choices).

Table 3.1 provides a summary of the indicators associated with each criterion in the Mavromaras *et al* approach. The NILS approach notably tries to control for the state of the labour market and, in doing so, removes some of the cyclical drivers of skills mismatches.

⁵⁴ Mavromaras, K., Healy, J., Richardson, S., Sloane, P. Wei, Z. and Zhu, R. (2013). A System for Monitoring Shortages and Surpluses in the Market for Skills. Final Report to the Australian Workforce and Productivity Agency (AWPA) by the National Institute of Labour Studies (NILS)

Table 3.1 NILES' criteria for identifying priority occupational skill mismatches

Criteria	Indicator
State of labour market*	Employment / population ratio Unemployment rate Hours Worked Numbers employed Change in wages Proportion of workforce aged over 55 years
Recruitment experience	Vacancies filled after six weeks Average number of applicants per vacancy Average number of suitable applicants per vacancy Vacancy rate as a percentage of employment Unemployment rate as a percentage of employment
Education experience**	Entry requirement to study a particular course Change in level of enrolments Completion rate
Labour market entrants	Labour market status four months after completion** Labour market status six months after completion** Labour market status three years after completion** Immigrants as a % of all new entrants to an occupation Labour market status of university students three years after graduation**

* These are a mix of economy wide and occupation specific indicators; all other indicators are occupation specific

** Qualification based measures

Finally, the **Migration Advisory Committee (MAC)** developed a methodology for assessing whether there were skill shortages attached to a specific occupation that would warrant exceptions being made to immigration entry requirements to the UK. The approach identified a number of indicators (see Table 3.2) and set thresholds above which there was considered to be a risk. In the MAC methodology, the threshold for the wage indicators, for example, is 50 per cent above the mean or median.

Table 3.2 MAC's potential indicators included in measuring mismatches

Indicator Type	Indicator No.	Specific indicators
Survey based measures	1	Per cent of skill shortage vacancies as a percentage of all vacancies
	2	Per cent of skill shortage vacancies as a percentage of all hard-to-fill vacancies
	3	Per cent of skill shortage vacancies as a percentage of employment in an occupation
	4	Per cent of individuals who report that their (a) skills are in excess of those demand in the job / (b) skills are lower than those needed in the job
Price based measures	5	Per cent change in median hourly / annual pay for all employees by occupation
	6	Per cent change in mean hourly / annual pay for all employees by occupation
	7	Hourly / annual wage rate for an occupation
Volume based measures	8	Per cent change in unemployment by sought occupation (or occupation in last job)
	9	Per cent change in employment in occupation
	10	Per cent change in median hours worked for full-time employees
	11	Change in percentage of workers in occupation for less than one year
	12	Variation in qualifications held within occupations
Administrative data / vacancy surveys	13	Vacancy / unemployment ratio for an occupation
	14	Change in median duration of vacancy for an occupation

Source: Derived from MAC (2008).

The multi-dimensional approaches, such as those developed and used by Skills Australia, NILS and MAC, offer many advantages over using single, often biased, measures. But unless the indicators are all pointing in the same direction such approaches can prove to be difficult to interpret. This would suggest that there needs to be a degree of parsimony in selecting indicators.

3.3 Combining data to provide an indicator of skill mismatches

As noted above, exploring a number of different indicators of potential skill mismatches can provide a more complete picture than looking at different measures in isolation. Table 3.3 brings together the data on employers' reports of skill mismatches, wage data, and occupational employment / unemployment rates discussed above. The shaded cells show where there is prima facie evidence of skill shortages occurring insofar as employer reports of skill shortages are above average, wage growth is above average, and the unemployment rate associated with an occupation is below average. The final column of the table places a cross against all those occupations that have an above average measure on all of the following: (a) skill shortages as a percentage of vacancies; (b) employment rate, and (c) wage indicators. This is an indicator of skill shortages and includes the following occupations:

- Other managers and proprietors (SOC 12);
- Science, research, engineering and technology professionals (SOC 21);
- Business, media and public service professionals (SOC 24);
- Science, engineering and technology associate professionals (31);
- Protective service occupations (SOC 33);
- Business and public service associate professionals (SOC 35);
- Skilled metal, electrical and electronic trades (SOC 53);
- Skilled construction and building trades (SOC 54).

This relatively simple analysis would suggest that the extent of skill shortages in the economy is limited, though the impact of these shortages on employers' organisational performance may be substantial. Analysis of occupations disaggregated to only one-digit and two-digit SOC groups however does not provide a great deal of insight into the specific types of skills that are likely to be in excess demand by employers. Further, the type of analysis based on observations made across Table 3.3 illustrates the potential for inconclusive results when the various indicators of potential skill mismatch do not all agree (e.g. not all indicators point in the same direction).

Table 3.3 Occupational skill mismatches: employer reports of skill mismatches, wage data, and occupational employment / unemployment estimates

Description	SOC 2010 code	Employer-reported vacancy data (ESS 2013)				Employment data (LFS 2014)		Earnings data (full-time) (ASHE 2014)			Mismatch indicator
		Number of vacancies	HtFVs as % of vacancies	SSVs as % of HtFVs	SSVs as % of vacancies	Unemployment rate (%)	Employment rate (%)	Mean annual wage (£)	Year on year growth (%)	Nominal growth 2011 - 2014 (%)	
All employees		550,975	29	78	23	4.1	79.2	33,475	0.6	2.4	
Managers, directors and senior officials	1	20,879	23	82	19	2.1	84.0	56,514	1.0	2.5	x
Corporate managers and directors	11	14,914	20	86	17	1.7	85.2	60,116	0.2	2.2	
Other managers and proprietors	12	5,937	32	77	24	3.0	81.5	37,325	5.2	0.4	x
Professional occupations	2	82,294	33	87	29	1.6	84.1	41,422	0.5	0.7	
Science, research, engineering and technology professionals	21	25,714	44	93	41	1.9	87.9	43,374	1.3	4.3	x
Health professionals	22	15,312	43	77	33	0.9	85.9	40,681	-1.1	-0.6	
Teaching and educational professionals	23	18,428	19	78	15	1.6	77.8	37,970	-0.3	1.3	
Business, media and public service professionals	24	22,763	26	91	24	1.9	85.5	43,079	1.5	-2.7	x
Associate professional and technical occupations	3	86,624	32	84	27	2.7	85.2	37,214	2.5	3.3	x
Science, engineering and technology associate professionals	31	14,102	27	89	24	3.8	83.0	30,415	1.4	2.6	x
Health and social care associate professionals	32	11,222	29	54	16	3.2	81.4	26,606	0.3	2.4	
Protective service occupations	33	983	42	100	42	1.8	88.4	36,271	-0.5	1.5	x
Culture, media and sports occupations	34	7,833	27	87	23	2.6	87.3	32,004	-7.8	-5.8	
Business and public service associate professionals	35	51,965	34	87	30	2.5	85.3	41,760	4.0	3.6	x
Administrative and secretarial occupations	4	57,898	17	81	14	3.9	75.3	23,565	1.1	0.7	
Administrative occupations	41	48,097	16	80	13	3.9	76.8	23,779	1.0	0.4	
Secretarial and related occupations	42	9,669	19	86	16	3.7	70.6	22,534	1.2	2.3	

Source: ESS2013; LFS 2014; ASHE 2014; own calculations

Table 3.3 Occupational skill mismatches: employer reports of skill mismatches, wage data, and occupational employment / unemployment estimates (continued)

Description	SOC 2010 code	Employer-reported vacancy data (ESS 2013)				Employment data (LFS 2014)		Earnings data (full-time) (ASHE 2014)			Mismatch indicator
		Number of vacancies	HtFVs as % of vacancies	SSVs as % of HtFVs	SSVs as % of vacancies	Unemployment rate (%)	Employment rate (%)	Mean annual wage (£)	Year on year growth (%)	Nominal growth 2011 - 2014 (%)	
Skilled trades occupations	5	41,428	46	83	38	3.6	80.6	26,971	1.5	3.5	x
Skilled agricultural and related trades	51	1,995	47	88	42	3.0	82.8	20,029	-0.1	1.7	
Skilled metal, electrical and electronic trades	52	18,843	46	90	42	3.0	81.8	29,999	1.5	4.7	x
Skilled construction and building trades	53	7,767	41	73	30	3.0	81.2	26,671	2.4	3.5	x
Textiles, printing and other skilled trades	54	12,700	48	78	37	5.8	76.9	20,488	0.6	-0.6	
Caring, leisure and other service occupations	6	85,425	36	75	27	4.1	76.6	18,173	-0.9	-0.6	
Caring personal service occupations	61	67,870	35	73	26	4.0	76.9	17,493	-1.0	-1.6	
Leisure, travel & related personal service occupations	62	17,534	39	83	32	4.5	75.6	20,983	0.4	4.2	
Sales and customer service occupations	7	65,352	19	71	14	7.2	73.7	19,123	0.2	-0.2	
Sales occupations	71	52,056	22	70	15	7.5	72.4	17,596	-0.1	-0.6	
Customer service occupations	72	13,251	9	80	7	6.5	78.3	21,920	0.2	0.0	
Process, plant and machine operatives	8	24,349	35	68	24	5.3	76.2	24,416	-0.1	4.2	
Process, plant and machine operatives	81	11,176	27	80	22	7.0	74.4	23,474	0.2	2.9	
Transport and mobile machine drivers and operatives	82	13,134	42	61	26	4.0	77.6	25,451	-0.4	5.6	
Elementary occupations	9	67,164	23	60	14	9.7	70.6	18,807	-1.3	2.6	
Elementary trades and related occupations	91	6,436	25	61	15	13.8	68.5	19,985	0.7	3.4	
Elementary administration and service occupations	92	60,591	22	60	13	9.0	71.0	18,534	-1.7	2.6	

Source: ESS2013; LFS 2014; ASHE 2014; own calculations

3.4 An experimental approach: identifying potential skill mismatch clusters

To further investigate potential areas of shortages on the basis of these indicators, cluster analysis was used to explore the data and to establish whether the various indicators may be usefully combined to help identify those occupations where there may be skill shortages (and surpluses). Cluster analysis seeks to identify natural groupings or clusters within data and there are a variety of approaches which may be taken. The results here are based on Ward's hierarchical clustering model.⁵⁵ The analysis of potential skill surpluses was carried out separately from shortages.

3.4.1 Assessment of skill shortages

In looking at potential skill shortages, the unit of observation in the data set was the occupation at either 3- or 4-digit level. For 4-digit occupations, the cluster analysis included: the annual percentage change in mean wages (obtained from ASHE); percentage of vacancies reported to be hard-to-fill (from ESS); and percentage of vacancies reported as skill shortage vacancies (ESS). For 3-digit occupations, a further variable was added from the LFS – the percentage change in the employment rate between 2013 and 2014⁵⁶.

Based on the cluster analysis, occupations were allocated into three groups. Table 3.4 shows the average values for the main variables of interest (i.e. those used in carrying out the cluster analysis) for these three groups of 4-digit occupations. The groups have been labelled as:

1. 'skill shortage likely' (Group 1);
2. 'skill shortage possible' (Group 2); and
3. 'skill shortage unlikely' (Group 3),

The names reflect what each group's average value suggests about the presence of skill shortages for the particular group of occupations. Group 1, on average, has higher shares of HtFVs and SSVs as proportions of all vacancies when compared with the overall averages (across all occupations). Similarly, the average change in mean wages is higher for this group than across all occupations. Group 2 (shortage possible) also has average shares of HtFVs and SSVs which are relatively high and higher wage growth compared with the all occupation averages, but the differences are smaller than for Group 1. The third group (unlikely shortage) has relatively low

⁵⁵ Two clustering methods (*kmeans* and *Ward's* clustering methods) were used in carrying out this analysis with the results reported being based on the *Ward's* approach. *Ward's* clustering, uses a hierarchical approach -each observation in the data (each occupation here) is initially assigned to a separate group or cluster. These groups are then joined so as to maximise an objective function, namely the error-sum-of-squares.

⁵⁶ This variable could not be used in the analysis of 4-digit SOC occupations as the LFS does not include this level of detail for occupations in the respondent's last job.

shares of HtFVs and SSVs and lower average growth in mean wages compared with all occupations.

Table 3.4 Average values of main indicators by cluster, 4-digit SOC

Clusters	HtFVs as % of vacancies	SSVs as % of vacancies	p.a. change in mean wages (%)	N
Group 1: 'skill shortage likely'	65.36	60.65	1.23	61
Group 2: 'skill shortage possible'	40.89	28.23	1.18	118
Group 3: 'skill shortage unlikely'	12.91	9.96	1.02	168
<i>Total (all occupations)</i>	<i>31.64</i>	<i>25.09</i>	<i>1.11</i>	<i>347</i>

Table 3.5 presents the group averages for the three groups derived from cluster analysis of 3-digit occupations (which adds a further variable showing the change in employment between 2013 and 2014). In this case, the first two groups could reasonably be expected to comprise occupations where skill shortages are likely or at least possible. For the third group of occupations skill shortages may be considered unlikely for reasons analogous to those described above with reference to the 4-digit occupation analysis – here, Group 3, on average, has lower shares of HtFVs and SSVs as well as lower growth in wages than the all occupation averages. The average change in the employment rate for this Group 3 is also lower than the overall average (0.99 per cent increase for this group compared to 1.15 per cent increase in employment rate for all occupations). The distinction between Groups 1 and 2 is less clear here as both suggest possible skill shortages on the basis of within-group averages for all four variables.

Table 3.5 Average values of main indicators by cluster, 3-digit SOC

Clusters	HtFVs as % of vacancies	SSVs as % of vacancies	Annual change in mean wages (%)	Change in employment rate 2013-14 (%)	n
Group 1: 'skill shortage likely'	49.47	44.31	2.22	1.24	16
Group 2: 'skill shortage possible/likely'	35.36	28.73	1.34	1.33	29
Group 3: 'skill shortage unlikely'	17.94	12.69	0.85	0.99	44
<i>Total</i>	<i>29.29</i>	<i>23.60</i>	<i>1.26</i>	<i>1.15</i>	<i>89</i>

Occupations which belong in Group 1 in Table 3.4 (for 4-digit occupations) and in Groups 1 and 2 in Table 3.5 (for 3-digit occupations) are listed in Tables 3.6 and 3.7, respectively. Employment and SSVs for each occupation are also shown and occupations are presented in descending order of total employment.⁵⁷ These tables exclude occupations in the major SOC groups 8 (Process, plant and machine operatives) and 9 (Elementary occupations) because, as described in Chapter 2, these occupations are considered to be relatively low skilled and the skills required in

⁵⁷ Data from ESS 2013 are provided only in accordance with reporting guidelines and data usage agreement with UKCES.

such jobs are more likely to require relatively short training. For other, relatively higher skilled occupations, substantive and longer training would be required.

Nearly half (46 per cent) of the skill shortage occupations listed in Table 3.6 are skilled trades occupations (SOC 5) and over 20 per cent are professional occupations (SOC 2). The most common levels of qualification held by workers in many of these occupations are relatively high. The modal level of qualification⁵⁸ is NQF Level 4 or higher for half of the occupations listed and for a further 24 per cent the modal level of qualification is NQF Level 3 or a trade apprenticeship. It is somewhat more surprising that in 10 of the occupations listed, the most common highest level of qualification is less than NQF Level 2 (but with at least some qualification). These occupations include a number of skilled trades occupations (e.g. chefs (SOC 5434); roofers, roof tilers and slaters (SOC 5313); and pipefitters (SOC 5216)).

A number of STEM occupations (i.e. occupations requiring skills / training in science, technology, engineering or mathematics) feature within the cluster of occupations where skill shortages have been assessed as being likely. Such STEM occupations include programmers and software development professionals (SOC 2136); design and development engineers (SOC 2126); IT engineers (SOC 5245); taxation experts (SOC 3535); and aircraft maintenance and related trades (SOC 5235). These STEM occupations account for relatively high employment numbers and within these the level of educational attainment is also relatively high (i.e. workers typically qualified to NQF Level 3 or higher). Just under a third of the skill shortage occupations listed in are graduate jobs (according to SOC(HE) classification⁵⁹) and more than half of these graduates jobs are in STEM areas. Finding skill shortages related to STEM skills is in line with the findings from previous research using other data (see Chapter 2).

There are some notable differences between the clusters of 4-digit occupations and those of 3-digit occupations. Whilst the 3-digit occupation functional managers and directors (113) is not classified as being likely to have skill shortages (it is not present in Table 3.7), a number of 4-digit occupations within SOC 113 are identified within the 'skill shortage likely' cluster shown in Table 3.6. A similar result is observed for Media Professionals (3-digit SOC 247). Table 3.7 does not contain any administrative and secretarial occupations (1-digit SOC 4), but company secretaries (SOC 4214) is included in the 'skill shortage likely' cluster.

⁵⁸ The most common highest of level of qualification held workers within a particular occupation is referred to here as the modal level of qualification for that occupation.

