

2020

# The 2020 List of Occupations in High Demand: A Technical Report

Labour Market Intelligence research programme



higher education  
& training  
Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA





2020

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## Acknowledgements

The authors would like to thank everyone who assisted with and contributed to the creation of the List of Occupations in High Demand for 2020. We extend our gratitude to the Department of Higher Education and Training (DHET) and the Development Policy Research Unit (DPRU) for their guidance and input throughout the process. In particular, the contributions of Ms Mamphokhu Khuluvhe (DHET), Ms Sybil Chabane (DHET), Dr Hersheela Narsee (independent consultant), Prof. Mike Rogan (Rhodes University), and Prof. Haroon Borat (UCT and DPRU) were invaluable to the process of developing this list. Lastly, we would like to thank the South African Qualifications Authority (SAQA), under the leadership of Dr Julie Reddy, for assisting with mapping qualifications to each of the occupations.

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## Suggested citation

DNA Economics (2020). *The 2020 List of Occupations in High Demand: A Technical Report*. Produced for the Department of Higher Education and Training (DHET) as part of its Labour Market Intelligence (LMI) research programme.

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# Acronyms and abbreviations

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<b>3S</b>	Sensible, skilled, and in shortage	<b>MAC</b>	Migration Advisory Council
<b>BPESA</b>	Business Processes Enabling South Africa	<b>MER</b>	Manufacturing, engineering, and related services
<b>CATHS</b>	Culture, arts, tourism, hospitality, and sports	<b>NAACAM</b>	National Association of Automotive Component and Allied Manufacturers
<b>CESM</b>	Classification of educational subject matter	<b>NDOH</b>	National Department of Health
<b>CFE</b>	Call for evidence	<b>NGP</b>	New growth path
<b>CHIETA</b>	Chemical Industries Education and Training Authority	<b>NHLS</b>	National Health Laboratory Service
<b>CHW</b>	Community healthcare worker	<b>NQF</b>	National Qualifications Framework
<b>CJ</b>	Career Junction	<b>OCJ</b>	Office of Chief Justice
<b>COVID-19</b>	Coronavirus disease 2019	<b>OECD</b>	Organisation for Economic Co-Operation and Development
<b>CSIR</b>	Council for Scientific and Industrial Research	<b>OFO</b>	Organising Framework for Occupations
<b>CSL</b>	Critical Skills List	<b>OIHD</b>	Occupations in high demand
<b>CTFL</b>	Clothing, textiles, footwear, and leather	<b>PCA</b>	Principal component analysis
<b>DEL</b>	Department of Employment and Labour	<b>PIVOTAL</b>	Professional, vocational, technical, and academic learning
<b>DHET</b>	Department of Higher Education and Training	<b>PSET</b>	Post-school education and training
<b>DOJ</b>	Department of Justice	<b>PsySSA</b>	Psychological Society of South Africa
<b>DoT</b>	Department of Tourism	<b>QLFS</b>	Quarterly Labour Force Survey
<b>DOT</b>	Department of Transportation	<b>SABMEO</b>	South African Blanket Manufacturers Employers Organisation
<b>ESSA</b>	Employment Services South Africa	<b>SACAP</b>	South African Council for Architectural Profession
<b>ETDP</b>	Education, training, and development practices	<b>SAFREA</b>	South African Freelance Association
<b>EW</b>	Energy and water	<b>SAIBA</b>	South African Institute for Business Accountants
<b>HPCSA</b>	Health Professionals Council of South Africa	<b>SAIEE</b>	South African Institute for Electronic Engineers
<b>HW</b>	Health and welfare	<b>SAS</b>	Safety and security
<b>ICT</b>	Information and communications technology	<b>SASA</b>	Security Association of South Africa
<b>IITPSA</b>	Institute of Information Technology Professionals of South Africa	<b>SAVC</b>	South African Veterinary Council
<b>IOBSA</b>	Institute of Bankers of South Africa	<b>SBIDZ</b>	Saldanha Bay Industrial Development Zone
<b>IPAP</b>	Industrial Policy Action Plan	<b>SETA</b>	Sector Education and Training Authority
<b>IPASA</b>	International Police Association of South Africa	<b>SIPs</b>	Strategic integrated projects
<b>IRMSA</b>	Institute of Risk Management of South Africa	<b>SSI</b>	Semi-structured interview
<b>JIPSA</b>	Joint Initiative for Priority Skills Acquisition	<b>SSP</b>	Sector skills plan
<b>JOI</b>	Job Opportunities Index	<b>TETA</b>	Transport Education and Training Authority
<b>LMDS</b>	Labour Market Dynamics Survey	<b>W&amp;R</b>	Wholesale and retail
<b>LPO</b>	List of Priority Occupations		



