Skills Mismatch Methodology

centre for **progressive policy**

1: Introduction

The Centre for Progressive Policy (CPP) has developed a skills mapping system with the capability to identify potential mismatches in technical skills in local areas. The demand for technical skills – established through analysis of live vacancy data – is compared to the supply flowing from further education (FE) colleges to pinpoint areas of potential under or overprovision.

The standard report, which is fully customisable, features the following analysis:

Mapping the level of demand for skills in the local area. Analysis is presented on the number and growth of vacancies in the local economy by occupation group, including data on advertised salaries.

Identifying technical skills shortages. The rate of skills shortages for a wide array of technical occupational groups in the local area is established and compared with national rates.

Mismatch analysis of potential under and over provision. Total and skills shortage vacancies are compared to further education course and apprenticeship completions through time to assess where realignment of provision could be beneficial for the local economy. The analysis is presented at a number of levels, allowing for both a granular high level approaches.

Sectoral analysis. Employer demand and skills shortage rates are established at the level of the sector, which can be linked back to the preceding mismatch analysis

This methodology document begins by providing an overview of the skills mapping system that underpins the reports' analysis. It then goes on to describe the methodology of the main sections of analysis of the reports.

2: Overview of the Skills Mapping System

2.1: Supply vs demand

The central component of Centre for Progressive Policy's skills mismatch reports is the Skills Mapping System (SMS). The system acts as a bridge between the supply side and demand side skills data, to allow for meaningful comparison.

Demand and supply side datasets are mapped to common groups – referred to as secondary occupation groups – of which there are 98 in total (see section 7 for a more detailed mapping example).

2.2: Demand side data

The demand side data is obtained using Burning Glass software, which scrapes vacancy data from job posting websites. This occupational data is given at the four digit Standard Occupational Classification (SOC) code level. There are 368 different occupations at the four digit SOC code level and each of these is mapped into one of the 98 secondary occupation groups.

Data on typical education level is also added to the mapping system at the four digit SOC code level. The source for this is the Labour Force Survey.

2.3: Demand side mapping methodology

Mapping of four digit SOC code occupations into secondary groups was done through rigorous analysis of the skills required for each role and establishing groups for which there was a significant level of common skills. This was carried out primarily through desk based research

using the ONS's SOC hierarchy, which includes detailed information on entry requirements, common tasks and related jobs. The hierarchy itself groups together similar occupations through the use of major groups, sub-major groups and minor groups.

The groupings were made with FE courses and apprenticeships in mind and so the process was heavily influenced by the supply side mapping (see section 2.5 for more details).

2.4: Supply side data

The supply side of the system maps college based technical courses and apprenticeships into the secondary occupation groups. Clearly there are a number of occupations for which this type of training is irrelevant; health professionals, for example. For the purpose of these reports, therefore, technical occupations are defined as any that on average is done by less than 30% graduates (as indicated by the highest level of education identified in the labour force survey) and can be linked to relevant FE courses or apprenticeships. As such, the technical courses and apprenticeships are mapped into 59 of the 98 secondary occupation groups for which technical training is relevant.

The data sources used were:

College-based technical courses: Education and Skills Funding Agency's LEP Data Cube data on the number of completions by individual learning aim (based on all skills providers within the LEP).

Apprenticeships: Skills Funding Agency's LEP Data Cube data on the number of completions by pathway chosen for each apprenticeship framework (based on all skills providers within the LEP)

For the number of completions of college-based courses, only 'education and training', 'traineeships' and 'community learning' funded courses were included. The small number of courses funded via 'workplace learning' (which has largely been phased out in favour of apprenticeships) were excluded since trainees on this route are in employment.

Only technical courses with a significant time commitment required for completion were included. This was defined as certificates (130 to 260 hours of learning) and diplomas (370 or more hours of learning). Awards, which can require as little as 10 hours of learning, were not included. AS and A-levels were also excluded given the report's focus on technical education and training.

Analysis of apprenticeships is done by the pathway chosen by each apprentice, rather than the wider framework. For example, an apprenticeship in the Engineering Manufacture framework has 11 diverse pathways, including aerospace; fabrication and welding; and electrical and electronic engineering.

2.5: Supply side mapping methodology

Mapping of courses and apprenticeships into secondary groups was carried out principally through desk based research. The general process is as follows:

Identify skills, expected job roles and common progression routes for each individual course or apprenticeship

Match these with the skills and typical job roles from the four digit SOC codes

Triangulate with further research on employment destinations for each type of course (where available)

The sources used are outlined below.