⁵⁹ Elias, P. and Pucell, K. (2012) 'Classifying graduate occupations for the knowledge society: SOC(HE) 2010', Futuretrack Working paper No. 5. University of Warwick Institute for Employment Research

Table 3.6 Occupations in 'skill shortage likely' cluster (Group 1), 4-digit SOC

SOC	Description	Employment		SSVs	
		number	% of total employment	number	as % of employment
2136	Programmers and software development professionals	238,042	0.92%	3,195	1.3%
5434	Chefs	203,419	0.79%	3,293	1.6%
1132	Marketing and sales directors	154,091	0.60%	-	-
5223	Metal working production and maintenance fitters	153,331	0.59%	1,924	1.3%
5113	Gardeners and landscape gardeners	140,372	0.54%	656	0.5%
5111	Farmers	106,628	0.41%	-	-
6126	Educational support assistants	105,761	0.41%	111	0.1%
2129	Engineering professionals n.e.c.	84,494	0.33%	1,248	1.5%
1136	Information technology & telecommunications directors	77,162	0.30%	-	-
6222	Beauticians and related occupations	74,066	0.29%	1,066	1.4%
2126	Design and development engineers	66,638	0.26%	721	1.1%
2122	Mechanical engineers	65,344	0.25%	1,411*	2.2%
3541	Buyers and procurement officers	63,370	0.25%	635*	1.0%
5312	Bricklayers and masons	56,382	0.22%	-	-
5221	Metal machining setters and setter-operators	50,620	0.20%	632	1.2%
2127	Production and process engineers	49,172	0.19%	444*	0.9%
1133	Purchasing managers and directors	48,216	0.19%	-	-
5330	Construction and building trades supervisors	47,540	0.18%	-	-
2221	Physiotherapists	44,562	0.17%	-	-
5313	Roofers, roof tilers and slaters	40,120	0.16%	-	-
2472	Public relations professionals	39,459	0.15%	311*	0.8%
2219	Health professionals n.e.c.	38,218	0.15%	-	-
3567	Health and safety officers	35,212	0.14%	-	-
2429	Business, research & administrative professionals n.e.c.	35,106	0.14%	-	-
5250	Skilled metal, electrical & electronic trades supervisors	34,214	0.13%	-	-
5245	IT engineers	33,834	0.13%	-	-
2123	Electrical engineers	33,272	0.13%	-	-
3119	Science, engineering and production technicians n.e.c.	32,899	0.13%	1,026*	3.1%
4214	Company secretaries	32,621	0.13%	-	-
2212	Psychologists	32,437	0.13%	-	-
3313	Fire service officers (watch manager and below)	31,568	0.12%	-	-
3535	Taxation experts	30,639	0.12%	-	-
2142	Environment professionals	27,099	0.10%	-	-
6123	Playworkers	26,100	0.10%	676	2.6%
5232	Vehicle body builders and repairers	24,195	0.09%	-	-
3217	Pharmaceutical technicians	23,624	0.09%	-	-
5431	Butchers	22,418	0.09%	254*	1.1%
5224	Precision instrument makers and repairers	19,280	0.07%	-	-
1241	Health care practice managers	19,060	0.07%	-	-
5235	Aircraft maintenance and related trades	16,756	0.06%	-	-
3115	Quality assurance technicians	15,878	0.06%	-	-
5414	Tailors and dressmakers	14,350	0.06%	-	-
5119	Agricultural and fishing trades n.e.c.	14,282	0.06%	-	-
6131	Veterinary nurses	13,034	0.05%	-	-
5222	Tool makers, tool fitters and markers-out	11,970	0.05%	-	-
7123	Roundspersons and van salespersons	11,354	0.04%	-	-
5234	Vehicle paint technicians	11,147	0.04%	-	-
5225	Air-conditioning and refrigeration engineers	11,114	0.04%	216*	1.9%
5214	Metal plate workers, and riveters	8,785	0.03%	-	-
5311	Steel erectors	8,505	0.03%	-	-
5216	Pipe fitters	7,186	0.03%	-	-
5411	Weavers and knitters	3,876	0.02%	-	-
5212	Moulders, core makers and die casters	2,520	0.01%	-	-
5211	Smiths and forge workers	1,918	0.01%	-	-

Note: ESS figures on SSVs are not provided where data are available for fewer than 25 establishments. * indicates that SSV figure is based on 25 to 50 establishments and should be interpreted as indicative.

Sources: Employment figures from LFS; SSVs from ESS 2013.

Table 3.7 Occupations in ‘skill shortage likely’ or ‘skill shortage possible’ cluster (Group 1 or 2) (3-digit SOC)

SOC	Description	Employment		SSVs	
		number	% of total employment	number	as % of employment
213	IT & telecommunications professionals	675,134	3.10%	5,341	0.79%
543	Food preparation and hospitality trades	355,996	1.63%	4,208	1.18%
212	Engineering professionals	344,559	1.58%	4,469	1.30%
331	Protective service occupations	291,719	1.34%	-	-
311	Science, engineering and production technicians	231,870	1.06%	-	-
522	Metal machining, fitting & instrument making trades	223,644	1.03%	3,110	1.39%
523	Vehicle trades	189,869	0.87%	3,001	1.58%
622	Hairdressers and related services	106,994	0.49%	3,488	3.26%
511	Agricultural and related trades	92,196	0.42%	830	0.90%
222	Therapy professionals	92,009	0.42%	622*	0.68%
521	Metal forming, welding and related trades	86,945	0.40%	432	0.50%
533	Construction and building trades supervisors	39,131	0.18%	-	-
214	Conservation and environment professionals	33,774	0.16%	156*	0.46%
525	Skilled metal, electrical & electronic trades supervisors	33,031	0.15%	-	-
614	Caring personal services	1,029,353	4.73%	13,489	1.31%
354	Sales, marketing and related associate professionals	775,333	3.56%	7,356	0.95%
223	Nursing and midwifery professionals	508,434	2.33%	3,259	0.64%
242	Business, research and administrative professionals	506,990	2.33%	2,798	0.55%
356	Public services and other associate professionals	401,271	1.84%	6,180	1.54%
221	Health professionals	312,050	1.43%	1,207	0.39%
531	Construction and building trades	271,865	1.25%	1,938	0.71%
125	Managers and proprietors in other services	266,809	1.22%	594	0.22%
524	Electrical and electronic trades	265,431	1.22%	1,154	0.43%
713	Sales supervisors	163,842	0.75%	522	0.32%
122	Managers & proprietors in hospitality & leisure services	156,901	0.72%	521	0.33%
621	Leisure and travel services	133,147	0.61%	1,653	1.24%
244	Welfare professionals	126,152	0.58%	-	-
246	Quality and regulatory professionals	96,637	0.44%	-	-
321	Health associate professionals	95,937	0.44%	-	-
712	Sales related occupations	88,865	0.41%	1,118	1.26%
342	Design occupations	78,712	0.36%	935	1.19%
115	Financial institution managers and directors	69,436	0.32%	-	-
124	Managers and proprietors in health and care services	64,800	0.30%	313	0.48%
111	Chief executives and senior officials	54,449	0.25%	-	-
542	Printing trades	48,577	0.22%	159*	0.33%
613	Animal care and control services	48,481	0.22%	258*	0.53%
544	Other skilled trades	47,108	0.22%	193	0.41%
312	Draughtspersons and related architectural technicians	45,804	0.21%	-	-
532	Building finishing trades	45,403	0.21%	274*	0.60%
541	Textiles and garments trades	26,945	0.12%	175*	0.65%

Notes: 1. shaded cells correspond to occupations in the Group 2 cluster ‘possible/likely shortage’ (see Table 3.5). 2. ESS figures on SSVs are not provided where data are available for fewer than 25 establishments. * indicates that SSV figure is based on 25 to 50 establishments and should be interpreted as indicative.

Sources: Employment figures from LFS; SSVs from ESS 2013.

Comparing the allocation of 3-digit occupations to clusters with the results for 4-digit occupations illustrates some of the issues that may arise when trying to identify skill mismatches in this manner. Intuitively, 4-digit occupations are more relevant for

considering skill mismatches as it is at this level of disaggregation that the skills used in or required for employment are more homogeneous within the classification. An occupation coded at the 4-digit level is more likely to correspond with an actual job that people undertake. The modal level of qualification of workers in a 3-digit SOC group may mask variations in the typical qualifications profile of the constituent 4-digit SOC occupations (e.g. caring and personal services (SOC 614) comprises a number of occupations where the modal level of qualification ranges from NQF Level 2 for care workers and home carers (SOC 6145) to NQF Level 4 or above for dental nurses (SOC 6143). One drawback of using 4-digit SOC codes is that data are more limited at this level of disaggregation (e.g. there is a reduced set of variables recorded at this level in LFS; empty and small cell problems especially in relation to wages in ASHE).

3.4.2 Assessment of skill surpluses

Similar cluster analysis was carried out for skill surpluses. In this analysis, data on individuals' highest level of qualification was used to indicate the degree of over-qualification (here taken to represent skill surpluses) within each 4-digit SOC occupation. The definition of over-qualification (and under-qualification) is aligned with that used by Eurostat. For each occupation, the modal level of qualification was found and then the percentages of people in employment with higher or lower levels of qualification in the occupation were calculated. These percentages included the percentage qualified to one level, two levels and three or more levels above (or below) the modal level of education within each occupation. Cluster analysis was again used to allocate occupations according to these measures of over-/under-qualification.

The characteristics of occupations allocated to the three clusters generated through this approach are set out in Table 3.8. The second and third columns show the average percentages of workers in occupations in each cluster that are over-qualified and under-qualified by at least one qualification level. Group 2 has the highest percentage of over-qualified workers (45.4 per cent) compared to none in Group 1 and 5.8 per cent in Group 3. The average annual wage is also lowest in Group 2 (£22,219 per year) though wage growth is highest for this group (1.23 per cent per year).

Table 3.8 Characteristics of clusters of occupations, clusters based on over-qualification and under-qualification only (4-digit SOC)

Clusters	% over-qualified	% under-qualified	p.a. change in mean wages (%)	Average annual wage	N
Group 1	0.0%	44.3%	0.89%	£41,824	78
Group 2	45.4%	28.7%	1.23%	£22,219	99
Group 3	5.8%	12.7%	1.17%	£30,384	192
<i>All occupations</i>	15.2%	23.6%	1.13%	£30,587	369

Given the higher proportion of over-qualified workers in Group 2, this cluster of occupations was then explored further to identify occupations where there is further evidence to support the finding that there is a skill surplus. Further cluster analysis

was carried out using only those 99 occupations that were allocated to Group 2 (see Table 3.8). In this second step, the clusters were based on the change in average wage levels in each occupation and occupations were allocated to three clusters (2a, 2b and 2c). The characteristics of these clusters are summarised in Table 3.9.

Table 3.9 Characteristics of clusters of occupations based on change in average annual wages (4-digit SOC)

Clusters	% over-qualified	% under-qualified	p.a. change in mean wages (%)	Average annual wage	N
Group 2a	44.1%	28.8%	-2.22%	£21,003	37
Group 2b	46.0%	24.3%	6.25%	£22,972	24
Group 2c	46.2%	27.5%	1.41%	£22,927	38
<i>All occupations</i>	<i>45.4%</i>	<i>28.7%</i>	<i>1.23%</i>	<i>£22,219</i>	<i>99</i>

The percentage of workers who are classified as being over-qualified ranges from 44.1 per cent in Group 2a to 46.2 per cent in Group 2c. As noted in Chapter 2, changes in wage levels by occupation may indicate potential skill shortages or surpluses. One may expect there to be a negative rate of change in wages (or at least relatively low real wage growth) in those occupations where there is a skill surplus. The average growth, however, in mean annual wages has a wider range across the three clusters shown, from -2.22 per cent in Group 2a to 6.25 per cent in Group 2b. Given the average negative growth in wages for Group 2a along with this group's relatively high incidence of over-qualification (compared to all occupations) it is of interest to consider the occupations allocated to this group (see Table 3.10).

Occupations are shown in descending order of employment levels in Table 3.10. Given the definition of over-qualification used in this analysis (i.e. relative to the modal level of qualification in an occupation), occupations where the modal level of qualification is NQF Level 4 or higher do not appear in this list of potential skill surplus occupations. For most of the 37 occupations listed, the modal level of qualification is NQF Level 2. There are no 4-digit SOC occupations from the first three major occupational groups (managers, directors and senior officials; professional occupations; and associate professional and technical occupations) amongst those occupations listed.

Table 3.10 Potential skill surplus occupations (4-digit SOC)

SOC Description	% over-qualified	Employment	Change in average wages (% p.a.)
6145 Care workers and home carers	46%	630,077	-0.2%
8111 Food, drink and tobacco process operatives	55%	112,406	0.2%
8149 Construction operatives n.e.c.	56%	85,924	-0.6%
9244 School midday and crossing patrol occupations	48%	81,355	-1.4%
9251 Shelf fillers	43%	76,811	-0.4%
7211 Call and contact centre occupations	54%	76,196	-1.8%
5435 Cooks	27%	71,964	-2.9%
7114 Pharmacy and other dispensing assistants	43%	59,021	-0.4%
5312 Bricklayers and masons	48%	56,382	-7.0%
6240 Cleaning and housekeeping mngrs and supervisors	32%	50,725	-4.3%
4217 Typists and related keyboard occupations	47%	47,477	-3.2%
8125 Metal working machine operatives	48%	41,182	-2.4%
5313 Roofers, roof tilers and slaters	56%	40,120	0.0%
5449 Other skilled trades n.e.c.	44%	39,239	-0.6%
8229 Mobile machine drivers and operatives n.e.c.	65%	36,838	-1.1%
5316 Glaziers, window fabricators and fitters	49%	36,553	-2.3%
9231 Window cleaners	22%	35,053	-8.7%
4121 Credit controllers	41%	32,053	-0.5%
5432 Bakers and flour confectioners	32%	29,394	-1.6%
8116 Plastics process operatives	40%	25,749	-0.8%
9235 Refuse and salvage occupations	14%	24,946	-1.0%
9132 Industrial cleaning process occupations	59%	24,189	-5.5%
9259 Elementary sales occupations n.e.c.	39%	22,716	-4.9%
5423 Print finishing and binding workers	50%	16,977	-1.0%
7213 Telephonists	58%	16,800	0.1%
8134 Weighers, graders and sorters	43%	15,352	-3.9%
7122 Debt, rent and other cash collectors	54%	15,093	-2.9%
6148 Undertakers, mortuary and crematorium assistants	49%	14,013	-3.0%
8234 Rail transport operatives	45%	13,957	-1.2%
8135 Tyre, exhaust and windscreen fitters	27%	13,666	-2.0%
8119 Process operatives n.e.c.	29%	12,939	-2.8%
8117 Metal making and treating process operatives	39%	11,145	-0.2%
5225 Air-conditioning and refrigeration engineers	38%	11,114	-1.7%
9232 Street cleaners	28%	6,505	-6.0%
6132 Pest control officers	59%	6,450	-2.6%
8223 Agricultural machinery drivers	39%	6,013	-2.1%
9112 Forestry workers	66%	6,012	-1.3%

Sources: Over-qualified and employment levels derived from LFS; wages from ASHE.

Whilst occupations may experience skill surpluses and shortages simultaneously, only three of the occupations which are listed as potential skill surplus occupations here also appear in the list of likely skill shortage occupations (see Table 3.6). These are: air-conditioning and refrigeration engineers (SOC 5225); bricklayers and masons (SOC 5312); and, roofers, roof tilers and slaters (SOC 5313). The modal level of qualification for all three of these occupations is relatively low (less than or equal to NQF Level 2) which may suggest that skill shortages are less likely than first thought. That said, the number of SSVs as a percentage of employment in each occupation is relatively high compared with the all occupation figure. It may be that a number of reported skill shortages for these (and similar) occupations arise from a

variety of other factors such as the attractiveness of the occupations (e.g. these may be perceived to be physically demanding and repetitive tasks) rather than skill shortages per se. Relatively large shares of workers in each of these occupations are classified as over-qualified and the idea of there being skill surpluses here is reinforced by low or negative average wage growth. As previously noted though, changes in wages do not reflect only relative skill demand and it could be that for these particular occupations the recent economic downturn may have pushed wages downward or suppressed wage growth temporarily.

3.4.3 Further comment on the experimental results

The cluster analysis here does not impose any weighting of the different indicators of possible skill mismatches (i.e. indicators of HtFVs, SSVs, wage growth, and (for 3-digit occupations) employment growth). Whilst no particular variable is more influential on the allocation of observations to the resulting clusters in labelling these groups of occupations as being indicative of 'likely', 'possible' or 'unlikely' skill shortages, subjectivity is introduced about which indicators are more 'important' in identifying mismatches where one variable suggests something slightly different to the others.