PART 1

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# Introduction to the List of Occupations in High Demand

Understanding occupational dynamics and labour market requirements are vital to meeting the goals of the National Development Plan (NDP), the New Growth Path (NGP), and the Industrial Policy Action Plan (IPAP). The Department of Higher Education and Training (DHET) has an important role to play in both identifying the key occupations that will support these policy initiatives and improving the responsiveness of the post-school education and training (PSET) system to the skills needs of the economy.

The List of Occupations in High Demand (OIHD) (henceforth referred to as “the list of OIHD”) is one of the most important mechanisms through which the DHET fulfils this role. The primary purpose of the list of OIHD is to inform planning in the PSET sector by:

- Signalling the need for the development of new qualifications;
- Acting as a signpost for enrolment planning (Reddy, Rogan, Mncwango, & Chabane, 2018); and
- Informing career guidance for learners and work-seekers.

To fulfil this purpose, the list of OIHD consists of occupations that show relatively strong employment growth or experience shortages in the labour market. More specifically, occupations are said to be in high demand if they fulfil the descriptions outlined in Figure 1 below:

**FIGURE 1:** The concept of an occupation being in high demand



An occupation has shown relatively strong signs of employment growth in the past, in the present, and potentially in the future as well;



An occupation has been identified as being in shortage (meaning that the demand for a skill/occupation is higher than the supply of adequately skilled individuals turned out by the PSET system); or



An occupation is seen as novel and is expected to emerge in the near future due to innovation and technological advancements or is brought about by government strategic priority.

*Source: Reddy, Rogan, Mncwango, & Chabane (2018)*

It is through providing a clear understanding of the demand for skills and occupations that are not being met in South Africa that the list of OIHD acts as an integral component for holistically understanding South African labour market dynamics.

Beyond presenting the list of OIHD, this technical report’s primary aim is to describe the approach taken to identifying occupations that fulfil the definitions articulated in Figure 1. This report also seeks to clarify the historical foundations for the list of OIHD by explaining its methodological evolution over time and by describing the international methodologies from which the list of OIHD methodology borrows. The current methodology will then be described, and an analysis of the results presented. First, however, it is important to explain South Africa’s Organising Framework for Occupations (OFO) as it represents an essential building block to understanding the methodology employed.



**PART 2**

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# **Organising Framework for Occupations**

According to the DHET, the OFO is a classification framework that establishes “a common language for talking about occupations”. The OFO:

is a skill-based, coded classification system of occupations which is used by the DHET for “identifying, reporting and monitoring skills demand and supply” in the labour market. It captures almost all occupations in the country and classifies them by skill level and skill specialisation. (Reddy et al., 2018, p. 10)