Apprenticeships:

Apprenticeships Frameworks Online: AFO includes detailed documentation on all current, archive and legacy apprenticeship frameworks. The documentation describes skills gained and potential job roles for each pathway following completion. These roles were compared to those listed in the SOC hierarchy and other sources.

The government apprenticeships, traineeships and internships website: This includes information by type of apprenticeship, with examples of job roles that follow.

Individual apprenticeship advertisements: inspection of individual apprenticeship advertisements was carried out to review the types of skills were being offered and employment prospects following completion. This was principally carried out on the government's 'find an apprenticeship' website.

Awarding body websites, e.g. NCFE: The website of apprenticeship awarding bodies were used as an extra source of information for job roles and skill creation of apprenticeships.

Government statistical releases: further education and skills: This provides a high level review of apprenticeship completion rates by type.

Centre for Vocational Education Research (CVER) papers and briefing notes: Unfortunately, very little data is available concerning actual employment destinations following competition of specific types of apprenticeship. However, CVER papers were helpful in attaining a general understand of the apprenticeship process and provided some data on general apprenticeship to employment pathways. Government evaluations were also helpful, but again data is limited to apprenticeships in general, rather than specific types.

FE courses:

National careers service course finder: The course finder was used to locate specific courses and assess the skills created.

Awarding body websites, e.g. City & Guilds: Course descriptions and specifications were used to analyse the expected outcomes in terms of skills and employment prospects.

Individual course advertisements on FE college websites: detailed information on specific courses and how they play into the local labour market is often available through FE college websites.

Government statistical releases: further education and skills: This provides a high level review of FE course completion rates by type.

Centre for Vocational Education Research (CVER) papers and briefing notes: Unfortunately, as with apprenticeships, very little data is available concerning actual employment destinations following competition of specific types of FE courses. Again, CVER papers were used to attain an understanding of the general FE course process and provided some data on general course to employment pathways.

Note, the mapping of courses is an ongoing process. As new courses are encountered in the datacube, the above method is used to add them to the mapping system.

2.6: Primary group mapping

Each of the 59 'technical' secondary occupation groups is mapped to one of five technical primary groups to allow for analysis at a higher level.

The five technical primary groups are defined as follows:

Core technical: technical secondary occupation groups that are typically held by people with level 3 qualifications or above.

Semi-technical: technical secondary occupation groups that are typically held by people with level 2 qualifications or below. While further education can lead to these occupations, it is also possible that some people will enter them without having done an FE course or apprenticeship, given the relatively low level of skill required.

Public sector technical: technical secondary occupation groups that are predominantly in the public sector. Examples include care workers and teaching and educational support assistants.

Privately funded training: technical secondary occupation groups that are not typically done by graduates, but nor are they unskilled. They are occupations that are technical in nature but for which publicly funded training is not commonly provided. An example is skilled drivers.

Technical – advanced: technical secondary occupation groups towards which FE can often provide a first step or foundation qualification. Entry into these occupations straight from FE is not common. They also include some occupations that are more advanced versions of those found in the core technical group. Examples include artists and designers and engineering professionals.

Alongside these 5 technical primary groups, sections of the analysis consider four additional, non-technical primary groups:

Professional: occupation groups made up of four digit SOC code occupations from the standard professional and associate professional SOC major groups that on average are done by more than 30% graduates

Managers: same as the standard SOC major group

Elementary: same as the standard SOC major group

Other: those occupations that are not in the professional, associate professional, managers or elementary SOC major groups but cannot be considered technical or professional for a variety of reasons. These make up less than 3% of total vacancies.

3: Mapping the level of demand for skills in the local area

3.1: Number and percentage of vacancies

A detailed analysis of vacancy data scraped from job posting websites using Burning Glass software is presented. As described in section 2.2, the data is obtained at the four digit SOC code level and is then mapped to each secondary occupation group. The data covers both full and part-time positions, but analysis suggests that the vast majority of the vacancies picked up by the software are for fulltime roles.

The data is presented at the primary and secondary group level (see section 2 for definitions) and is rounded to the nearest ten. Any variation in geography (e.g. vacancies by local authority) uses filters in the Burning Glass software.

3.2: Salary data

Data on average advertised salaries is also analysed. The figures presented use Burning Glass estimates of the mean salaries of occupations posted on job websites.

Feedback from various stakeholders suggests that the mean salaries appear to be slightly higher than those reported for existing employees. Analysis of the ONS's Annual Survey of Hours and Earnings (ASHE) suggests that the average advertised salaries from vacancies picked up by Burning Glass is indeed higher than the average salaries presented in the ASHE data. The Centre has sought clarification on this issue, with Burning Glass analysts identifying three principal reasons:

The ASHE data does not take into account certain types of contractors and self-employed people, and these vacancies often command significantly higher point-in-time salaries than longer-term postings.