3.5 Conclusion

A multi-dimensional approach to assessing skill mismatch seems a reasonable approach to adopt and certainly presents a number of advantages over the use of any single indicator. Implementing a multi-dimensional approach, in practice, is not entirely straightforward. The approaches developed and used by Skills Australia, NILS and MAC, offer many advantages over using single, often biased, measures but as discussed in this chapter, there can be difficulties in interpreting the findings from such approaches if - as is often the case - different indicators point to different conclusions.

STEM / STEM-related occupations are prominent in the cluster of skill shortage occupations; there is also a relatively high proportion of graduate jobs in the list. This corresponds to other evidence based on employers' reports of skill shortages.

A list of potential skill surplus occupations has also been developed using the multi-dimensional (cluster) analysis, but it is less clear how to identify policy priorities in relation to these. Other evidence shows that skill surpluses (especially in the form of over-qualification) can have a number of negative consequences for individual. It also represents, potentially, an under-used resource by employers.

The development of a systematic approach, as presented here, can take the assessment of mismatched further than hitherto has the added advantage of providing a more systematic, data-driven analysis than previous approaches. The approach shown here can help overcome some of the biases encountered in single indicators of skill mismatch and can identify those areas where skill shortages or surpluses are most likely to occur. The approach does not provide a means of prioritising mismatch occupations for policy intervention – this would require use of other criteria to rank those occupations. Such criteria could be based on scale of employment, or their concentration in high value sectors, etc. If one considers the

employment levels by occupation and the number of SSVs relative to employment then an indication of the importance of shortages is provided. In total, the 4-digit occupations listed as potential skill shortage occupations account for employment of nearly 2.6 million, about 47,000 vacancies of which around 25,600 are reported as hard-to-fill and around 23,500 as skill shortage vacancies. The total number of vacancies here can be taken as an upper bound on the number of jobs that could potentially be filled if the match between the supply of and demand for skills was improved. The 23,500 skill shortage vacancies would indicate a lower bound on the increase in filled jobs that could arise.

4. The Causes and Consequences of Skill Mismatches from the Employers' Perspective

Key findings

This chapter provides further views on the nature of recruitment problems and skills mismatches facing employers. It draws on a number of research studies as well as evidence collected from 20 employer case studies.

The principal findings indicate that where employers face difficulties recruiting from the external labour market they are:

- often reluctant to tackle the problem through provision of training to employees (for example, by recruiting someone with a different set of skills than those in the job specification and training them to meet that specification);
- similarly there is not much evidence of employers changing their work structures to accommodate the supply of skills from the external training market;
- instead employers often muddle-through or find a range of work-around that solve the shortage over the short-term.

Overall, employers are unwilling to move far from their job specification and would prefer not to recruit if they consider that applicants' skills and attributes are not a close enough fit with those in the job specification.

The fact that employers are willing to forego recruitment and are not prepared to provide additional training in the face of reported skill shortages suggests that in these instances the reported shortage may not be of critical importance to the employer. In other words, the impact of the shortage on their organisational performance is not sufficient to warrant substantial investments in training.

4.1 Introduction

The scale of skill mismatches, as revealed in the previous chapters, appears to be relatively modest. This is especially true with respect to skill shortages. In looking further at the extent, causes, and implications of skill mismatches there is a need to consider:

1. the importance of mismatches with respect to whether they adversely affect organisational performance; and
2. if organisational performance is adversely affected, whether this warrants public intervention of some kind.

The evidence provided in this chapter draws upon evidence from previous studies that shed light on how skill mismatches arise in the workplace, the impact they have on organisational performance, and the way in which employers respond in the face of mismatches. This is supplemented by a series of employer case studies,

conducted as part of the current study, that look in more detail at how mismatches arise in the workplace and the manifold ways in which employers react to them.

Given that just 20 employer case studies were undertaken the data they provide ought to be regarded as indicative. But by combining these data with the results from other studies, a more robust assessment of the causes, implications, and responses to skill mismatches in the workplace is provided.

The remainder of this chapter is structured as follows. Firstly, a description of the employer case studies and the rationale which guided their selection is provided. The overarching framework for considering the case study evidence and that from other studies is then presented. The narrative then considers, in turn, how skill mismatches arise in the workplace, their impact, and how employers respond to them. As will become apparent much of the evidence relates to skill shortages rather than surpluses. Accordingly surpluses are considered separately. The chapter concludes by considering whether the evidence points to mismatches being a phenomenon of substantive importance and the extent to which an intervention of some kind may be required.

4.2 The employer case studies

The employer case studies involved interviews with employers from:

- 1 industrial sectors where there is evidence of relatively strong skill demand at levels 3 and above in the Qualifications Credit Framework (QCF); and
- 2 those that had reported experiencing either skill shortages or skill surpluses in the Employers Skills Survey 2013.⁶⁰

The focus of the employer case studies – especially in relation to skill shortages – was on occupations that require a relatively high degree of skill in order to gain entry to them. Engineering, information technology (IT), and construction were selected because many of the jobs in those sectors require their incumbents to be qualified at QCF Level 3 and above. By selecting employers that had experienced skills mismatches in the past – either skill shortages or being faced with employing people whose skills are higher than those required of the role – there was a guarantee that employers had recent experience of mismatches that could form the focus of the discussion with them. The semi-structured interview schedule used to guide the discussion with employers is provided in Annex A.

⁶⁰ The Employers Skills Survey 2013 (ESS2013) asks employers: (a) whether they have skills shortages (i.e. vacancies that are difficult to fill because of a shortage of applicants with the skills, experience, or qualifications required); and (b) and whether they employed people whose skills are higher than those required in the job. Only employers in ESS2013 that that agreed to participate in further studies were included in the study.

Details of the employers that participated in the study are provided in Table 4.1. As can be seen there was a mix of employers facing shortages and surpluses, sometimes both simultaneously, in relation to skilled trades, associate professional, and professional occupations. The employers interviewed faced differing external labour market conditions: from relatively rapid growth in London and the South East, to more modest levels of growth in the Midlands.

Table 4.1 Employers participating in the study

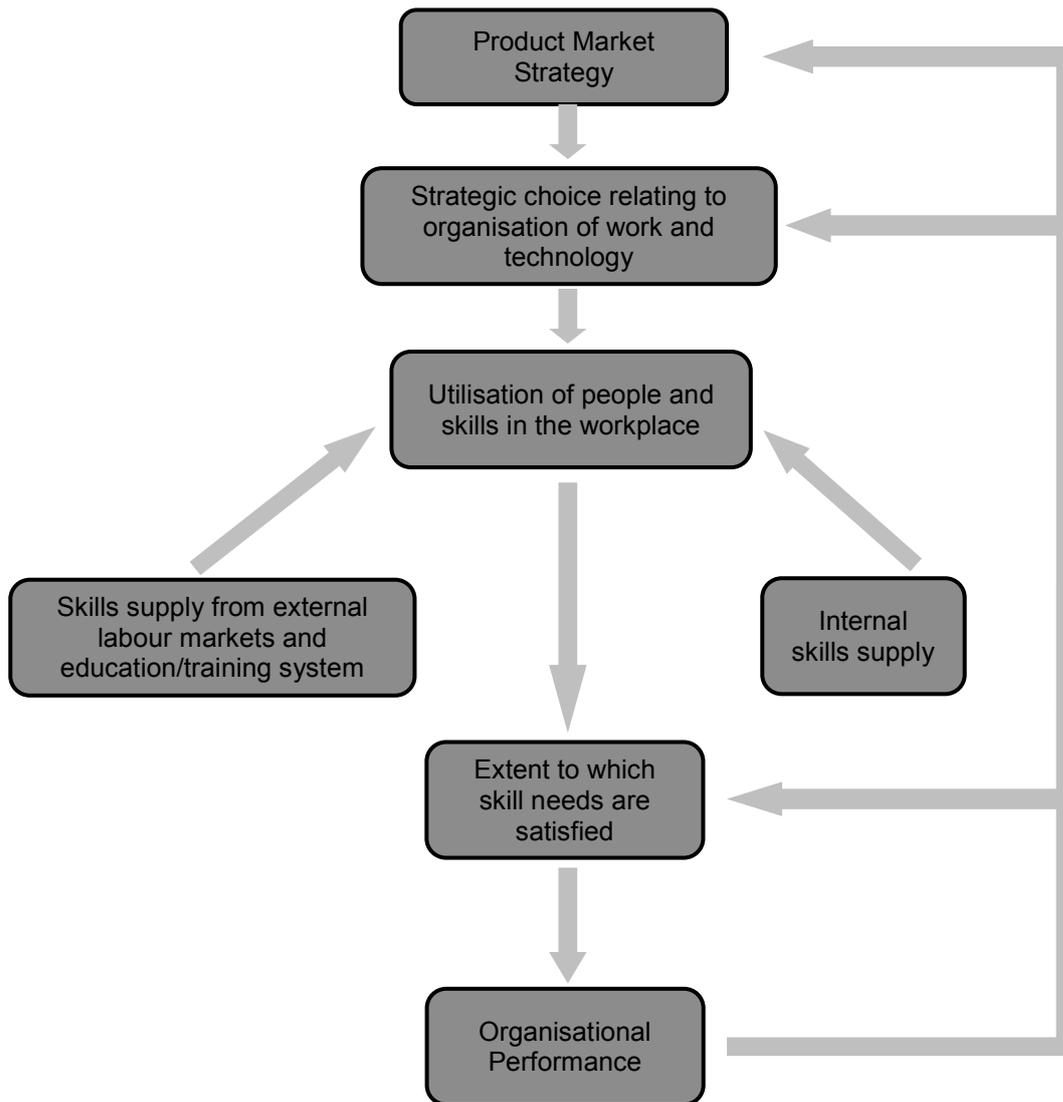
Employer	Sector	Number of employees	Occupational focus of skill shortages	Occupational focus of skill surpluses
No.1	Construction	140	Supervisors	
No.2	Construction	28	High voltage cable jointers	
No.3	Construction	250	Senior project managers, Contract managers, Quantity surveyors	
No.4	Construction	2,000 nationally (250 at establishment)	Estimators	
No.5	Construction	63	Water-proofers	
No.6	Engineering	235	Production engineers	
No.7	Engineering	68	Production engineers	
No.8	Engineering	220	Maintenance and facilities managers. Quality control managers	Quality control managers
No.9	Engineering	44	Technical sales / architectural technicians	
No.10	Engineering	47	Purchasing managers	
No.11	Engineering	250	Electrical engineers (graduate entry and apprenticeships at Level 3)	
No.12	Engineering	50		Boat builders
No.13	Engineering	45	Gas engineers	Administration
No.14	Engineering	650	Gas engineers	Engineers (craft)
No.15	IT	7,000 in total (450 at establishment)	Software engineers (trainees and experienced staff)	
No.16	IT	50	Technicians (experienced) and cable jointers (trainees)	*
No.17	IT	17,000 in total (2000 in establishment)	Software support employees	
No.18	IT	25	Software engineers, finance and communication specialists	
No.19	IT	80	Programmers	
No.20	IT	150		Programmers

Source: BIS Skill Mismatches Study (IER/IFF)

4.3 A conceptual framework for understanding the causes and consequences of skill mismatches

In trying to understand why mismatches within the workplace occur it is perhaps worthwhile first addressing how employers determine their own skill demands. This has been schematically mapped out in Figure 4.1.

Figure 4.1 Schematic Outline of Employer Demand



Employer demand for skills is driven by product market strategies, but employers also have a degree of strategic choice in how they organise technology and work in fulfilling their product market strategies and, thereby, the configuration of skills in

their workplace. Where employers have relatively low value-added product market strategies this tends to give rise to relatively low skill demands and commensurately low terms and condition of employment in the workplace. This tends to give rise to a workplace environment that often results in relatively high levels of labour turnover⁶¹. The relatively low value attached to employment retention in the workplace results in high quit rates and, when the economy is in a period of growth, the same employer reports of vacancies being difficult to fill.

On the other hand, the capacity of both internal and external skills supply to keep pace with product market change can be challenging where employers have relatively high value, dynamic product market strategies.⁶² Hence research has tended to reveal a U-shaped relationship between product market strategy and recruitment problems.⁶³ Both low and high value product market strategies tend to be associated with a relatively high incidence of skill shortage though the origins of these shortages differ.

If product market strategies give rise to specific skill needs within the workplace, there is a need to understand why those skill needs are not being fulfilled such that employers report skills shortages or gaps of one kind or another. This requires some consideration of the way in which work is organised in the workplace and the role of internal and external skills supply (e.g. through training programmes such as Apprenticeships) in ensuring that the skill needs are met. This is likely to reveal much about the way in which skill needs in the workplace are determined and the processes that employers have in place to ensure that their skill needs are satisfied.

Understanding why skill mismatches occur within the workplace can be addressed by looking at the specific skills employers seek. Jobs may be considered as comprising bundles of skills. The way in which employers seek to bundle skills together and utilise them in the workplace, will provide them with, other things being equal, their competitive advantage. How those skills are obtained is clearly of importance in the context of skill mismatches. Are they produced through employer investment in initial and continuing vocational education and training, or is the employer looking to find those skills in reasonably plentiful supply in the external labour market? And how are these skills retained? Depending upon the value the employer attaches to bundles of skills – or the cost of replacing those skills should an employee leave their employment – one would expect to see, to a greater or lesser extent, processes to be in place to retain skills.

Case study evidence suggests that where employers train their own employees – via both initial and continuing vocational education and training - there is a mutually reinforcing relationship between investment in skills by the employer, relatively high

⁶¹ Wilson, R.A. and Hogarth, T. (2003). *Tackling the Low Skills Equilibrium: A Review of Issues and Some New Evidence.*, London: Department for Trade and Industry, London: Department for Trade and Industry

⁶² Davis, C., Buckley, T., Hogarth, T., and Shackleton. (2002) *Employers Skills Survey: Case Study - Engineering.* London: National Skills Task Force / Department for Education and Employment SKT 33

⁶³ Bosworth, D.L., Davies, R, and Wilson, R.A. (2002) *Employers Skill Survey: Econometric Analysis.* Department for Education and Skills / National Skills Task Force

levels of job satisfaction in the workforce, increased worker productivity, and increased levels of skill retention in the workplace.⁶⁴ Employers, however, want to be assured, to some degree, that the returns to any investment they make in skills to offset the risk of future skill shortages, will be appropriated by them.

Lazear suggests that most jobs comprise unique bundles of general, transferable skills.⁶⁵ It is the way in which employers bundle the skills together that makes them unique (and valuable) to the employer such that the value of skilled employees is greater to the current company rather than one looking to recruit someone. In this way, the employer is able to retain and recoup the cost of that training by paying a wage that is below the employee's marginal product.⁶⁶ At face value, this would suggest that the employer needs to make an investment in skills at least up to the point that allows the unique bundles of skills to materialise. It is notable that in relation to the Apprenticeship system in England that employers investing in this form of training often report that it allows them to tailor the skills and attitudes towards work of their apprentices so that they are consistent with the values of the organisation.⁶⁷ In other words, it gives some discretion in putting together bundles of skills that meet their specific needs and, in so doing, help offset the potential risk that their apprentices, once trained, being recruited by other firms.

The discussion about skill bundles suggests that the way in which employers define a job may be highly specific and contain elements that are designed to ensure a good fit between recruit and employer. In other words, whilst it may not be possible to find someone in the external labour market in possession of all the unique features the recruiting employer may ideally want, some indication is required that any would-be recruit will be able to quickly develop the unique bundle of skills on which the employer is dependent. Evidence of the skill demands of employers being highly specific, or even idiosyncratic, is found in a study of the ICT industry that observed that employers were often looking for hybrid skills, including

1. a mix of technical (specific programming abilities) and generic skills (such as leadership, management, etc.); and,
2. combinations of technical skills of different vintages.

It was not sufficient for would-be recruits to be proficient only in the technical aspects of the job, they needed to have a range of soft skills that would allow them to manage projects and, importantly, fit into the business. There was also a demand

⁶⁴ Bosworth, D.L., Giernalczyk, H., Hogarth, T. and Vogler-Ludwig, K (2011). *The anatomy of the wider benefits of VET in the workplace*. Cedefop Research Report No.12. Luxembourg: Publications Office of the European Union

⁶⁵ Lazear, E.P. (2004). *Firm-specific human capital: A skill-weights approach*. NBER Working Paper 9679.

⁶⁶ Geel, R., More, J. and Backes-Gellner, U. (2008). *Specificity of Occupational Training and Occupational Mobility: An Empirical Study Based on Lazear's Skill-Weights Approach*. Leading House Working Paper 38

⁶⁷ Gambin, L., Hasluck, C. and Hogarth, T. (2010) 'Recouping the costs of apprenticeship training : employer case study evidence from England', *Empirical Research in Vocational Education and Training*, 2(2), 127 - 146

for technical skills of different vintages because computer programmes tended to reflect the language that was in vogue when the software was developed.

4.4 Vacancies and recruitment

Evidence from the employer case studies indicated that a vacancy for a specific job arose in three ways:

1. as a direct replacement of an employee who had left the business;
2. recruitment of an employee into an existing job role, where additional people were being recruited, within a stable work organisation;
3. recruitment into new roles created as a consequence of either organisational or technical change within the workplace.