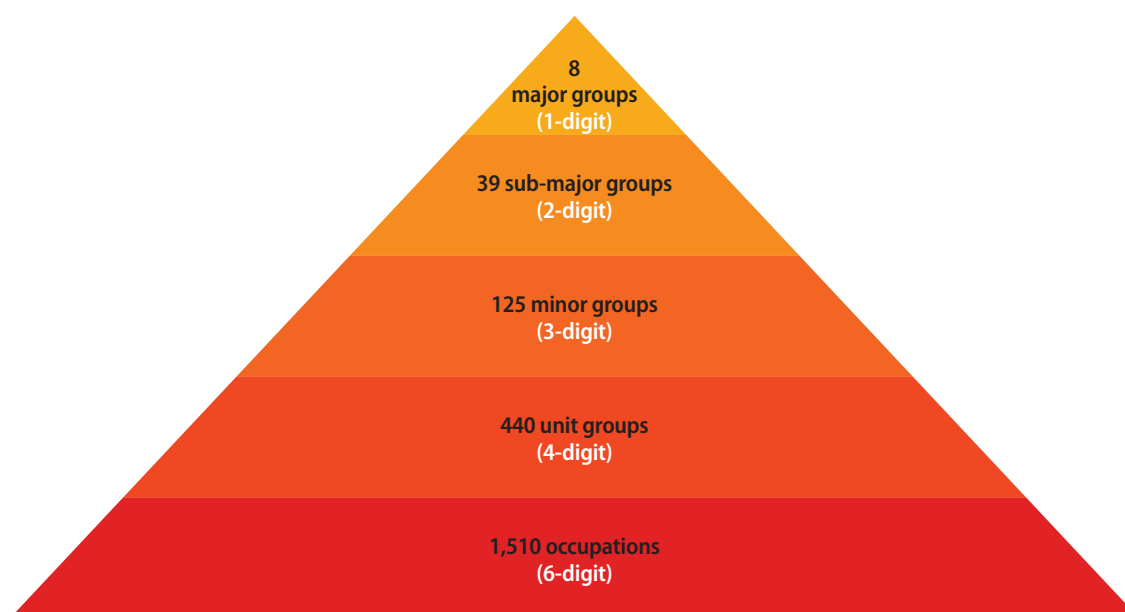
The framework consists of eight major groups, categorised primarily according to skill level and secondarily according to area of specialisation. The eight major groups are presented in Table 1.

**TABLE 1:** Meaning of 1<sup>st</sup> digit of OFO code

OFO CODE 1 <sup>ST</sup> DIGIT	DESCRIPTION
1	Managers
2	Professionals
3	Technicians and associate professionals
4	Clerical support workers
5	Service and sales workers
6	Skilled agricultural, forestry, fishery, craft, and related trades workers
7	Plant and machine operators and assemblers
8	Elementary occupations

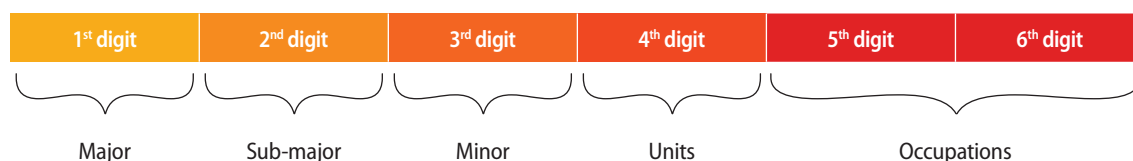
Each of these major groups are then disaggregated into four levels, with each subsequent level providing more specific detail than its predecessor. As shown in Figure 2, the eight one-digit major groups together encapsulate the entire set of 1,510 six-digit occupations.

**FIGURE 2:** Number of classifications in the OFO



Source: DHET (2019)

Occupations are, therefore, the lowest coded level of disaggregation.<sup>1</sup> Each occupation is given a six-digit code with each digit in the code referring to its respective grouping, as depicted in the pyramid above. This can be most easily understood as follows:



The eight major groups will be particularly interesting when analysing the composition of the list of OIHD. The major group indicates the skill level and the broad area of specialisation. Figure 3 maps the major groups to the National Qualifications Framework (NQF) levels. It illustrates that as the major groups move from 1 to 8, the NQF levels decrease.

**FIGURE 3:** Relationship between OFO major categories and NQF level

NSDS (level of skill required for a given NQF)	NQF	OFO MAJOR GROUP			
High	10	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">2</span>                      Professionals                 </div>		<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">1</span>                      Managers                 </div>	
	9				
	8				
	7				
Intermediate	6	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">3</span>                      Technicians and associate professionals                 </div>			
	5				
Entry	4	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">4</span>                      Clerical support workers                 </div>	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">5</span>                      Service and sales workers                 </div>	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">6</span>                      Skilled agricultural, forestry, fishery, craft, and related trade workers                 </div>	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">7</span>                      Plant and machine operators and assemblers                 </div>
	3				
	2	<div style="text-align: center;"> <span style="background-color: #f9a825; border-radius: 50%; padding: 5px;">8</span>                      Elementary occupations                 </div>			
	1				

Source: DHET (2015)

The importance of the relationship between OFO major categories and occupations presented in Figure 3 will become apparent in subsequent sections of this report.

