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Engineering Council

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ENGINEERING FOOTPRINT

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Defining engineering using the 2020 Standard Occupational Classification (SOC) System

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Introduction

The following analysis forms part of continued work exploring the contribution of engineering to the UK's workforce and was prompted by the Office for National Statistics (ONS) revising its standard occupation classification (SOC) codes. As part of this piece of work, we conducted a series of analyses providing an up-to-date figure for the percentage of people working in engineering occupations in the UK.

Using the 2022 Labour Force Surveys (LFS), we concluded there are approximately 6.2 million people working in engineering occupations, representing nearly one fifth (19.2%) of the workforce[1].

Table 1: UK's Engineering Footprint by approximate number and percentage of the workforce (2020 SOC Codes)

	Approximate number	% of the UK workforce
Core engineering	3.9 million	12.1%
Related engineering	2.2 million	7.1%
Total engineering	6.2 million	19.2%

Source: Office of National Statistics (ONS), 'Quarterly Labour Force Surveys', 2022

In addition, to understand the impact of the ONS's newly updated occupational coding system from SOC2010 to SOC2020, we ran the same analysis using the original 2010 SOC codes. There were approximately 46,000 people fewer when using the 2010 SOC codes, however, there was little difference between the percentages of the 2010 and 2020 SOC codes (19.1% and 19.2% respectively).

This report outlines how the engineering footprint was originally developed and revised following the ONS's revision of its occupational coding system.

Background

Recognising the need for a universal and consistent definition of engineering, the EngineeringUK, the Royal Academy of Engineering and the Engineering Council worked together to establish an agreed upon list of SOC codes which encompasses all aspects of engineering, known as the 'engineering footprint'. It was designed, and later updated, in 2017 to be used by organisations to ensure robustness when referring to jobs and industries which could be considered 'engineering' and for indicating the sector's contribution to the UK workforce[2].

The footprint was developed by agreeing a set of criteria regarding the level of qualifications and skills deemed to be required for engineering roles. This included undertaking an extensive review of SOC and standard industrial classification (SIC) codes and agreeing the list that fulfilled the criteria. It can be further disaggregated to 'core' and 'related' engineering roles, defined as:

- **Core:** roles that are primarily engineering-based and require the consistent application of engineering knowledge and skills to execute the role effectively (for example, civil engineers, mechanical engineers, electrical engineers, science, engineering and production technicians, machine operatives and so on).

[1] It is worth noting this update does not include a figure for engineering industries, as the ONS did not revise the SIC codes used to categorise these.

[2] Engineering Council. (2018). *Defining the engineering sector: the engineering footprint*. Available at: https://partner.engc.org.uk/media/9134/engineering-footprint-report-summary-raeng.pdf

- **Related:** roles that require a mixed application of engineering knowledge and skill alongside other skill sets, which are often of greater importance to executing the role effectively (for example, quantity surveyors, architects, IT operations technicians, web designers and developers and so on).

More recently, the ONS have undertaken work to update the occupational coding system used for their surveys from SOC2010 to SOC2020. Having investigated the codes thoroughly and the changes between lists provided on the ONS website[3,4], we have updated the engineering footprint accordingly. Here we document the changes to the footprint and the effect on estimates related to the size and composition of the engineering workforce.

Decision-making process

Upon reviewing the changes to the coding system, here we explain the decision-making process we followed for updating the footprint to SOC 2020 codes.

1. **Where the code and description did not change** the occupation remained in the footprint and under the same core/related category.

2. **Where ONS had identified a change** we reviewed the SOC codes within the footprint that were affected.
   - For those where two SOC2010 codes were combined:
     - If both were in the previous footprint, the new code was included in the new footprint.
     - If only one was in the previous footprint, we reviewed the new description alongside how many occupations within the new code were engineering-related, and if this was more than 50% the code was included in the new footprint.
   - For those where a SOC2010 code was split into two codes in SOC2020:
     - Descriptions for both codes were reviewed, and any engineering-related codes were included in the new footprint.