Across all three types of approach, outlined above, the decision to recruit was usually taken within the department or division of the organisation where a need had been determined and this then had to be agreed with a senior manager – either the Managing Director in smaller companies or the person with overall responsibility for the part of the business where the vacancy had arisen in larger organisations. In general, where the vacancy was for a replacement or for a person to fill an existing job role there was a tendency for employers to use existing job specifications for recruitment purposes. That said some employers had modified job specifications where vacancies had proved hard-to-fill or were attracting applicants not suited to the job on offer (see box).

Employer No. 8:

Manufacturer of display units

The company employed 220 people – slightly below a peak of 240 two years earlier - many of whom were employed in engineering roles. It produced goods for the UK and export markets. The company had a vacancy for a maintenance engineer. The job was described as being concerned with maintaining the range of machinery used on the shopfloor but also included a number of other activities – the facilities aspect – that involved tasks related to such areas as drainage, plumbing, electrics and so on, so beyond standard maintenance role. When the job was first advertised the company thought that a standard job specification relating to a maintenance engineer would be sufficient, but quickly realised they would need to add facilities to the job title as no-one applying had that facilities experience. It still struggled to find applicants but was eventually able to recruit the single applicant who possessed the range of skills they were looking for.

Source: BIS Skill Mismatches Study (IER/IFF)

At Employer No.17, a large multinational IT company, the Human Resources (HR) Manager pointed out that departmental managers need to be realistic in developing their job specifications. Typically a departmental manager will want to recruit the ideal candidate, someone who ticks all the boxes, whereas the role of the HR department is to whittle down the skills, experiences and attributes required to identify the essential ones. The HR manager described it as “...a case of working

with them [the departmental managers] to work out where the compromise can be or be more creative around it.”

Where recruitment was being undertaken in an environment of organisational or technical change much greater consideration was given to determining the job specification. It also introduced a degree of uncertainty into designing the job specification since employers were, to some extent, entering uncharted territory. Employer No.11, a construction company, had been through a major organisational restructuring that had resulted in some people being made redundant and a need to recruit people to fill new roles for which the firm had struggled to find suitable applicants. This resulted from growth of the company and the need for people to fill more specialised, narrower roles than hitherto. This was a new development for the company and they had struggled to find someone who fitted the new specialised roles.

All companies tended to use a variety of means to recruit people typically including a mix of the following:

- advertising the vacancy internally (in the larger organisations);
- advertising in the press;
- recruitment agencies;
- using job bulletin boards;
- social media;
- professional networks / word-of-mouth.

There was a tendency to resort to agencies and increased use of word-of-mouth the longer the vacancy remained unfilled. In some instances, employers anticipated difficulties attracting applicants as soon as the vacancy was announced and, accordingly, tended to use a wider variety of recruitment mechanisms from the start of the recruitment process. There was reluctance, in some instances, to use recruitment agencies because of the expense and because they were not always able to deliver the candidate required. Other organisations, however, had effectively outsourced the initial part of the recruitment process to agencies.

Applicants in most instances were required to complete an application form – or a CV in a few instances – and then undertake an interview and, in some cases, a second interview. In at least one case the process was described as relatively informal, as indicated by one IT employer: “It's a bit ad hoc, receiving applications via email and we just send an email back and arrange an interview. It's not a strict process but it works, and varies depending on the candidate” (Employer No.18). In the larger establishments, especially where they were looking to recruit a relatively large number of people or recruit trainees, the process tended to be more formal including the use of an initial sifting processes and online assessments. The use of competency-based interviewing was mentioned by some engineering employers.

This was considered useful as it was good test to see if people really knew what they were talking about.

Employers said that many applicants fell by the wayside at the earliest stage of the recruitment process. Some of this was due to issues to do with spelling and grammar, but in other cases it was due to failing the competency tests or assessments. One company, in relation to the assessment test that it used for its graduate traineeship programme, commented that: “One thing I find quite disappointing is a third of the people who take the tests fail them. Honestly I don’t know how anyone fails it.” Other companies pointed out that candidates often do not demonstrate sufficient attention to detail in the assessment / competency tests.

The entire recruitment process, especially when looking to recruit experienced workers, was designed to obtain a good fit between employer and would-be employee. The interview was designed to tease this information out of the applicant. If there was not a good fit between the skills, both technical and generic, held by the applicant and those sought by the company, then they would be willing to forego recruitment in some instances. The example of Employer No.6 is illustrative of this point (see box).

**Employer No. 6:
Manufacturer of superconductors**

The company is a medium sized engineering company making superconducting magnets. It described its market as being buoyant and was looking to recruit production engineers educated to BEng or MEng levels. The respondent commented that it is best to wait to get the right candidate rather than appointing someone they were not sure about: “We realised that it was a false economy and sometimes taking the pain in the shorter term to actually get the right person for the longer term is better. These jobs [production engineers] have been vacant for three or four months. In real terms that’s not an awful long time not with a full recruitment process and quite a number of them are at second interview.... I suppose it’s toughening the managers up to say no, we need these technical things, you tell me that’s what you need so let’s go and find them....It’s not a question of keep playing the numbers game as such, it’s a question of getting quality not quantity. As I’ve said, we’ve had a lot of applicants. I mean there are no shortages of engineers out there but they’re not quite what we’re looking for. It’s the quality we’re after and that’s what has been difficult to find, but hopefully now we’ve found a way of doing it.”

Source: BIS Skill Mismatches Study (IER/IFF)

The above reveals that employers were exacting both in their determination to find some with more or less the whole set of skills and attributed they wanted, and also in the process through which they put applicants to ensure that they possessed the qualities they were looking for. Consequently many employers faced problems in recruiting people. The next section considers in more detail why skill shortages arise.

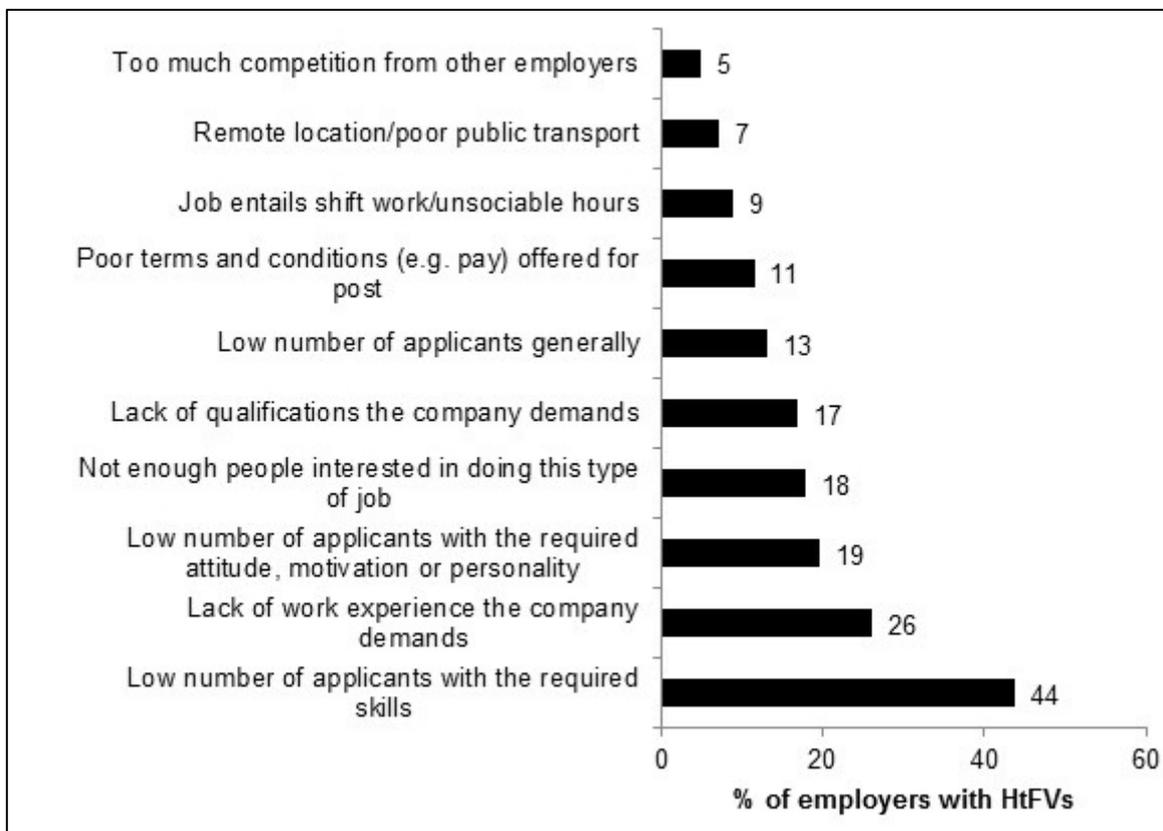
4.5 The causes of skill mismatches

The Employers Skills Survey 2013 provides a representative picture of the causes of hard-to-fill vacancies (HtFVs) in England. As noted earlier in the report, the survey revealed that that 5 per cent of employers in England reported HtFV, and that there

were 160,000 such vacancies accounting for around 1 per cent of all employment. The main cause of HtFVs is a lack of applicants with the skills the employer sought (Figure 4.2).

It is not just recruitment problems that are of interest. There is also a need to consider internal skill gaps – i.e. the extent to which an employer’s existing workforce is fully proficient. In relation to skill gaps, there was an estimated 1.16 million people who were not fully proficient in their existing job in 2013 (equivalent to around 5 per cent of all in employment). If one looks at the causes of skill gaps they appear to be transitional: they arose because employees were new to their job (62 per cent of all skill gaps) or had not yet completed their training (58 per cent). The evidence would appear then to suggest that skill gaps occurred mainly in relation to people being new to their job where they had not completed induction or other training that would allow them to carry it out proficiently.

Figure 4.2 Causes of hard-to-fill vacancies reported by employers (% of employers)



Source: Employers Skills Survey 2013
 Base: All establishments with HtFVs in England

The employer case studies provide a more nuanced understanding of how skill shortages arise. The employers experienced a number of different types of recruitment problem where there was a mismatch between applicants’ skills and those required by the employer. It is possible to discern several, though not mutually exclusive, types of recruitment problem:

1. relatively strong economic growth meant many more employers were trying to recruit from a pool of skills that has not grown commensurately;
2. a relatively disadvantageous location;
3. a particularly narrow job specification with respect to the technical skills sought such that there was little supply in the external labour market;
4. relatively rapid technical change resulting in sometimes relatively cutting edge skills being sought;
5. the external training system being unable to meet the employer's skill needs combined with the limited capacity of internal training systems to develop the skills required;
6. a demand for skills of a certain vintage where supply in the external labour market has been in long-term decline;
7. an inability to provide terms and conditions of employment that will reduce labour turnover or attract new employees.
8. a need to fully satisfy the job specification (c.f. the requirement to obtain a good fit between employer and would-be employee).

Economic growth and skills demand

Employers sometimes pointed to strong local competition for the skills they wanted. Many of the employers interviewed reported that they were beginning to emerge from the economic doldrums following the 2007/8 financial crisis with output and employment increasing. But other employers involved in similar lines of work were also experiencing growth and were chasing the same types of skill set. Employer No.15, a large IT company, exemplifies this point (see box).

Employer No. 15:

Provision of software services to investment banking sector

The company pointed out how a recovering financial services sector could afford to pay relatively high salaries for software engineers, and with the development of initiatives such as Silicon Roundabout, the demand for software engineers was increasing without necessarily a commensurate increase in the supply of the skills required. Often new business start-ups, where there was the possibility of acquiring a share in the company, drew skills to these companies. The company was facing a problem of increasing internal demand as well as increasing demand for the same skills from many companies working in the same sector.

Source: BIS Skill Mismatches Study (IER/IFF)

Disadvantageous location

The situation was perhaps more marked at an organisation such as Employer No.15 given its London location. Location could be a problem in other local labour markets, too. Employer No.17, a large multinational IT employer based in the South East thought its location, on the outskirts of a major urban centre, affected its capacity to recruit people in general and in particular to jobs such as order processing. It noted

that: “in terms of skills, for those roles, it’s not so much a shortage of skills, it’s attracting them to this location and competing with Reading and Slough which have much better public transport.”

Narrow, highly specialised job descriptions

Further of where the highly specialised role that needed to be filled leading to shortages is exemplified by the construction company below (see box).

Employer No. 4:

Construction employed involved in project management of offices and houses

The company offered both Apprenticeships and graduate traineeships. As such it had been able to ensure it has a pipeline in place to meet its skills needs. Where it has struggled to recruit and retain employees was in the role of estimators. The job of the estimator is to estimate the time and cost attached to undertaking various processes on a construction project and how much contingency to allow for, centrally important to costing potential projects.

It is a job which typically requires a combination of technical skills and experience. Typically estimators will be experienced project managers who moved sideways into the job, or be quantity surveyors. The recruitment problem was twofold: (i) there were no courses for estimators; and (ii) the number required by the industry overall is small. It is not necessarily a dead-end career option as there is progression to principal estimator level, but it is not always easy to persuade people to take the job. And because volumes are low, colleges / training providers were unwilling to provide a course. The company had created two trainee estimator roles which is a new development and they are waiting to see how this works out.

Source: BIS Skill Mismatches Study (IER/IFF)

Skills supply not keeping pace with technical change

The type of job described above – estimator – is a traditional one in construction project management. Highly specialised roles also emerged as a consequence of technical change which created demands for new skill sets. This was relatively common in the IT sector where technology develops rapidly. Accordingly, employers were often looking for people with a wide range of skills including the latest technologies and this is not always readily available in the external market. This was also true of the engineering sector.

Employer No. 6:

Manufacturer of superconductors

The job specification for engineers has changed with more of a focus on the technical aspects of the production process and product. This has meant that engineers need to be more competent than hitherto in their understanding of physics, engineering principles, and manufacturing principles. The company has been able to attract people with *good engineering skills but they did not quite meet the requirement. The respondent commented: “A lot of our product is driven out of physics, and if they don’t have an appreciation of even basic physics then they don’t quite see how it works. We have incredibly intelligent, highly experienced managers here who can spot a problem from ninety yards. Also they have the ability to see the big picture and the minutiae at the same time. They expect that from their staff and they’re becoming more and more demanding as a result. So what we’re looking for is obviously more and more technically demanding.”*

Source: BIS Skill Mismatches Study (IER/IFF)

Small-scale skills demand

Employers also recognised that sometimes they were trying to recruit into relatively esoteric jobs (see box above for Employer No.4). Typically due to business growth, or the need to replace staff who had left, there was an immediate need to fill jobs such as estimators, employees with experience of working with 11kV cabling, or gas engineers with knowledge of several vintages of technology, etc. These were jobs where demand was relatively small, and in some cases an ageing workforce had resulted in the pool from which people could be recruited, becoming even smaller. In general, demand across industry for these skills was falling but supply was falling faster. Moreover the volume of jobs involved was relatively small so there was not much incentive for the external training system to run courses to train people to fill these jobs. The costs of the company training these people themselves was seen as relatively high but they were increasingly being pushed down this route because of the lack of an alternative. That said, where there were shortages in the external labour market this could act as a disincentive to employers to invest in the skills of existing employees or those who might be recruited, unless they could find a means of assuring themselves that any employees they trained would subsequently remain with the company.

Skill supply falling faster than demand

Employers sometimes had a demand for skills whose supply was in long-term decline in the external training market. Two employers, for instance, reported that they had a relatively high demand for gas engineers who were familiar with technologies of different vintages. In the past they had relied upon ex-British Gas apprentices to satisfy their demand for gas engineers but this source of supply had all but dried up and so needed to look further afield to obtain the skills they wanted. The example of Employer No.13 is illustrative of this situation (see box).

Employer No. 13:

Manufacturer of Industrial Gas Ovens

The company produced industrial gas burners / ovens, mainly at the quality, bespoke end of the market. It employed 45 people mainly in manufacturing and servicing its products. There was not much competition in the market as it is made up of a few small players that produce bespoke products and large US companies that provided off-the-shelf solutions.

It had found it relatively easy to staff its manufacturing plant. It has tended to retain staff and had an Apprenticeship programme that ensured that future skill needs will be met. Where the company had struggled to recruit staff was in service engineering. This required a specific set of skills: being up to date in gas technologies but also familiar with past vintages of gas burners. In the past the company had relied upon recruiting British Gas trained engineers. But because British Gas no longer trained as many people as they had in the past, this pool of recruits had all but dried up. Over the longer-term it may be possible to train its own gas service engineers via Apprenticeships but for the time being it was proving difficult to satisfy demand. This had caused problems for the company. It had not lost business, but it caused delays in meeting servicing requirements – a potential growth area for the business.