Advertised salaries are not always the salaries that are actually paid once the position is filled. If an employer cannot get the exact skill set the role requires, for example, they may still hire for the position, but with a decreased salary.

Online postings in general are somewhat skewed towards more highly skilled positions and away from entry-level, manual labour openings which may be advertised more locally.

As it is vacancies that FE provision is attempting to fill, vacancy salary data is the more appropriate measure for these reports. However, future reports will include the option of having ASHE data presented alongside vacancy data to allow for greater depth of analysis.

4: Identifying technical skills shortages

4.1: Skills shortage rates for primary groups

Skills shortage calculations use data from the UKCES's Employer Skills Survey (ESS). The biannual survey asks employers to report the total number of vacancies they currently have and the number of vacancies they have that they are struggling to fill due to skills shortages. Skills shortage rates are thus the proportion of skills shortage vacancies (SSVs) to total vacancies.

The raw data is obtained at the LEP level, split by 15 industry sectors and the ONS's nine major SOC groups. Skills shortage rates for the Centre's nine primary groups (see section 2.6 for definitions) are calculated as weighted averages of the rates for the ONS's major groups, using Burning Glass data.

For example, if, according to Burning Glass data, the majority of vacancies in the core technical primary group are in the skilled trades major SOC group, then the core technical skills shortage rate will be heavily weighted towards the skilled trades skills shortage rate (calculated using the ESS data).

4.2: Skills shortage rates for secondary occupation groups

The process for calculating the skills shortages rates for secondary occupation groups is slightly different to that for the primary groups. Skills shortage rates for secondary occupation groups are a weighted average – calculated using Burning Glass data – of the skills shortage rates for the industry sectors provided in the ESS raw data, rather than the major SOC groups.

Thus, it is based on how many vacancies the group has in each sector, according to Burning Glass data. This assumes a normal distribution of sector skills shortages across occupations.

For example, see table 1. In this case, the number of vacancies for skilled driver roles by sector (gained from the Burning Glass Data) are displayed in the second column. Each of these is multiplied by the sector skills shortage rate (gained from the ESS data) to give an estimate of the skills shortage vacancies for skilled drivers in each sector. Dividing the sum of the skills shortage vacancies (the fourth column) by the sum of total vacancies (the second column) gives the estimated skills shortage rate for skilled drivers.

In the example below the majority of vacancies in the skilled drivers secondary group were in the transport and storage sector according to Burning Glass Data. As the transport and storage sector has a skills shortage rate of 50%, the skills shortage rate of skilled drivers is heavily weighted towards this figure.

Table 1: Skilled Drivers SSV% Calculation

Skilled drivers				
Industry	Total vacancies (BG)	SSV % (2015 UKCES)	SSVs	
Business services	86	18%	16	
Manufacturing	25	37%	9	
Construction	43	26%	11	
Wholesale and retail trade	95	21%	20	
Transport and storage	3000	50%	1500	
Public administration	40	2%	1	
Hotels and restaurants	40	24%	10	
Information and communications	25	22%	5	
Arts, Entertainment, Recreation and Other Service activities	11	22%	2	
Education	23	22%	5	
Financial services	44	10%	4	
Health and social work	55	18%	10	
Electricity, gas and water supply	110	40%	45	
Agriculture	10	100%	10	
Mining and quarrying	11	0%	0	
	3618		1648	46%

This method is used, as opposed to the method used for primary groups, because the nine major SOC groups are far more closely aligned to the nine primary groups than the 98 secondary groups. The skills shortage rates of the 98 secondary groups are more accurately calculated using their sectoral composition.

5: Mismatch analysis of potential under and over provision

The mismatch analysis is conducted for technical occupations only. It is not conducted for professional roles, as the link between the provision of graduate courses and local labour market demand is far weaker and less direct. This is due both to the greater movement of graduates out of the area after course completion and the large variation in graduate course subject and eventual career path.

Data on total vacancies, skills shortage vacancies, FE course completions and apprenticeships is analysed and presented in graphical form to highlight areas of potential under or oversupply of technical skills. Only data for levels 2, 3 and 4/5 are included. The data is rounded to the nearest 10.

The mismatch is conducted at the primary and secondary occupation group level and for each of the 15 new 'technical pathways'.

The mismatch analysis is not intended to encourage a soviet style planning system where the number of courses is allocated down to the last vacancy. Its objective is to identify possible skill areas where LEPs and FE providers can aim to either increase or decrease provision of technical courses or apprenticeships.