<sup>1</sup> There are specialisations within the occupations in the OFO, but these are not coded.

PART 3

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# Theoretical foundation



The 2020 list of OIHD will be the list's fourth iteration, the first having been published in 2014, followed by a new publication every two years thereafter. Over this period, the methodology has evolved as the list has responded to the lessons learned from each previous publication.

A report completed by DNA Economics in 2020 outlined the approaches followed for the previous iterations of the list, and highlights the development of the methodology over time:

**TABLE 2:** Historical overview of the list of OIHD

ITERATION OF THE LIST	DEFINING CHARACTERISTICS	BRIEF OVERVIEW OF THE METHODOLOGY USED TO GENERATE THE LIST
2014	A primarily qualitative approach based on the review of strategic government documents.	<ul style="list-style-type: none"> <li>• Various sources were used qualitatively, such as Sector Education and Training Authority (SETA) professional, vocational, technical, and academic learning (PIVOTAL) lists, sector skills plans (SSPs), strategic integrated projects (SIPs), the Joint Initiative for Priority Skills Acquisition (JIPSA), and so forth.</li> <li>• Given these sources, a points-based approach was used, with an occupation scored out of 100 (based on SETA identification, appearance in the SIPs and the JIPSA, the number of associated vacancies, etc.).</li> <li>• This created a list of occupations (at the six-digit level) that was then validated and added to by a broad set of private and public sector participants.</li> </ul>
2016	<p>Included quantitative analysis of data from the Quarterly Labour Force Survey (QLFS) and Job Opportunity Index (JOI) in addition to documentary review.</p> <p>Included quantitative forecasting of occupational growth.<sup>2</sup></p> <p>Broader validation process with private and public sector stakeholders.</p>	<ul style="list-style-type: none"> <li>• Data from the QLFS and the JOI were analysed to assess occupational growth and job vacancy trends.</li> <li>• Forecasts (up to 2025) of occupational growth were made and then used to ascertain the top 20 job prospects in the country.</li> <li>• Various sources (such as SETA PIVOTAL lists, the SIPs, the DHET's call for evidence [CFE], literature in South Africa, etc.) were used qualitatively.</li> <li>• These findings were amalgamated and presented to various private and public stakeholders for validation (although the sample of "validators" was far smaller than the sample used in the 2014 list).</li> </ul>
2018	<p>Developed a multidimensional index of demand.</p> <p>Included data from Career Junction (CJ).</p> <p>2-stage approach consisting of a bottom-up quantitative method and top-down qualitative method.</p>	<ul style="list-style-type: none"> <li>• Data from the QLFS and CJ were analysed, and a four-digit OFO-coded list was produced.</li> <li>• Various sources (such as SETA PIVOTAL lists and SSPs, the SIPs, the DHET's CFE, grey literature in South Africa, etc.) were used qualitatively, to turn the four-digit list into a six-digit list.</li> <li>• This list was then validated by a limited number of stakeholders in both the private and public sectors.</li> </ul>

<sup>2</sup> Forecasts are often extremely inaccurate. Although future information on labour market trends is very important, it is difficult to obtain forecasts that are reliable. Therefore, forecasts were not included in the 2018 and 2020 iterations of the list of OIHD. However, a forecast analysis at an occupational level is at the beginning phases of its development, with the hope of including the findings of this forecast analysis in the 2022 iteration of the list of OIHD.