Source: BIS Skill Mismatches Study (IER/IFF)

The problem faced by the organisation above – and others – was that their demand for skills was relatively small scale such that there was limited training supply in the

external training market, and the organisation did not have the resources to develop the skills in house (though they were beginning to look at Apprenticeships).

Skill retention difficulties

Difficulties attracting and retaining staff was a problem for some employers. Employers Nos.13 and 14, both engineering companies with a demand for gas engineers, pointed to the dominance of a local multinational engineering employer. Both companies were fishing in a pool with dwindling stocks of skills, but pointed to the capacity of the local dominant employer, through its capacity to offer higher wages and fringe benefits, to soak up much of the available talent. Both employers commented that if they were to remunerate their employees at the same rate then this would damage their profit margins and, in the case of one of these employers, the pressures it was facing in meeting its pension obligations meant that competing for staff solely on the basis of wages was out of the question. This generally made it more difficult for both these employers to recruit the calibre of skilled labour they required.

Employer No.5, a construction company, acknowledged that its pay rates had fallen behind its competitors over recent years and consequently had struggled to both retain employees and recruit new ones as the market for its services, and those of other local construction companies, had picked up over the past two years. It was reviewing its pay and reward schemes.

The critical requirement to achieve a good fit between recruit and the employer

As noted above employers were often looking for a good fit between the applicant and the job description. They were in some instances willing to recruit someone at a lower level of competence and train them up, but more often than not they were looking for someone who was a close fit with the job specification. Having developed the job specification, companies were sometimes unwilling to move too far away from it in making an appointment.

Good fit usually meant that the applicant possessed:

- the technical skills required, often in combination with a range of soft skills related to project management, communication, etc. Competence based interviews were seen as important in applicants being able to demonstrate that they possessed the skills the employer wanted;
- skills at the appropriate level. There was a reluctance to take on, for instance, people with degree where the employer was typically looking for someone who needed to have completed an Apprenticeship;
- a CV that suggested that would be likely to fit in with the company, such as not having moved between employers too often.

Several of the establishments that participated as case studies said they needed people with the specific technical skills to undertake the job, but there were a wider set of generic or soft skills that needed to accompany those technical skills. Table 4.2 gives an indication of the types of generic skills some employers sought.

Table 4.2 Soft skill sets that needed to accompany technical skills

Employer	Sector	Skills sought
No.1	Construction	Job involves supervising a team of engineers. Inter-personal skill set essential. Also need good communication skills from a customer / management point of view and including written and verbal communication skills. Employer was also looking for problem solving skills and wanted someone who was self-motivated and eager to learn.
No.6	Engineering	Graduate electrical and electronic engineers. Need ability to manage projects. <i>"They have to be able to direct teams, which is very difficult to get people "green" out of universities to do. We're finding a little more success with these very recently qualified graduates."</i>
No.14	Engineering	The skills needs are related to gas engineering. In the future they will need more electrical skills as well because they are moving into the production of dual fuel models and this will raise skill demands. The company recognises that this will mean that it needs to undertake training to meet its needs. There is also a need for people to have good team working and general social skills - it is a relatively small team so people need to be able to get on. In the past the company has taken on people who possess just the technical skills required but this has tended not to work out and the people have left the business quite quickly because they had not fitted in with the workplace culture.
No.15	IT	There are "a lot of boxes to tick" as have to be highly analytical, good communication skills, highly organised, reliable, as well as having an interest in the finance sector, and having good customer service skills. Looking for "introverted extroverts" who are expected to deal with clients straight away.
No.16	IT	Need someone to look after / build website / online presence / social media etc. by gathering information from the whole company and publishing that on digital media - e.g. via a blog, articles on the website, linked to Twitter and Facebook. And someone who understands the markets and products, The company is in a broad line of work, and because of that it needs to have to be the type of person that can keep themselves busy, be given a brief and get on with it. <i>"That's why,"</i> the company said, <i>"it's a hard role to fill."</i>
No.17	IT	Software engineer. The skills / experience needed includes technical skills (e.g. database / development skills / java or other computing languages), having worked in a similar environment, and a capacity to empathise with the client and understanding their challenges. Also looking for people with a language capability (e.g. French / German).

Source: BIS Skill Mismatches Study (IER/IFF)

Nearly all employers wanted applicants who possessed both technical skills and the generic skills that would allow them to put those technical skills to efficient and productive use. The example of Employer No.15 (in panel on next page), a large multi-national IT company, illustrates this point.

Employer No. 15:

Provision of software services to investment banking sector

The company employed 7,000 people around the world, 750 at its UK headquarters. It had vacancies for IT consultants and software engineers. For both jobs it required applicants to possess a range of technical and generic skills. Too often applicants for the IT consultant jobs possessed the technical skills but lacked the generic skills that would make them productive for the company. In particular, it felt that too many applicants were lacking in commercial skills / business acumen, and had not sufficiently developed their CVs such that the employer was convinced that they would feel comfortable and confident in a commercial environment.

Similarly in relation to the specification for software engineers it wanted people who were highly analytical with well-developed communication and customer service skills, and who were highly organised and reliable, as well as having an interest in the finance sector. The software engineers were expected to deal with clients straight away, so it was essential that they had the commercial skills in combination with the technical ones. The employer pointed out that a *“software engineer will look at finding the right solution to a problem; a programmer will purely deliver the solution that someone else has come up with.”* The latter type of job can be easily placed offshore whereas the software engineer was what was required in the UK.

The employer also noted that it expected those who were taken on to its graduate trainee programme to be able to demonstrate well developed soft skills that would show that they could fit into the team and work with clients.

Source: BIS Skill Mismatches Study (IER/IFF)

It was also apparent that employers wanted skills at the appropriate level in many instances. The general view was that people who were over-qualified for the job would be likely to leave the company if an alternative job appropriate to their skills arose, which could be costly to the company if they have invested in their training and development. But there were a wider set of issues too. Employer No.8, for instance, an engineering company, said that it did not usually take on people who were too qualified because as well as the risk of them leaving quite soon after being appointed, there were also issues related to their management: they tend to question instructions more often making management harder; and they will often be less happy in their role which affects how they fit into the team and ultimately the morale of the team as whole. Where people were over-qualified for the jobs they were applying for they sometimes did so from having had more senior jobs in other sectors, so it was not always the seniority that was a problem but a lack of experience of the sector to which they were applying for a job.

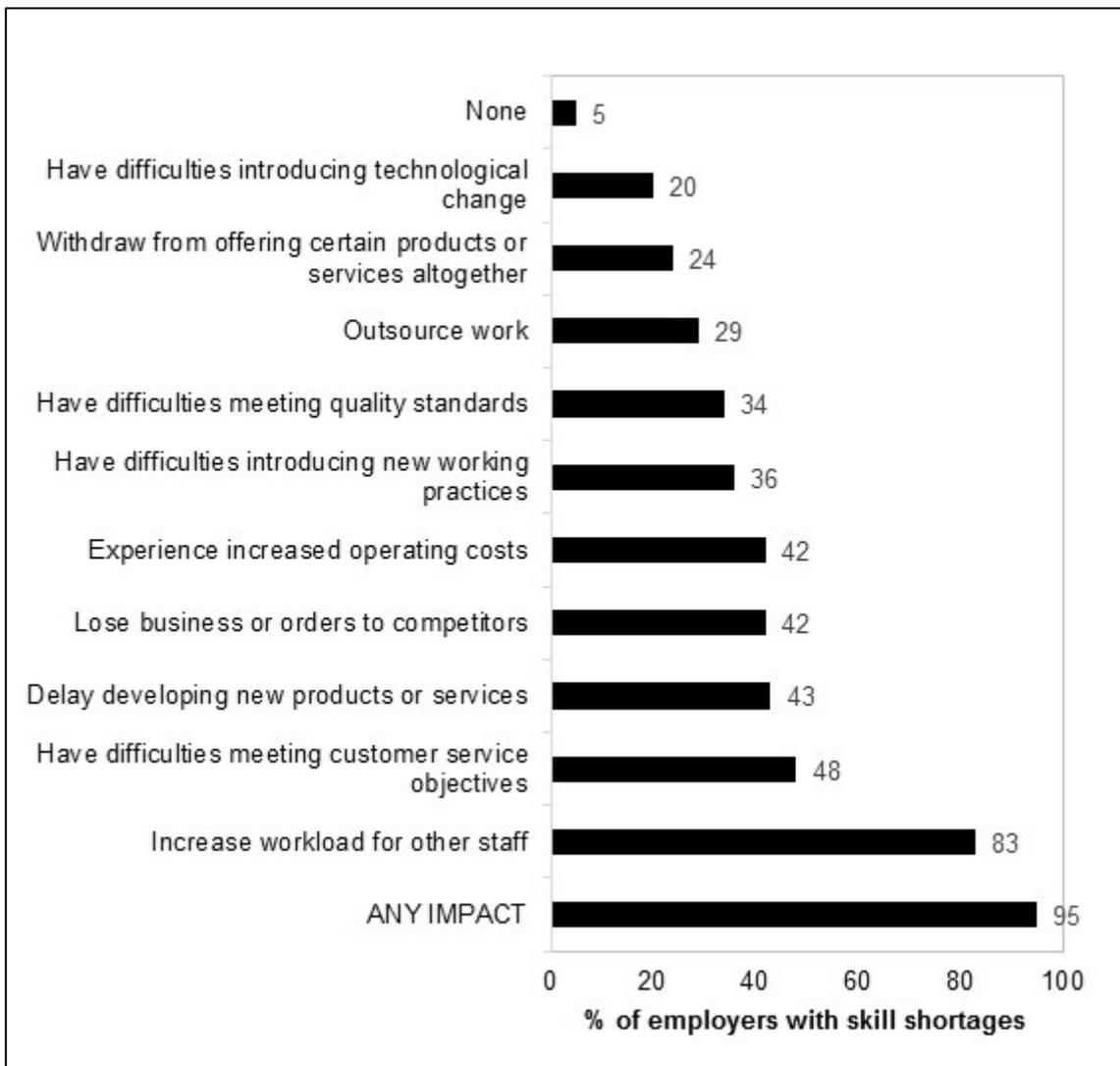
As noted above, employers also wanted some evidence that if the applicant was appointed that they would fit in and stay with the company. They were therefore looking for evidence in application forms and CVs – such as the average length of job tenure – that the applicant would want to stay and develop their careers with the company. As will be outlined below, one of the principal responses to offsetting recruitment problems was that of improving employment retention.

4.6 The impact of skill mismatches in the workplace

Where employers reported skill shortages nearly all of them indicated that it has some impact on their organisation (see Figure 4.3). By far the most commonly reported impact was that of increasing the workload of existing staff (reported by 83

per cent of employers with skill shortages) which, presumably, has implications for staff retention. Substantial proportions of employers with skill shortages also reported lost business (42 per cent), though the value of this lost business is not known. The other main impacts included: increased operating costs (26 per cent); issues with quality of products/services (26 per cent); difficulties introducing new working practices (25 per cent); loss of business to competitors (21 per cent); delays in production/processes (17 per cent); and the need to outsource (10 per cent). At face value, these would all appear to represent substantial impacts on business performance.

Figure 4.3 Impacts of Skill Shortages on Organisational Performance



Source: Employers Skills Survey 2013

Base: All Establishments with skill shortages in England

Drawing on the evidence obtained from the employer case studies two broad types of impact were observed:

1. those that had found work-arounds that to some extent offset the impact of shortages. This included:
 - a. increased workloads on existing employees, including paying overtime;
 - b. using ex-employees, sometimes retired ones or those who were self-employed;
 - c. outsourcing work to other companies;
2. those where the impact on organisational performance was more profound and resulted in:
 - a. work being transferred elsewhere; or
 - b. work not being taken on.

In general, where employers reported impacts on their business this was frequently expressed as the assumed or potential impact upon their businesses. Often they had found ways around the problem of lacking a person in given job. Though they found the arrangements they had in place less than satisfactory, they felt that they had avoided some of the more abject consequences of having skills shortages, such as lost business.

Where skill mismatches were an inconvenience the impression was that the difficulties employers experienced obtaining the skills they needed were longstanding ones and, accordingly, had developed a range of 'work-arounds' that minimised the impact on organisational performance. The types of business impacts that employers reported included:

- delays in delivering products / services;
- a need to prioritise certain work of certain clients over others which posed customer service problems;
- requesting workers to take on additional work in order to meet production targets;
- increased the labour costs (where overtime was paid, the costs of outsourcing work, or paying a wage premium in looking to recruit from other companies).

Several employers said they had managed to find work-arounds that offset the potential impact of having skill shortages. The example of the Employer No.5, a construction company that specialised in waterproofing, represents the minimal impact of shortages. It had struggled to recruit and retain workers experienced in waterproofing. It described having shortages as a "headache". It had not lost business as a result of the shortages but it had to work hard to ensure that this was the case. It relied heavily upon staff to work overtime and it was, it said, fortunate that it employed a large number of young people who were willing to work overtime at weekends when their hourly rate doubled. It also caused some problems in relation to customer service and required the prioritising of jobs which meant that those clients' whose jobs were delayed needed to be carefully managed. The need to pay overtime was also affecting the company's profitability.

An engineering company that had difficulties recruiting gas service engineers – Employer No.13 that produced industrial gas burners / ovens - explained that it was able to offset the impact of recruitment problems by using a former employee to undertake work in one area of the country, and outsourcing work to another company to cover another area of the country. The company explained that this worked satisfactorily, but it would prefer to have its service staff directly employed. Moreover, it saw potential to increase the gas servicing side of its business but this was constrained by the shortage of gas service engineers. The other company that had a shortage of gas engineers – Employer No.14 - reported that it could draw upon former employees but regarded this very much as a stop-gap measure and was, consequently, looking for a longer-term solution to its shortages. Employer No.2, a construction company, had shortages of high voltage jointers which meant that the development of this side of the business was constrained and they had to concentrate on less profitable low- and mid-voltage work

Other employers reported that they too had found ways of working around skill shortages but were less sanguine about the impact on their business. The example of Employer No.16, a medium sized IT services company, is instructive here in that it demonstrates the way in which placing increased pressures on existing workers could have a wider set of impacts on the business.

Employer No. 16:

Medium sized IT company providing network infrastructure installation and servicing

The company employed 50 people. It currently had an unfilled vacancy for a digital media executive. The job was described as mid-level skilled one, not requiring someone educated to degree level. They were looking for someone who had some previous experience.

The respondent said that he personally was taking on extra work but not doing it as well as someone who was expert in the tasks. He is currently designing a new website - producing the photographs, taglines and text - but thought that this was something that would be undertaken better by a young person with an interest in website design. He also noted that he could only work so many hours a week which meant if he was doing x, he was not doing y. Consequently he felt that growth was being constrained: "I just know if I could get someone doing that role and assisting me, the company definitely would grow."

Source: BIS Skill Mismatches Study (IER/IFF)

Other employers were more direct in reporting the negative impacts on their businesses. Employer No.6, a medium sized general construction company, reported that there were limits to the amount of additional work that could be placed on existing employees, so there was a point at which work had to be turned down (see box).

Employer No. 3:

Medium sized general construction company

The company was looking to recruit experienced contract managers. It was currently experiencing a period of growth following a period of contraction in the post-2007 period. It thought that its recruitment problems were due, in part, to people exiting the construction industry during recessionary period and then not returning when the upturn commences.

The MD reported that they were currently just about coping, but this was at the expense of stopping taking on any new work and growing the business. This was because the MD knew that if it took on more work it could not fulfil its obligations. The MD said “I could win this company more contracts quite easily, but I'm not because we can't service them for the next eighteen months. The company is being held back, so the growth that we are all enjoying is stifled because I cannot resource it safely, effectively and efficiently to make that growth worth anything.”

The company had recruited someone in the past who fulfilled about 70 to 80 per cent of the job specification at the interview but this had not worked out well because there were key elements of the job they could not competently undertake. When they had offered the job to an ideally experienced candidate, he was offered substantially higher salary elsewhere that the company could not match.

Source: BIS Skill Mismatches Study (IER/IFF)

An engineering company also pointed to skill shortages holding back growth. Employer No.6, that produced superconductors and had shortages of production engineers, reported that it did not have the people to drive projects forward. Consequently projects fell behind timetable and customers did not receive the product when they wanted it. It felt strongly that an unhappy customer led to a potential loss of business or loss of repeat business. The employer said: “That’s the risk we face; I’m not saying it has happened but that’s what we’ve been risking”

Two of the multinational IT employers reported that they experienced shortages of various IT staff. One reported that the impact of skill shortages had been minimal because it had been able to bring across staff from the USA to undertake the work in the UK. The other also said that it had the option of transferring work to France or Germany which ran the risk that this might also lead to other parts of the business being increasingly transferred to those countries.