Of course, the data on either side will never be entirely accurate. For example, it is likely that a proportion of those completing veterinary nurse courses will go on to work in pet shops. However, such disturbances will be consigned to the margin, and it is highly unlikely that some qualified veterinary nurses working pet shops will change the general nature of over or undersupply of skills for either the veterinary nurses and animal care group or the sales and retail group.

5.1: Vacancies

As outlined in section 2.2, the demand data – in the form of vacancies – is gained using Burning Glass software. It is then mapped into the 59 technical secondary groups and divided into levels, based on Labour Force Survey data on highest reported level of education.

For analysis at the primary and pathway level, vacancy data is simply the sum of each secondary group mapped to that primary group or pathway.

5.2: Skills shortage vacancies

The skills shortage vacancies are calculated as the total number of vacancies multiplied by the skills shortage rates for each secondary group (see section 4.2 for secondary group skills shortage rate calculations).

For the primary group level, skills shortage vacancies are calculated using the primary skills shortage rates (see section 4.1 for primary group skills shortage rate calculations). Given the slightly different methods used to calculate primary and secondary group skills shortage rates, the number of skills shortage vacancies is not exactly equal to the sum of the skills shortages in

the secondary groups that are mapped to it. However, the numerical difference is small, and the mismatch analysis is designed to give indications of problem areas, rather than outline shortfalls of courses exactly. To do so accurately would be practically impossible given the movement of people in and out of the area.

For the pathway level, skills shortage vacancies are calculated as the sum of each of the secondary groups mapped to it.

5.3: FE courses

As outlined in section 2.4, the Education and Skills Funding Agency's LEP Data Cube is used to calculate the number of FE course completions by individual learning aim. Only certificates and diplomas are considered.

For analysis at the primary and pathway level, FE course data is simply the sum of each secondary group mapped to that primary group or pathway.

Note, the data cube gives information on the raw number of completions for any given course, rather than the number of individuals who have completed a course. Therefore, it is possible that there is a bit of noise in the data. However, the disturbance is not thought to be significant, and does not compromise what it intended to be an estimate process, as opposed to meticulous measurement.

5.4: Apprenticeships

As outlined in section 2.4, the Education and Skills Funding Agency's LEP Data Cube is used to calculate the number of apprenticeship completions. The mapping is done for pathways rather than frameworks.

5.5: Mismatch calculation

The figures that appear in the charts that outline the year on year trend in levels of mismatches for any given group are calculated simply as the number of FE course completions minus the number of skills shortage vacancies and the number of FE course completions minus the total number of vacancies.

While the mismatch charts include data on apprenticeships, the above calculations for the trend figures do not include the number of apprenticeships. This is because apprentices are already in some kind of employment, and according to government data, 77% of apprentices stay with the same employer after finishing.[1] As such, the majority of those completing apprenticeships will not then be competing for vacancies shown in the chart.

Having said this, it is true that an occupation group with a large amount of skills shortage vacancies and few FE course completions will be in a better position to tackle the skills shortages if there are a good amount of apprenticeships. As such, consideration of this data is also important.

6: Sectoral Analysis

6.1: Vacancies

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[1] https://www.gov.uk/government/publications/key-facts-about-apprenticeships/key-facts-about-apprenticeships

Burning Glass job vacancy data is filtered by industry at the ONS two digit SIC level. This is then adjusted to the fifteen sectors used by the UKCES Employer Skills Survey and in the reports as follows:

ONS	CPP/UKCES
A: Agriculture, forestry and fishing (1-3)	Agriculture
B: Mining and quarrying (5-9)	Mining and quarrying
C: Manufacturing (10-33)	Manufacturing
D: Electricity, gas, steam and air conditioning supply (35)	Electricity, gas and water supply
E: Water supply; sewerage, waste management and remediation activities (36-39)	
F: Construction (41-43)	Construction
G: Wholesale and retail trade; repair of motor vehicles and motorcycles (45-47)	Wholesale and retail trade; repair of motor vehicles and motorcycles
H: Transportation and storage (49-53)	Transportation and storage
I: Accommodation and food service activities (55-56)	Hotels and restaurants
J: Information and communication (58-63)	Information and communication
K: Financial and insurance activities (64-66)	Financial services
L: Real estate activities (68)	Business services
M: Professional, scientific and technical activities (69-75)	
N: Administrative and support service activities (77-82)	
O: Public administration and defence; compulsory social security (84)	Public administration
P: Education (85)	Education
Q: Human health and social work activities (86-88)	Health and social work
R: Arts, entertainment and recreation (90-93)	Arts, entertainment, recreation and other services
S: Other service activities (94-96)	
T: Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use (97-98)	

6.2: Skills shortage vacancies

The UKCES Employer Skills Survey (ESS) gives skills shortage rates for all vacancies in each of the fifteen sectors. Some adjustment is necessary to calculate the number of skills shortage vacancies for technical roles in each sector.