3. **Where a SOC2010 code within the previous footprint had a new description in SOC2020** we reviewed the full SOC2020 code list.
   - If the new description was engineering-related, the new code was included in the footprint. Otherwise, it was not included.
   - We searched for the SOC2010 description in other codes and where found, the new corresponding code was included in the new footprint.
   - If the SOC2010 description was not included in the SOC2020 list, we reviewed the mapping document to find which code the occupations were listed under to ensure all engineering-related occupations were attributed to a code in the new list[5].

In addition, we took this opportunity to re-look at the existing codes. No major changes were made as a result of this, but a small number of codes were moved between core and related, for example including ensuring all 'operatives' were in the same category.

[3] Office of National Statistics. (2016). *SOC 2010.* Available at: https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2010

[4] Office of National Statistics. (n.d.). SOC 2020 Volume 2: the coding index and coding rules and conventions. Available at: https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/soc2020/soc2020volume2codingrulesandconventions#toc

[5] It is worth noting that whilst the ONS changed a number of codes related to engineering occupations, in some cases, the description remained the same. Therefore, whilst the full list of SOC codes may look different, the real number of changes is minimal.

The full list of 2020 SOC codes in the engineering footprint can be found in the Appendix.

Differences between SOC2010 and SOC2020

Table 2 shows the difference in the total estimated number of employees in the engineering workforce in 2022 as defined using the SOC2010 and SOC2020 codes, for core and related engineering roles, separately and combined.

Table 2: Comparing the use of the 2010 and 2020 SOC codes for calculating the UK's Engineering Footprint

	2010 SOC Codes	**2020 SOC Codes**
Core	12.1%	12.1%
Related	6.9%	7.1%
Core and related	19.1%	19.2%
Extrapolated engineering footprint	6.1 million	6.2 million

Source: Office of National Statistics (ONS), 'Quarterly Labour Force Surveys', 2022

The above demonstrates a slight increase in the size of the engineering footprint with the revised 2020 SOC codes (n= 46,000 people). The difference, however, between the percentages of core and related engineers across both SOC codes was minimal and no greater than 0.2 percentage points. This represents a minimal change and is consistent with previous reports[6].

[7] EngineeringUK. (2022). Trends in the engineering workforce Between 2010 and 2021. Available at: https://www.engineeringuk.com/media/318305/trends-in-the-engineering-workforce_engineeringuk_2022.pdf

Methodology

The engineering footprint was calculated in accordance with previous methods, using the ONS's Quarterly Labour Force Surveys (LFS). The LFS quarterly surveys for 2022 were merged and an extrapolation figure calculated by dividing the mid-year UK population estimate for 2021 by the total cases in the merged dataset. Whilst we would have preferred to use the mid-year estimate from 2022, this was not available at the time of writing[7].

[7] Office of National Statistics. (2023). *Update on plans for the publication of population and migration statistics*. Available at: https://www.ons.gov.uk/news/statementsandletters/updateonplansforthepublicationofpopulationandmigrationstatistics