4.7 Employer responses to skill mismatches

In his exploration of the extent of skill mismatches in the USA, Capelli is somewhat sceptical about employer reports of skill shortages.⁶⁸ He notes, for example, that where employers reported skill shortages relatively few had taken action that might in some way address their incidence. Few employers, for example, responded by providing more training to increase the supply of skills or by increasing wage levels to attract more skilled employees. Whether this means that the skills shortages

⁶⁸ Capelli, P. (2014) *Skill Gaps, Skill Shortages and Skill Mismatches: Evidence for the US*. NBER Working Paper No. 20382

employers' experienced were not sufficiently important to do much about them is a moot point. It points to the importance of addressing how employers respond to what they consider to be skill shortages when addressing whether the shortage is of importance. As the previous section illustrates, many employers, because they had experienced shortages over a relatively long period of time, had developed work-arounds so that the business impact of shortages was mitigated.

Research from the early 2000s indicated that employers' more substantive responses to skill shortages were along the following lines.⁶⁹

- investing in education and training,
 - at a macro-level by becoming more integrated within skills eco-systems;
 - at a micro-level by investing in initial vocational education and training and / or the skills of experienced workers;
- addressing retention through improving pecuniary and non-pecuniary benefits;
- re-organisation of work;
- externalising the problem.

There is large body of evidence that demonstrates the potential effectiveness of the skills-ecosystem approach to developing skills.⁷⁰ The skills ecosystem constitutes the State, employers, and education / training providers working collaboratively to address skill needs, typically at the local level.⁷¹ There is some evidence in England that local eco-systems are becoming more collaborative in meeting employment and skill needs at the local level. Evidence from abroad, such as in Flanders, shows how eco-systems that bring employers together to tackle common skill problems can result in some pooling of risk. Employers can collaborate in delivering training of one kind or another – thereby reducing the costs of training – and there are spillovers to other areas of activity, too, such as sharing information about effective working practices and in R&D.⁷² In Flanders, such collaborative action is recognised as a key factor in the survival of the textiles industry that has been able to move upmarket as a consequence of the development of the skills ecosystem. The evidence points to the State, at local and regional levels, being required to act as a catalyst in bringing partners together.

⁶⁹ Hogarth, T., and Wilson, R.A. (2003) *Skill Shortages, Vacancies and Local Unemployment: A Synthesis of the Exploring Local Areas, Skills and Unemployment Analyses*, Nottingham: Department for Employment and Skills

⁷⁰ OECD (2011). *Towards an OECD Skills Strategy*. Paris: OECD

⁷¹ Finegold, D. (1999) 'Creating self-sustaining, high-skill ecosystems'. *Oxford Review of Economic Policy*. Vol. 15 (1): 60-81.

⁷² Bosworth, D.L. Gambin, L., Giernalczyk, H., Hogarth, T., Vogler-Ludwig, K. (2012) *Sectoral perspectives on the benefits of vocational education and training*. Cedefop Research Report No.22

Investing in education and training can sometimes encompass both taking on trainees through programmes such as Apprenticeship, but also training existing employees to fill new jobs or carry out additional tasks. In the latter case, this is sometimes observed with respect to reorganising work in a variety of ways that, in effect, allows the skill shortage to be solved. In manufacturing / STEM sectors of the economy this has been observed with the renaissance of the technician.⁷³ Typically technicians are seen as fulfilling a para-professional role in the organisation, bridging the gap between associate professional and skilled trades jobs.⁷⁴ A number of benefits have been conferred upon the employer as a result, including increased organisation efficiency. The individuals are seen to benefit, too; the role of technician also has the potential to offer career progression to those in intermediate level jobs and, in doing so, increase employee retention.⁷⁵

Externalising the problem is frequently observed through employers using agencies to find temporary staff to fill a particular vacancy.⁷⁶ This response can provide employers with an expedient but expensive solution where a shortage is causing an immediate problem. Again this explanation may go some way in explaining why skill shortages do not necessarily show up in wage statistics.

More representative evidence suggests that most employers respond to shortages by considering how they go about recruiting people. The Employers Skills Survey provides the most representative picture of how employers have responded to skill shortages and skill gaps at the workplace level and suggests that, for the most part, a resort to delivering more vocational education and training was not that commonly reported by employers.

How employers responded to difficulties recruiting the staff they wanted is shown in Figure 4.4. It is perhaps notable that the principal responses related to improving methods of recruitment with relatively few employers indicating willingness to take on less skilled workers and train them up to meet the needs of the job, or increasing employer-provided training programmes. For instance just seven per cent of employers with hard-to-fill vacancies had increased the training given to their existing

⁷³ Lewis, P.A. (2012). *Flying High? A Study of Technician Duties, Skills, and Training in the UK Aerospace Industry*. London: The Gatsby Charitable Foundation. Lewis, P.A. (2012). *Space for Technicians? An Analysis of Technician Skills and Training in the UK Space Sector*. London: The Gatsby Charitable Foundation.

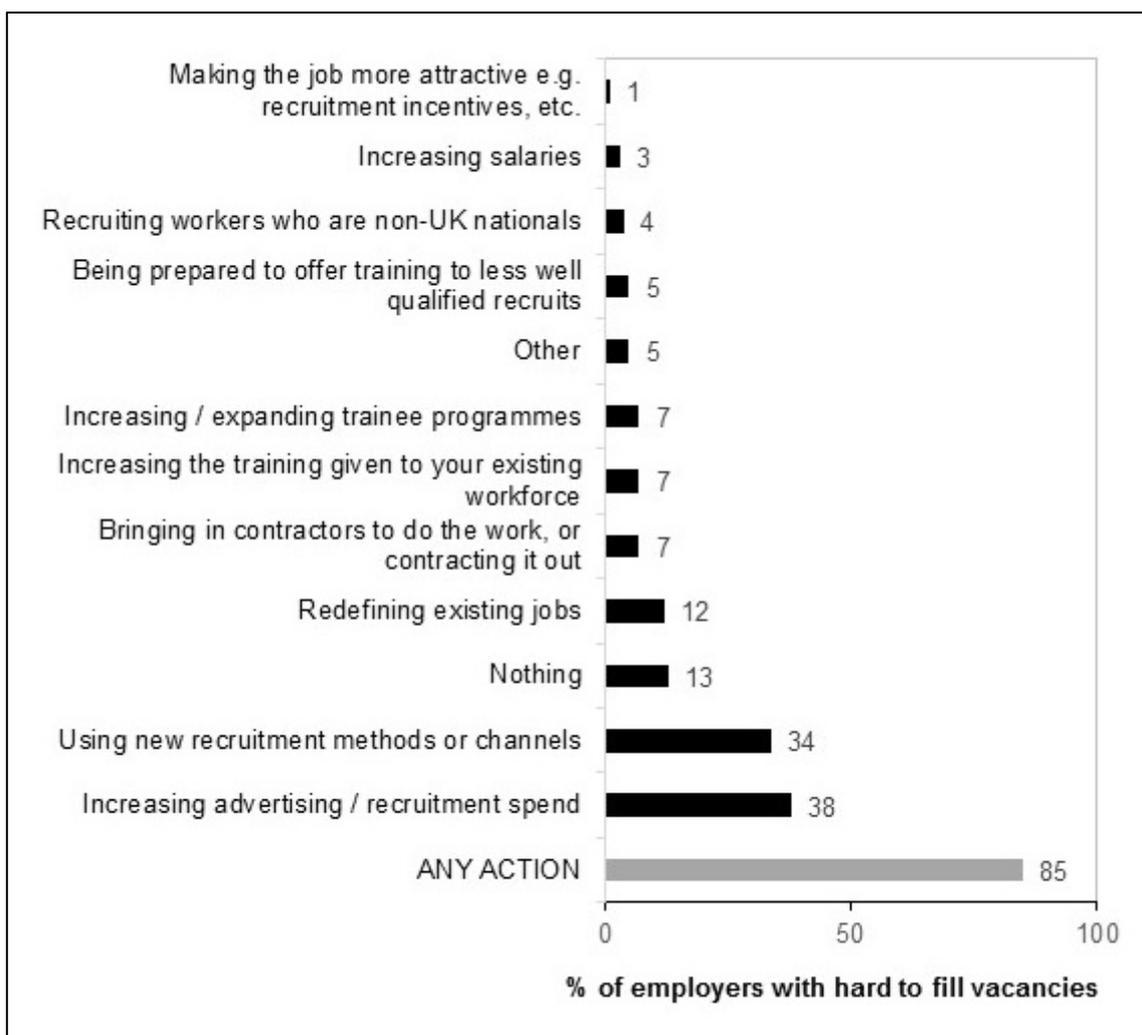
⁷⁴ Mason, G. (2014). *Science, Engineering and Technology Technicians in the UK Economy*. London: The Gatsby Charitable Foundation.

⁷⁵ McCaig, C., Hogarth T., Gambin L. and Clague, L. (2014) *Research into the need for and capacity to deliver STEM related apprenticeship provision in England*. London: Department for Business Innovation and Skills Research Paper No.171

⁷⁶ Hogarth, T. and Wilson, R.A. (2002) *Skills Matter: A synthesis of research on the extent, causes and implications of skill deficiencies*. Nottingham: Department for Education and Skills, DfES Report SMS1

workforce.⁷⁷ A resort to training is not, therefore, the principal response of employers facing hard-to-fill vacancies many of which are a result of a difficulty finding people with the skills required to do the job. This, as the employer case studies indicate, is because employers often want someone to fill the job immediately rather than being able to wait until someone has completed their training. Additionally, there were concerns about being able to retain employees after they have trained them.

Figure 4.4 Employer responses to hard-to-fill vacancies



Source: Employers Skills Survey 2013
 Base: All establishments with skill shortages

⁷⁷ This is much less the case where employers are faced with skill gaps amongst their existing workforce. In this instance, 68 per cent of employers said that they had increased their training activity in response to internal skill deficiencies. Employers may be more willing to invest in existing employees because they perceive less risk of losing them to another employer after training.

Research by CITB found employers' use of training to combat skill shortages and gaps being relatively limited were due more to, employers' perceptions of the necessity of training and the value of training relative to its costs, than by low quality or availability of training.⁷⁸ This tends to reinforce the view that employers tend to be risk averse about investing in training, especially where cost is high and there are higher chances of poaching or it not working out for other reasons.

In the previous section that looked at the impact of skill shortages and gaps on organisational performance, it was apparent that employers had resorted to a number of short-term measures to avoid shortages having too severe an impact on their organisation. The responses included:

- using employment agencies to fill vacancies;
- using social networks to find potential recruits;
- utilising ex-employees to fulfil tasks;
- outsourcing work to other companies.

There were also some longer-term actions in place that employers were taking in order to head off future skill shortages. These longer-term actions included:

- developing skills pipelines that would offset the emergence of future skills shortages;
- more attention to employee retention;
- transferring work elsewhere.

Before considering these responses, it is worth pointing out that some employers were unsure how they could, over the longer-term, address skill shortages. This is exemplified by Employer No.2, an engineering company that specialised in high voltage work (see box).

⁷⁸ CITB (2014) *Skills and Training in the Construction Industry 2014*. Construction Industry Training Board / BMG: Birmingham.

Employer No. 2:

Engineering company specialising in high voltage

The employer was experiencing problems recruiting 11kV electrical engineers. Currently it relied upon existing employees to work overtime in addition to outsourcing some work to other firms. The employer said that it preferred to work on high voltages because there was less competition in this market and the work was generally more profitable. But if the company had shortages of 11kV electrical engineers which meant that it could not fulfil contracts then it would switch to low voltage work where skills supply was better. There was the option of training apprentices to work on high voltages but the company was reluctant to do this having tried this in the past on two occasions, taking on apprentices to a five-year training programme. None of the apprentices had completed the apprenticeship with the result that the company had lost money on the investment.

Source: BIS Skill Mismatches Study (IER/IFF)

The example of Employer No.2 is not necessarily typical of employers in the sample, but it illustrates the way in which some employers responded to shortages by withdrawing, either fully or partially, from those sectors of the market that give rise to skill shortages emerging in the first instance. In this case the move into the 11kV market led to problems of recruiting high voltage jointers.

Other employers were engaged in a process of developing skill pipelines that were designed to offset future skill shortages. This included:

- investing in Apprenticeships;
- improving graduate recruitment mainly by offering internships / placements;
- upskilling the existing workforce.

Employer No.4, a construction company that was experiencing a shortage of estimators, potentially saw Apprenticeships as providing a long-term solution to the problem it encountered in recruiting them (see box on next page).

Employer No. 4:

Construction employed involved in project management of offices and houses

The company currently offered Higher Apprenticeships in project management leading to an HND qualification. This was a new development. The company had been particularly impressed by the Trailblazer process as it provided the opportunity to acquire training that was specific to the company's needs. In the past it had found it difficult to persuade FE colleges to provide the training it wanted, but it was now looking to work with a consortium of other construction companies in order to purchase training from a provider. If the company worked in a consortium with other employers to bring about a substantial pool of people completing Apprenticeships, then there will be an increase in the overall pool of skilled workers from which the company recruited.

Source: BIS Skill Mismatches Study (IER/IFF)

The engineering company – Employer No.13 - that was experiencing problems recruiting gas service engineers had turned to Apprenticeships as a solution to this problem (see box).

**Employer No. 13:
Manufacturer of Industrial Gas Ovens**

The company had a long history of taking on apprentices in the manufacturing division and this had worked out well for the company: the apprentices were well trained and tended to stay with the company. In relation to gas service engineers it wanted to avoid needing to fall back on agency workers and build up its own cadre of skilled employees. In order to prepare for the future, the company recognised that it needed to increase its supply of service engineers who were Gas Safe registered. It has taken on its first apprentice this year and will see how this development progresses. It is being developed with a local FE college. It will take around three to four years for the apprentice to complete but if it works out well this will be how the company meets its future demand, and will assist the company move more into the gas service market which it considers to be a potential growth area.

Source: BIS Skill Mismatches Study (IER/IFF)

At a graduate level employers were also looking to improve their recruitment process mainly by offering placements / internships to students / graduates. Employer No.6, for example, that produced superconductors, was investing in Apprenticeships and increasing its engagement with universities by offering sandwich course placements. If this continued to work out well – as it has done with the last two students -, then the employer will continue to sponsor students in their final year at university with the expectation that they will work for the company on graduation. By offering placements, the company noted, it can help mould the students. With this plan in place the company was convinced that its current shortages for production engineers would be temporary.

Similarly Employer No.17, a multinational IT company, was working closely with a local university and improving skills supply for the company. Some of the company's engineering managers provide guest lectures at the university and this, together with offering internships, helps to attract graduates to the company.

It was not solely a case of improving links with the external labour market. Employers were also looking to develop their existing workforces so that they have a cadre of staff who can be fill more senior roles in the organisation in the future. Employer No.15, also a multinational IT company, said that *"We've had to accept the old world doesn't exist. Where you have a vacancy, get loads of applicants, interview people and make an offer. It just doesn't work that way."* It was similarly not convinced that the external training system could provide it with the skills it needed so it was looking at how it could develop its own staff to meet future needs. It had a long-term roadmap to ensure that it was developing now the skills that it will need in three years' time. This meant that it also needed to pay more attention to how it retained the staff it was grooming for the future.

Employer No.6, the manufacturer of superconductors, had a strategy of becoming a centre of excellence for the design of its principal product. In order to achieve this goal it needed to retain its highly skilled and qualified engineers. It was relying upon employee recognition schemes and on-going review of employee remuneration in

order to retain its employees. Employer No.5, the construction company specialising in waterproofing, noted that it had to some extent neglected employee retention in the past and hoped that the introduction of a new wage system that offered more opportunity to increase their salary with the company over time would help solve its labour turnover problems.

Finally, the previous section revealed how multinational organisations have a degree of choice about where to locate various activities. Employer No.17, an IT company, said that it always had the option of moving some of its work to France and Germany if skill shortages adversely affected organisational performance.

4.8 The special case of skill surpluses

The focus here has been predominantly on skill shortages and gaps but skill shortages too have implications for both employers and individuals. Where workers possess skills that are at a higher level than those required to fill a job there is said to be a skills surplus and the evidence on the impacts and possible responses to this type of skill mismatch is rather mixed. On the one hand, those with higher level qualifications earn more than those educated at a lower level, working in the same kind of job. This suggests that employers may recognise the higher level skills an employee brings and reward it accordingly. Implicit here is that the higher skilled employee's marginal productivity is higher. On the other hand, there is evidence that those who work in jobs below their skill level are more likely to be dissatisfied with their job and tend, over their lifetime, to earn less than their counterparts who find a job commensurate with their skills.⁷⁹ The evidence suggests that the over-skilled employee is not able to make up the lost ground by starting out in a job where they are over-skilled.