The ESS raw data breaks down the number of skills shortage vacancies in each sector into the nine major SOC groups. To estimate how many of the skills shortage vacancies for a given major SOC group in a given sector are technical vacancies, the percentage of Burning Glass vacancies in that major SOC group that are technical is calculated. This percentage is then multiplied by the number of total skills shortage vacancies for that major SOC group in the given sector from the ESS data, to gain the equivalent number of skills shortage vacancies for technical roles.

For example, suppose in the ESS data there are 100 skills shortage vacancies among employers in the construction sector for machine operative (major SOC group 8) roles and Burning Glass data suggests that 90% of vacancies in the machine operative group are for technical roles. In this case there would be an estimated 90 skills shortage vacancies among employers in the construction sector for technical roles in the machine operative group. The total number of skills shortage vacancies for technical roles among employers in the construction sector is simply the sum of the figure for the nine major SOC groupings.

The figures are annualised using annual data from Burning Glass, since the UKCES question asks respondents whether they 'currently' have vacancies. The number of skills shortage vacancies are multiplied by the ratio of the number of Burning Glass vacancies for technical roles for that year to the estimated number of ESS vacancies for technical roles reported.

The process is the same for calculating the number of skills shortages vacancies by sector for each of the five technical primary groups. It is also the same for professional roles, with the small change that the figures are annualised using the ratio of Burning Glass vacancies for professional roles for that year to the estimated number of ESS vacancies for professional roles reported.

Note, mismatch analysis by sector is not possible as somebody completing an FE course or apprenticeship can then go on to take a vacancy with an employer in any sector. For example, someone who has just completed an IT course can then fill a vacancy with a business in any sector, not just the information and communications sector; they could for instance be employed in an IT role in a school and so be filling a vacancy in the education sector.

7: Example mapping

The follow shows the mapping for the 'Carpenters, joiners and craft woodworkers' secondary occupation group.

7.1: Vacancies

Burning Glass job vacancy data		Labour Force Survey UK-level data on the existing workforce (used to apportion the total number of job vacancies to levels)				
SOC code (4 digit)	SOC occupation (4 digit)	Degree or equivalent (Level 6)	Higher education (Levels 4 and 5)	GCE A level or equivalent (Level 3)	GCSE grades A*-C or equivalent (Level 2)	No qualification
5315	Carpenters and joiners	1%	5%	61%	22%	11%
5442	Furniture makers and other craft woodworkers	3%	3%	43%	25%	26%
8121	Paper and wood machine operatives	1%	7%	35%	36%	21%

As the highest average education level is level 3 (46%), carpenters, joiners and craft woodworkers goes in the core technical primary group.

7.2: Apprenticeships

Skills Funding Agency LEP data cube	
Framework	**Pathway(s)**
Furniture Industry	All
Wood and Timber Processing and Merchants Industry	All
Construction Building	Wood Machining; Wood Occupations
Construction Skills	Wood Machining
Engineering	Engineering Woodworking, Pattern and Modelmaking
Engineering manufacture	Engineering Woodworking, Pattern and Modelmaking

Engineering Manufacture (Craft and Technician)	Engineering Woodworking, Pattern and Modelmaking
Furniture Furnishings and Interiors Industry	Finishing Furniture; Fitted Furniture and Interiors; Furniture Making; Supervision in the Furniture, Furnishings and Interiors Industry; Wood Machining; Restoring Furniture: Furniture and Wood Processing; Furniture and Wood Processing – CNC Machining; Solid Surfaces; Furniture design

7.3: FE courses

Skills Funding Agency LEP data cube
Extended Diploma in Site Carpentry (QCF)
Diploma in Bench Joinery (Construction) (QCF)
Diploma in Site Carpentry (Construction) (QCF)
Diploma in Site Carpentry (QCF)
NVQ Diploma in Wood Occupations (Construction) (QCF)
Diploma in Bench Joinery (QCF)
Diploma in Furniture Design and Making (QCF)
Diploma in Shopfitting Bench Joinery (QCF)
Diploma in Furniture Making (QCF)
Diploma in Wood Machining (QCF)
NVQ Certificate in Wood Occupations (Construction) (QCF)
NVQ Diploma in Engineering Woodworking, Pattern and Model Making (QCF)
NVQ Diploma in Woodmachining (Construction/Sawmilling Extrusion) (QCF)
NVQ Diploma in Furniture Making (QCF)
Extended Diploma in Bench Joinery (QCF)