Appendix - Full list of SOC 2020 codes in the engineering footprint 2023

Code	SOC 2020 description	CORE/RELATED
1121	Production managers and directors in manufacturing	CORE
1122	Production managers and directors in construction	CORE
1123	Production managers and directors in mining and energy	CORE
2121	Civil engineers	CORE
2122	Mechanical engineers	CORE
2123	Electrical engineers	CORE
2124	Electronics engineers	CORE
2125	Production and process engineers	CORE
2126	Aerospace engineers	CORE
2127	Engineering project managers and project engineers	CORE
2129	Engineering professionals n.e.c	CORE
2133	IT business analysts, architects and systems designers	CORE
2134	Programmers and software development professionals	CORE
2135	Cyber security professionals	CORE
2136	IT quality and testing professionals	CORE
2137	IT network professionals	CORE
2139	Information technology professionals n.e.c	CORE
2152	Environment professionals	CORE
2161	Research and development (R&D) managers	CORE
2481	Quality control and planning engineers	CORE
2482	Quality assurance and regulatory professionals	CORE
3112	Electrical and electronics technicians	CORE
3113	Engineering technicians	CORE
3114	Building and civil engineering technicians	CORE
3115	Quality assurance technicians	CORE
3116	Planning, process and production technicians	CORE
3119	Science, engineering and production technicians n.e.c	CORE
3581	Inspectors of standards and regulations	CORE
5211	Sheet metal workers	CORE
5212	Metal plate workers, smiths, moulders and related occupations	CORE
5213	Welding trades	CORE
5214	Pipe fitters	CORE
5221	Metal machining setters and setter-operators	CORE
5222	Tool makers, tool fitters and markers-out	CORE
5223	Metal working production and maintenance fitters	CORE
5224	Precision instrument makers and repairers	CORE
5225	Air-conditioning and refrigeration installers and repairers	CORE
5231	Vehicle technicians, mechanics and electricians	CORE
5232	Vehicle body builders and repairers	CORE
5234	Aircraft maintenance and related trades	CORE
5235	Boat and ship builders and repairers	CORE
5236	Rail and rolling stock builders and repairers	CORE
5241	Electricians and electrical fitters	CORE
5242	Telecoms and related network installers and repairers	CORE

5243	TV, video and audio servicers and repairers	CORE
5244	Computer system and equipment installers and servicers	CORE
5245	Security system installers and repairers	CORE
5246	Electrical service and maintenance mechanics and repairers	CORE
5249	Electrical and electronic trades n.e.c	CORE
5250	Skilled metal, electrical and electronic trades supervisors	CORE
5315	Plumbers and heating and ventilating installers and repairers	CORE
5330	Construction and building trades supervisors	CORE
8114	Plastics process operatives	CORE
8115	Metal making and treating process operatives	CORE
8120	Metal working machine operatives	CORE
8131	Paper and wood machine operatives	CORE
8132	Mining and quarry workers and related operatives	CORE
8133	Energy plant operatives	CORE
8134	Water and sewerage plant operatives	CORE
8139	Plant and machine operatives n.e.c	CORE
8143	Routine inspectors and testers	CORE
8153	Rail construction and maintenance operatives	CORE
1137	Information technology directors	RELATED
1254	Waste disposal and environmental services managers	RELATED
2131	IT project managers	RELATED
2132	IT managers	RELATED
2141	Web design professionals	RELATED
2451	Architects	RELATED
2452	Chartered architectural technologists, planning officers and consultants	RELATED
2453	Quantity surveyors	RELATED
2454	Chartered surveyors	RELATED
2455	Construction project managers and related professionals	RELATED
3120	CAD, drawing and architectural technicians	RELATED
3131	IT operations technicians	RELATED
3132	IT user support technicians	RELATED
3133	Database administrators and web content technicians	RELATED
3511	Aircraft pilots and air traffic controllers	RELATED
5233	Vehicle paint technicians	RELATED
5311	Steel erectors	RELATED
5312	Stonemasons and related trades	RELATED
5313	Bricklayers	RELATED
5314	Roofers, roof tilers and slaters	RELATED
5316	Carpenters and joiners	RELATED
5317	Glaziers, window fabricators and fitters	RELATED
5319	Construction and building trades n.e.c	RELATED
8111	Food, drink and tobacco process operatives	RELATED
8113	Chemical and related process operatives	RELATED
8119	Process operatives not elsewhere classified	RELATED
8141	Assemblers (electrical and electronic products)	RELATED
8142	Assemblers (vehicles and metal goods)	RELATED

8145	Tyre, exhaust and windscreen fitters	RELATED
8149	Assemblers and routine operatives n.e.c	RELATED
8151	Scaffolders, stagers and riggers	RELATED
8152	Road construction operatives	RELATED
8159	Construction operatives n.e.c	RELATED
8221	Crane drivers	RELATED
8232	Marine and waterways transport operatives	RELATED