Mismatch between the skills required to carry out a particular job and the skills individuals possess is of course a concern at an aggregate level as it represents inefficient use of investments in education and training (a particular concern expressed about higher education), but the implications of mismatch for individuals themselves are also important to consider. A number of studies have found that being over-qualified and / or over-skilled results in a pay penalty for the individual and lower job satisfaction.⁸⁰ Evidence from France, for instance, found that a vertical skill mismatch (i.e. where the level of skill required for the job is lower than the level held by the individual) was associated with strong decrease in wages, but they found no effect of on pay in the case of horizontal mismatch (i.e. where the skill/knowledge subjects in the job differ from the individual's field of study).⁸¹

⁷⁹ Sloane, P.J. (2003). 'Much ado about nothing? What does the overeducation literature really tell us?' In Büchel, F. et al. (eds). *Overeducation in Europe: current issues in theory and policy*. Cheltenham: Edward. Sloane, P. Jones, MK, Jones, RJ, and Latreille, PL. 2009) 'Training, Job Satisfaction and Workplace Performance in Britain; Evidence from WERS 2004', in Mertens A., Salverda W. and Zwick T., editors, *Training and Job Insecurity*, Special Issue, Labour, vol. 23, 2009, pp 139-175.

⁸⁰ McGuinness, S, and Sloane, P.J, (2011), 'Labour Market Mismatch Among UK Graduates; An Analysis Using REFLEX Data', *Economics of Education Review*, 30(1), 130 -145.

⁸¹ Béduwé, C. and Giret, J-F. (2011): "Mismatch of vocational graduates: What penalty on French labour market?", *Journal of Vocational Behaviour*, 78, pp. 68-79

Horizontal mismatch was, however, found to increase dissatisfaction with the job and to increase the likelihood that the individual would look for other jobs.⁸² The evidence, suggest therefore that employers are not willing to compensate employees just because they are relatively well qualified for the job on offer.

Research indicates that whilst there is some transition of workers from mismatched jobs to jobs that are more matched to their qualification and skill levels, it is often the case that mismatch is persistent for individuals. For example, graduates who were mismatched (over-qualified and over-skilled) in their first job had a higher likelihood of still being mismatched to their job five years later.⁸³ Such findings contradict some theories of career advancement such as those that predict that a worker may enter employment at level that requires a lower level of education or skill than they possess but would do so with the intent of using it as a first step into the labour market and acquiring on-the-job training and learning to help them to advance more rapidly than if they were to wait for an entry job better matched to their skills. Others, however, have found that over-qualification is more of a temporary condition for workers. Evidence from Switzerland – a relatively flexible labour market - shows that that nearly 90 per cent of over-qualified workers ‘escape over-qualification’ within four years.⁸⁴ The authors suggest that employers may well have an incentive to adjust the requirements of jobs as a way of ensuring they do not lose those employees who may be over-qualified (and thus not using all of their skills at work). Where an over-qualified employee leaves their employer to move to a better matched job elsewhere, they take firm-specific human capital with them that has a value for the original employer. One way of reducing the inclination of a worker to leave would be to ensure that their job role better matches their skills and qualifications.

For the employer, notwithstanding the problems of employees who are dissatisfied, the presence of people in the workforce with skills in advance of those needed for the job, may be seen as a positive externality of their recruitment. The key issue is the extent to which they are able to effectively marshal those excess skills to the firm’s advantage. Whilst there is a wealth of studies that provide information on how to effectively utilise skill surpluses within the workplace,⁸⁵ it is not clear to what extent employers actually adapt their working practices to accommodate more highly skilled personnel. The evidence from the technician studies suggests that there is potentially scope to do so.⁸⁶

⁸² Desjardins, R., & Rubenson, K. (eds) (2013). ‘Adult learning systems in comparative perspective’, *European Journal of Education*, 48 (2), pp. 193-325

⁸³ McGuinness and Sloane (2011) *op cit*

⁸⁴ Dorn, D, Frei, C., and Sousa-Poza, A. (2009), "Overqualification: Permanent or Transitory?"

⁸⁵ Mavromaras, K., Healy, J., Richardson, S., Sloane, P. Wei, Z. and Zhu, R. (2013). *A System for Monitoring Shortages and Surpluses in the Market for Skills*. Final Report to the Australian Workforce and Productivity Agency (AWPA) by the National Institute of Labour Studies (NILS

⁸⁶ Lewis, P.A. (2012). *Flying High? A Study of Technician Duties, Skills, and Training in the UK Aerospace Industry*. London: The Gatsby Charitable Foundation. Lewis, P.A. (2012). *Space for Technicians? An Analysis of Technician Skills and Training in the UK Space Sector*. London: The Gatsby Charitable

The evidence collected from the employer case studies shows that employers were reluctant to take on people who were over-qualified or over-skilled for the job on offer. A few employers said that whilst they would be apprehensive about taking on people who had skills in advance of those they sought, where the applicant was clear that they wanted the job and were not necessarily looking to it being a stop gap, they were willing to take them on. But as noted in the chapter above the more general view of employers was:

- a reluctance to recruit people who were over-qualified because they expected them to leave quite quickly for a job that better matched their expectations, experience and qualifications;
- worries that the expectations of employees who more qualified or experienced than the job required would be too high which could result in them becoming dissatisfied which, in turn, may affect their colleagues;
- concerns about being able to manage people who were highly qualified where they tended to question everything.

Accordingly, there was a reluctance to recruit the over-qualified and over-experienced.

4.9 Conclusion

The job specifications for vacancies were constructed in the departments in which the successful applicant would eventually work. In this way the job specification accurately reflected the tasks that needed to be carried out. It was also apparent that employers wanted a close fit between the applicant and the job specification. Some employers reported that they had taken on people who did not fully possess the qualities and skills they were looking for and this had not worked out for them. Accordingly employers were unwilling to take a chance on an applicant who did not fully, or nearly fully, meet the job specification. There was also an unknown quality that employers sought that indicated to them that an applicant, who possessed all or most of the skills they were looking for, was a good fit with the organisation. In other words that they possessed qualities that allow them to readily fit in with the workplace culture.

For all vacancies employers were looking for a mix of technical and softer skills. This was true whether they were looking for an experienced worker or recent graduate from school or university, or whether it related to a senior professional / managerial role or a manual job on the shopfloor. Employers regarded the softer skills as being important in turning technical skills into economically productive ones. The selection processes, including the use of competency based interviews and assessments, was designed to ensure that those who possessed well developed

social skills – i.e. being able to talk the talk as one employer put it – could also demonstrate technical competence.

In summary, employers were seen to be conservative in their selection decisions and, as the evidence presented in the chapter demonstrated, resulted in hard-to-fill vacancies arising for a variety of skilled jobs. It also needs to be borne in mind that many of the jobs into which employers were looking to recruit people were narrowly defined. It was not a case of wanting to recruit an electrical engineer, for example, but a specific type of electrical engineer.

A key question for the study relates to whether the skill shortages employers reported might be classified as important in that they were affecting organisational performance and resulted from some form of systemic failing in the skills supply system. A means of gauging this is by looking at the causes of mismatches, their impact within the workplace, and how employers responded to them. First, it was apparent that there was a cyclical component to the shortages that employers reported. Many said that output and employment growth had been on the upturn over recent years and this had increased their need to recruit from the external labour market. At the same time, some were convinced that there was an absolute shortage in the labour market for the skills they sought. Whilst this resulted from the external training system not producing in sufficient quantity the skills they sought, it was also recognised that employers themselves had a role to play in ensuring that they had systems in place for developing the skills they would need in the future.

Whilst employers could point to a number of ways in which skill shortages were affecting their businesses, or would affect their businesses had they not been able to find a work-around, there was often a hypothetical element to this. This is because in many instances employers had developed the means of working around skill shortages. These were not ideal and probably affected optimal organisational performance but they were a means of preventing skills shortages taking too much of a toll on the business.

Employers were of the opinion that skill shortage of the type they currently faced could not continue indefinitely. Several reported that they were investing more – or planned to – in initial vocational education and training in the form of Apprenticeships or by developing the means to obtain the graduates they wanted to take on (e.g. through internships or sponsoring third year students). This would suggest that employers, to date, had not made as much use of the external training system, especially in relation to initial vocational education and training as they might have done. The emergence of shortages might be seen as a catalyst for persuading employers to engage more with the FE and HE sectors.

There was also the intent to improve internal structures for developing the skills of existing staff with a complementary set of measures that would ensure that the staff they trained remained with the company. Whilst this included looking at remuneration levels, several employers said that they had limited scope to increase salaries to attract scarce skills but this would adversely affect their profit margins. The fact that they were taking measures to ensure that skills supply improved indicates that the shortages they were facing were important and likely to damage longer-term organisational performance.

Some employers, however, were unwilling to invest in training, either through Apprenticeships or developing the skills of their existing staff because they were concerned that, on the basis of past experience, they would not be able to recoup the benefits of any investment.

For some employers the surplus of skills at the local level had allowed them to readily fill vacancies. So long as the person could fulfil the job specification the fact that they had additional skills that was not a concern. This was especially the case where applicants had deliberately decided to take a step down. In other cases, employers were more circumspect. Even in local labour markets with relatively weak labour demand, they were unwilling to take on a person who was over-qualified / over-skilled because they thought they would leave as soon as a job commensurate with their skills became available. They also feared over-qualified staff might be a disruptive influence on the shopfloor where they questioned everything and their dissatisfaction with the job was transmitted to others in the team.

There is also the issue of latent skill shortages.⁸⁷ This relates very much to those situations where employers fail to recognise skill shortages in sufficient time. These shortages became manifest but often too late insofar as the company had lost product market share and was not in a strong position to recruit skilled employees. This was observed in the employer case studies conducted by Wilson and Hogarth.⁸⁸ Their study revealed the way in which employers' product market strategies were not sufficiently attuned to external product market developments such that employers were often pushed into making product changes reactively but were often too late in doing so.⁸⁹

The overall picture, however, is that of employers muddling through. They report skill shortages – many of which had been relatively persistent – but they had found the means of being able to manage around the shortages. It is apparent that in many instances the shortages they faced did not merit investing substantially in a skills supply pipeline. This suggests, other things being equal, that the nature and scale of the shortages they faced were not considered sufficiently important to demand a substantial response. This was not true in every instance – and some employers were investing substantially in a skills supply pipeline – but the evidence from the employer case studies, and the wider survey of the literature, suggests that the response from many employers to the skill shortages they reported, was distinctly muted.

⁸⁷ Bosworth, D.L., Davies, R, and Wilson, R.A. (2002) *Employers Skill Survey: Econometric Analysis*. Department for Education and Skills / National Skills Task Force; Wilson, R.A. and Hogarth, T. (2003). *Tackling the Low Skills Equilibrium: A Review of Issues and Some New Evidence.*, London: Department for Trade and Industry, London: Department for Trade and Industry

⁸⁸ Hogarth, T. and Wilson, R.A. (2002) *Skills Matter: A synthesis of research on the extent, causes and implications of skill deficiencies*. Nottingham: Department for Education and Skills, DfES Report SMS1

⁸⁹ Collier, W., Green, F. and Kim, Y. (2007). *Training and Establishment Survival*, Sector Skills Development Agency Research Report 20. Collier, W. Green, F. and Peirson, J. (2005). "Training and Establishment Survival." *Scottish Journal of Political Economy* 52 (5): 710-35.

5. Conclusion and Recommendations

5.1 Findings from the Study: Conceptualising and measuring mismatches

This study has been concerned with improving the understanding of the extent and nature of skill mismatches in the economy and the (potential) impact of such imbalances on individuals, organisations and the economy as a whole. Taking a mixed methods approach (comprising a review of the literature on skill mismatches, review of existing data and statistical analysis of data on potential mismatches, as well as qualitative interviews with employers), the study has provided insights into the types and extent of mismatches in the labour market as well as the causes of, and responses to, skill mismatches.

Skill mismatches are inherently difficult to define. There are a range of indicators that provide information about mismatches but they all tend to be biased in some way. This report has demonstrated the way in which shortages and surpluses at the occupational level may be identified and how their importance may be assessed. This provides the basis of identifying the emergence of occupational shortages and surpluses. A quantitative assessment has been provided of where shortages and surpluses have arisen and, based on qualitative evidence from a series of employer case studies, an indication has been provided of the causes and consequences of mismatches and how employers have responded to them.

Though headlines on skill mismatches focus mainly on shortages from the employer perspective, mismatches also encompass other imbalances between the demand for, and supply of, skills in the economy, including skill surpluses and skill gaps. The main dimensions of skill mismatch may be summarised in relation to:

- the match between the skills individuals possess;
- the point at which mismatches arise, whether upon initial entry of an individual into the labour market or later due to skill obsolescence and other changes;
- structural and cyclical causes of mismatches; and
- the impact of mismatches on employment and output.

In practice, skill is typically measured with respect to occupation, level of educational attainment, formal qualifications, and competencies (e.g. numeracy, literacy, etc.). In order to assess whether there is an imbalance between the supply of, and demand for, skills (as measured by such proxy indicators) the following are often considered:

- employment and unemployment rates;

- wage differentiation;
- relative wage growth;
- individuals' views of whether they are over- or under-skilled for their current job;
- employers' reports of hard-to-fill vacancies, especially those being difficult to fill due to skill issues.

The various measures of skill mismatch do not always point to the same conclusion. This highlights the need to undertake analysis using a range of mismatch indicators. A number of countries have begun to adopt multi-dimensional approaches to identifying and measuring skill mismatches. These tend to bring together a variety of labour market indicators along with consideration of the risks and impacts of potential mismatches (typically considered from the employer and wider economic perspective).

5.2 Findings from the Study: The extent of mismatches based on existing data

Through combining various indicators, the analysis in this study has provided an initial list of occupations characterised by skill shortages. Most occupations in the shortage list are associated with relatively high skill requirements. Many are also in STEM/STEM-related areas and most of the occupations are skilled trades ones. That is, ones where a Level 3 Apprenticeship typically provides entry to the occupation.

The method used to estimate the overall number of skill shortages suggests that the overall incidence of skill shortages in the economy is relatively small when compared with overall employment levels. That said, where employers encounter shortages most say it has an adverse impact on organisational performance.

In considering the data on skill mismatches, the focus has tended to be on skill shortages rather than surpluses, though there is interest too in over-qualification and the degree to which graduates in particular, may be in jobs where their skills are under-utilised. The existing literature tends to support the idea that the graduate wage and employment premia are being maintained even with significant expansion in the supply of graduates. But there are a number of caveats.

The existing evidence on the returns to higher education tends to consider average returns which may overlook the outcomes for particular groups of individuals. The substitution of graduates for others with lower level qualifications has not been fully explored in the literature to assess whether the skills graduates bring to the workplace are fully utilised. Survey evidence suggests that many graduates do not consider their current jobs to require all of the skills they possess, but there is a degree of uncertainty attached to whether this results from graduates being employed in jobs that may be used as stepping stones to ones that better fit their skills.

From a public policy perspective it may be that shortages are the more pressing issue given their potential to constrain growth. Skill surpluses may be considered to represent untapped potential (i.e. the complete skill set is not being fully used in the job) rather than potentially imposing constraints on operations and on organisational and economic performance. Those skills may well be more fully utilised if growth can be stimulated.

It also needs to be borne in mind that the overall level of skill shortages reported reflects the current skills equilibrium in the economy. There is a general view that too few employers have product market strategies that create a substantial demand for intermediate and higher level skills (c.f. the low skills equilibrium hypothesis). If it were possible to simultaneously raise employers' product market ambitions and skill demands, then this may well give rise to an increase in the incidence of skill shortages. The pressing issue, arguably, is developing the mix of strategic policy interventions that will raise employer demand for skills (c.f. the 2013 Budget announcement regarding the level at which the minimum wage will be set in the future).

5.3 Findings from the Study: Causes and responses

Skill mismatches are considered to arise from a number of factors including: economic growth; technical change (especially the pace of this change which can result in there being a lag between demand for skills arising and the supply side being able to respond); replacement demand (resulting from individuals leaving the labour market due to retirement or for other reasons); supply side constraints (e.g. the lag between emerging demand and provision of appropriate training and education on the supply side; or the lack of training providers with particular programmes in certain locations); and other market imperfections that may lead to individuals making sub-optimal investment decisions (e.g. information asymmetries, mobility constraints).

The evidence reveals that employers encounter difficulties meeting their skill needs from the external labour market because:

- job vacancies have relatively narrow job specifications limiting the number of suitable applicants;
- there is a need to ensure that any would-be recruit is a 'good fit' for the job and the business. Employers are generally not willing to take a chance on appointing someone who they do not regard as a good fit;
- of difficulties attracting suitably skilled individuals to sectors and roles which are considered unattractive;
- geographical considerations such that is difficult to attract skilled applicants to out of the way locations, and / or there is strong local competition from other employers for the same pool of skilled applicants.

There are various ways in which employers might be expected to respond to skill mismatches, especially shortages, including:

- increasing training of existing employees and recruiting trainees and apprentices;
- widening or adapting the job specifications for roles they are trying to fill to allow for a wider pool of applicants; and
- improving the remuneration package (wages and other aspects of the employment offer) to attract suitable candidates.

Though employers reported shortages their response to these was often based on trying to find short-term fixes rather than longer-term responses based on improving their skill pipelines. This arose for a host of reasons, including:

- financial pressures on the business resulting in a short-term approach by employers in which they ‘work-around’ or ‘muddle through’ using the skills of their current workforce;
- employers being risk averse with regard to making investments in skills due to worries about poaching or business performance over the medium to longer term;
- limited education and training being available on the supply-side, especially within the local area in which the business operates.

The qualitative interviews with employers indicated that many who had had difficulties recruiting the skills they needed for their business had managed to develop a range of ‘work-arounds’ that minimised the impact of skill mismatches on the organisation’s performance. Many regarded this as a short-term approach and were considering how they might find longer-term, more permanent solutions to their recruitment problems. Some employers who had responded to shortages through work-arounds indicated awareness of the associated impacts for the business, such as constraining growth; and placing greater pressure on existing employees leading to job dissatisfaction and retention issues.

5.4 Implications and recommendations

A method has been developed for identifying skill shortages and surpluses. The mismatches it has identified are likely to change over time so there is a need to routinely re-run the analysis to gauge how the incidence and occupational characteristics of shortages and surpluses are changing over time. Carrying out the analysis on a regular basis would also help assess whether any mismatches are persistent over time.

The evidence points to the level of skill shortages being, at best, modest. This results from: (a) employers pursuing low value, low productivity product market strategies that give rise to little demand for skills; and (b) where employers have a

demand for skills which they are struggling to meet, they are not always willing to use the external vocational education and training system to acquire those skills. The product market ambitions of employers need to be raised and along with the skills base of their workforce. And employers need to be convinced that where they raise their ambition, the external VET system is able to deliver the requisite skills.

It is at an intermediate level where skills supply is not meeting demand. Apprenticeships are well placed to meet this demand but there is prima facie evidence that employers are unwilling to make what often amounts to a substantial investment in this type of training because of concerns about it meeting their specific, unique skill needs and being able to retain the services of the apprentices once they have completed their training. This can be especially the case with small and medium sized enterprises (SME) that are faced with a large dominant local employer that is able to soak up much of the skills supply in a local area. Accordingly there needs to be some means of reducing the risk that employers face when investing in programmes such as Apprenticeships.

Increasing the propensity of the employer to invest in Apprenticeships needs to give consideration to how the risk faced by the employer might be reduced, especially for those employers where the level of investment relative to turnover is relatively high. There are at least two ways of achieving this end:

- persuading some employers to over-train in those occupations that are prone to shortages through a training levy. If the levy succeeds in persuading larger employers to over-train, then this potentially provides a free gift to those employers that fall out of scope of the levy (i.e. smaller employers), so long as they are able to recruit the excess apprentices.
- making Apprenticeships a more risk-averse investment in general to all employers rather than via a levy type system or in conjunction with a levy.

Alternatively, there are other means of ensuring that employers become less risk averse when investing in Apprenticeships. Such an approach is not necessarily dependent upon a levy. This relates to developing a balance within the Apprenticeship that allows employers to obtain the unique bundles of skills that comprise jobs within their workplaces, whilst the apprentice is able to obtain skills that will afford them a degree of labour market mobility. Allowing the employer to develop the unique bundles of skills within Apprenticeships effectively provides a lock between employer and apprentice. If a non-training employer came along and sought to recruit the training employer's fully trained apprentices, they would be faced with meeting a price equivalent to breaking the lock. In this way the risk faced by the employer investing in Apprenticeships is reduced.

Annex A: Draft semi-structured interview schedule for use with employers

NOTE TO INTERVIEWER: The aim of the interview is to elicit information about skill mismatches: skill shortages, skill gaps, or skill surpluses in the establishment and the impact these have on organisational performance. The definitions are as follows:

1. skill shortages – difficulties recruiting people to an occupation because applicants lack the skills, qualifications, or experience required;
2. skill gaps – existing employees who lack the skills required in order for the company to meet its product market goals;
3. skill surpluses – employees who possess skills in excess of those required by the job. There are two elements to this: (i) employees who possess skills relevant to the current job but at a higher level; and (ii) employees who are qualified or experienced to a level higher than typical in a job but their qualifications or experience are not directly relevant to the current job.

It is proposed that the issues of (1) and (3) are addressed directly in the interview schedule, and that (2) is captured indirectly in relation to whether skill shortages later lead to skill gaps.

One way of identifying on skill mismatches is to concentrate on recent recruitment activity in relation to shortages and surpluses – i.e. have attempts to recruit resulted in difficulties recruiting the skills needed or in taking on people who skills are in excess of those required, and what has been the impact of any resulting surpluses or shortages.

Organisational performance is defined with reference to: meeting organisational targets (it will be important to capture information about what these are); lost orders; operating / trading surpluses; work being transferred elsewhere; investments being postponed / cancelled; delays developing new products and services; labour turnover; etc. Initially, the respondent should identify impacts without being prompted.

The aim is to identify occupations that are considered to be of critical importance to the company where there are skill mismatches. This may reflect the fact that the occupation employs a relatively large percentage of the workforce, or that it is of central importance to the organisation even if relatively few people are employed in the occupation. The respondent can then identify what they consider to be of critical importance.

PREAMBLE: Explain to the respondent that the study is concerned with understanding the impact of skill mismatches (as defined above) on organisational

performance. The aim is also to understand how skill shortages or surpluses arise and how the establishment has sought to mitigate any adverse impacts.

Ideally, the discussion will be framed around a few jobs / occupations which are of critical importance to the organisation (as defined above).

Remind the respondent that all information collected will be treated in the strictest confidence and the anonymity of respondents and the organisations for which they work is guaranteed in any report.

A: THE ESTABLISHMENT

NOTE TO INTERVIEWER: Most of the information required here will be available from other sources. The information to be collected in the interview should be that which it has not been possible to obtain from other sources such as the Employers Skills Survey.

1. What are the principal products or services produced at this establishment? If more than one product or service, gain an indication of what are the most important activities?
2. What are market conditions currently like for your products or services? Gain an indication of the extent to which demand is increasing or decreasing and the reasons why. Also find out about the location of markets (local, national, international) and the extent to which there is much competition either from local, national, or international producers.
3. How many people are employed at the establishment? Over the past three years, has the number of people employed at the establishment been increasing or decreasing? Obtain an indication of the scale of any increase or decrease and the reasons underlying it.
4. How much recruitment has there been over the recent past? [Probe around reasons to do with (a) business expansion and (b) labour turnover – if the latter, are levels of labour turnover high in the respondent's view and, if so, why]. [NOTE THIS IS ABOUT ALL EMPLOYMENT IN THE ESTABLISHMENT, OCCUPATION SPECIFIC QUESTIONS ARE ASKED IN SECTIONS C AND D].

B. EXPERIENCE OF SKILL MISMATCHES

NOTE TO INTERVIEWER: The aim is to discuss recent recruitment activity at the establishment over the past three years (or whatever period the respondent feels most comfortable reporting on, if they cannot recall events as far back as three years). The aim is to find out about the occupations or jobs they have recruited into, and then select up to three occupations/jobs to investigate further. The three occupations should be ones considered to be of critical importance to the establishment.

5. Over the past three years, to what occupations / jobs has the company recruited people?

6. How difficult was it to recruit people to the occupations / jobs? [Probe to: identify whether someone was recruited or whether the job remained unfilled, whether someone was recruited whose skills / experience / qualifications were higher or lower than those ideally sought].

7. NOTE TO INTERVIEWER: Identify up to three occupations / jobs that have either (a) proved difficult to fill or have been filled by someone whose skills set was below that sought, or (b) have been filled by someone whose skills are in excess of those sought. Ideally, a balance is required between shortages and surplus skill occupations. Then ask something along the following lines: From the occupations just mentioned, can we select three that it be worthwhile discussing in greater detail because the jobs are particularly important to this workplace, or because the outcome of the recruitment process resulted in changes needing to be made within the workplace?

NOTE TO INTERVIEWER: For occupations / jobs that are considered to be skill shortage ones by the respondent, go to Section C and repeat for as many occupations as relevant. For skill surplus occupations, go to Section D and repeat for as many occupations as relevant.

C: SKILL SHORTAGES

PREAMBLE: Explain that you would now like to discuss the shortages experienced in relation to [OCCUPATION SELECTED IN SECTION B], why the shortages occurred, the resulting consequences for the establishment, and how any adverse impacts were offset.

The vacancy and the job

8. Ask for information in detail about the job – what is involved in undertaking the job, what type of attributes are required and why, the level of responsibility, and so forth. [Probe around: the technical skills required to fill the job and whether these need to be certificated and if so, what certification is required / and what softer, generic skills are required].

9. To start with, ask about the details of the vacancy. Probe around: where advertised (national / local / international), wage and fringe benefits offered [probe on whether this is the going rate in the respondent's opinion]. Who decides whether or not there is a vacancy and the person specification? Has the person specification for the occupation in question changed over time – in what way and why? Is there a perception that supply is getting better or worse in the external labour market? In the respondent's view, was the person specification for the vacancy reasonable given the likely population from which they would recruit?

10. How did the vacancy arise? [NOTE TO INTERVIEWER: start by probing around issues relating to business expansion and the reasons behind this, then move on to whether it is due to labour turnover. Depending upon the number of vacancies it could be due to both business expansion and labour turnover.

- a. If business expansion is mentioned, ask if this has resulted in the person specification being different to what it may have been in the past.
 - b. If labour turnover is mentioned, probe around reasons why labour turnover has been high for the particular occupation? What has the establishment done to help retain staff in key positions in the occupation?
11. Thinking about the vacancy, did the employer anticipate any problems recruiting to the job? If so, why? And if not, why not? Was any recruit expected to 'hit the ground running' or was there scope for someone to take time and bed into the job for example by building in a handover period?
12. How many people applied? Was the vacancy filled? After how long? Did you recruit from abroad (if so, what country and why?) Was the eventual recruit a good fit with the needs of the job [Probe around: match of skills required to those obtained].
13. How are people selected / what recruitment techniques are used: use of CVs / standard application forms; initial sifting of applications using pre-defined thresholds; interviews (if so, how many – e.g. first and second interviews); assessment centres; psychometric testing; role-playing. It is important to fully understand the processes used to recruit people and the rationale that gives rise to the particular recruitment process. Obtain from the respondents their views about the effectiveness and efficiency of the methods used.
14. Would it be possible for someone who possessed the technical skills required to undertake the job to be recruited or is it essential to have the softer skills too? [Probe around how essential the combination of technical and generic skills is in order to undertake the job]. [NOTE TO INTERVIEWER – if asked, softer skills in this context refer to generic skills such as communication skills, leadership, team working, etc., the employer may also refer to range of personal attributes as well and these should be recorded as well]

Reasons for experiencing recruitment difficulties

15. In the respondent's view, why did the establishment experience difficulties recruiting to the job [Ask open ended, then probe around: whether wage rate competitive; whether other fringe benefits competitive; working time / unsocial working hours / shift systems; other demand in the area (if so, obtain details); specificity of the skills sought (i.e. relatively unique set of skills required); and other reasons suggested by respondent.
16. Were there people internally who could have been promoted or moved into the job? {Probe around use of workforce planning tools and whether people are being trained to fill more senior jobs in the establishment}.

Impact of skills shortages

NOTE TO INTERVIEWER: when discussing skill shortages there will be a need to differentiate between situations where the vacancy was eventually filled, so the impact is in some respects a temporary one - unless the difficulty resulted in a person with a differing set of skills being recruited – and where the vacancy remained unfilled. In the former, there will be a need to discuss what changes

needed to be made in order to accommodate a person whose skills are different to those initially sought. In the latter case there will be scope to explore what happened as a consequence of job remaining unfilled.

17. What was the impact on the delivery of products and services? [Ask unprompted and then probe around: lost orders, delays delivering products / services, impact on customer service, delays developing new products and services, work being transferred to elsewhere]. Wherever an impact is cited, ask for details in order that there is clear evidence of any impact.
18. What has been the impact on work organisation in the establishment? Probe around the following issues and ensure that where any impact is cited there is supporting evidence:
 - a. new patterns of work organisation / redefining job roles (if so, what?)
 - b. increased overtime work
 - c. increased outsourcing
 - d. increased workloads for existing employees
 - e. impact on morale of existing workforce (if so, how has this been mitigated – e.g. through financial incentives / bonuses)
19. Is it possible to monetise some of the impacts – e.g. value of lost orders, cost of overtime
20. Have any of the impacts just mentioned been permanent or temporary? How did the organisation seek to mitigate any impacts over the short-term?
21. In the respondent's view, what has been the most important impacts and why.

Avoiding future impacts (ASK IN GENERAL FOR ALL SKILL SHORTAGE OCCUPATIONS)

22. What longer-term plans does the establishment have to avoid future skill shortages? [Ask open ended and then prompt around: increased recruitment to trainee positions / workforce planning and use of internal labour markets; greater use of outsourcing; greater targeting of recruits from abroad; review of remuneration and reward systems; more focus on conditions in the external labour market).
23. Do skill shortages now lead to future problems down the line with employees not being fully skilled to carry out tasks the establishment may want them to undertake?

NOTE TO INTERVIEWER: ONCE LOOP IS COMPLETE GO TO SECTION D IF THERE ARE SURPLUSES IDENTIFIED IN CRITICAL JOBS AT SECTION A, OTHERWISE GO TO SECTION E.

D: SKILL SURPLUSES

PREAMBLE: Explain that you would now like to discuss the surpluses experienced in relation to [OCCUPATION] and what have been the consequences of recruiting someone whose skills are higher than those initially sought.

The vacancy and the job

24. Ask for information in detail about the job – what is involved in undertaking the job, what type of attributes are required and why, the level of responsibility, and so forth. [Probe around: the technical skills required to fill the job and whether these need to be certificated and if so, what certification is required / and what softer, generic skills are required].
25. To start with, ask about the details of the vacancy. Probe around: where advertised (national / local / international), wage and fringe benefits offered [probe on whether this is the going rate in the respondent's opinion]. Who decides whether or not there is a vacancy and the person specification. Has the person specification for the occupation in question changed over time – in what way and why? Is there a perception that supply is getting better or worse in the external labour market?
26. How are people selected / what recruitment techniques are used: use of CVs / standard application forms; initial sifting of applications using pre-defined thresholds; interviews (check for how many – especially first and second interviews); assessment centres; psychometric testing; role-playing. It is important to fully understand the processes used to recruit people and the rationale that gives rise to the particular recruitment process. Obtain from the respondents their views about the effectiveness and efficiency of the methods used.
27. Was the vacancy filled? After how long? Was the eventual recruit a good fit with the job [Probe around: match of skills required to those obtained]. Was the person recruited from within the UK or from abroad (if so, what country and why?)
28. Would it be possible for someone who possessed the technical skills required to undertake the job to be recruited or is it essential to have the softer skills too? [Probe around how essential the combination of technical and generic skills is in order to undertake the job]. [NOTE TO INTERVIEWER – if asked, softer skills in this context refer to generic skills such as communication skills, leadership, team working, etc., the employer may also refer to range of personal attributes as well and these should be recorded as well]

The recruitment decision

29. To what extent was the person eventually recruited in possession of skills in advance of those initially sought? [Probe around experience / qualifications / skill profile of person(s) eventually recruited].
30. Why was the person recruited? [Probe around: best person for job (why?); saw potential to utilise additional skills; no other suitable recruits; existing skills / qualifications not relevant to job]

31. Was there any concern in taking on someone whose skills were in advance of those sought? [Probe around: concerns that person would leave soon after recruitment; expectations would be too high; difficulties managing individual]

Impacts

NOTE TO INTERVIEWER: probe around the following issues in order to explore the organisational and business impacts of skill surpluses. The list contains positives and negatives, but first ask the respondent to say unprompted what they think the impact has been. Wherever possible collect corroborating evidence where an impact is cited – i.e. obtain an example.

32. The issues to explore include:

- a. a cadre of staff who can be readily trained to fill more senior / demand positions
- b. an opportunity to reorganise work / redefine job roles in a more efficient manner / a set of additional skills that have been used for the benefit of the establishment
- c. difficulties containing the expectations of employees who feel they skilled to do more than is required of them
- d. increased levels of labour turnover
- e. problems maintaining staff morale amongst workers doing jobs they feel are beneath them / communication of job dissatisfaction to other workers

33. In the respondent's view, is the issue of skill surpluses a problem for the establishment, a non-issue, or an opportunity? Ask the reasons for the answer provided.

E. CLOSE INTERVIEW

To end the interview, ask the respondent if there is anything else they would like to mention about the problems / opportunities they experience when they are recruiting staff. In particular, ask what lessons have been learnt by the establishment over recent years and how this is likely to avoid costly mismatches occurring in the future.

***** CLOSE INTERVIEW AND THANK RESPONDENT *****



© Crown copyright 2016

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3 or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

This publication available from www.gov.uk/bis

Contact us if you have any enquiries about this publication, including requests for alternative formats, at:

Department for Business, Innovation and Skills
1 Victoria Street
London SW1H 0ET
Tel: 020 7215 5000
Email: enquiries@bis.gsi.gov.uk

BIS/16/260