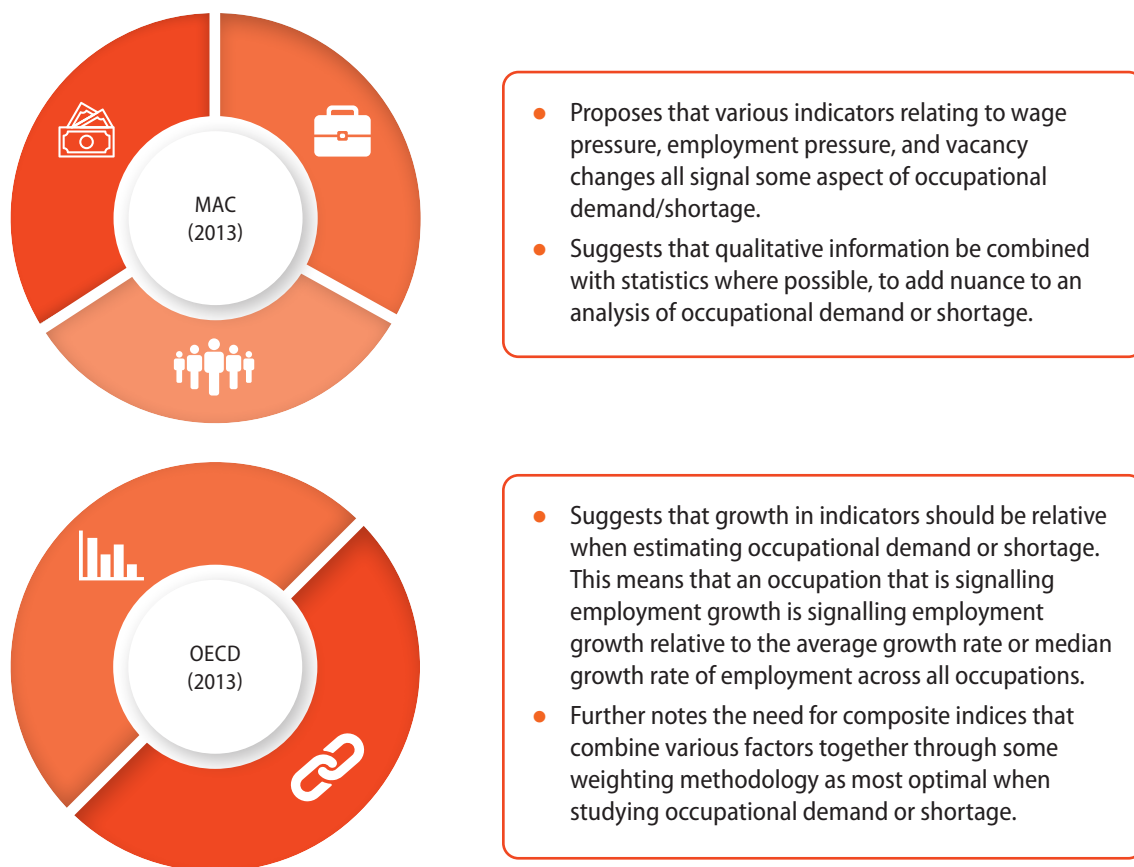


A rapid review of the second column in Table 2 reveals that the most visible component of the methodological evolution was the increasing importance of quantitative data. While there are several approaches internationally to identifying skills and occupational shortage, two in particular are highly informative. These are included within the shortage occupations lists produced by the UK's Migration Advisory Committee (MAC) and the Organisation for Economic Co-operation and Development's (OECD) Skills for Jobs indicators.

In the absence of a single indicator of occupational shortage, both approaches create a multidimensional index comprised of a range of direct and indirect measures (proxy indicators); that is, they combine several indicators into a single indicator. The strength of such an approach is two-fold. Firstly, because each proxy indicator will, by definition, be imperfect, the index creates a holistic picture utilising cumulative evidence instead of considering each indicator in isolation. Secondly, because each indicator is weighted explicitly, the importance placed on each indicator is transparent and therefore open to discussion and critique. Exactly how the index is calculated is discussed in the next section, detailing the 2020 methodology.

The increased prominence of the quantitative component on the list of OIHD has, however, not been at the expense of the qualitative component. Indeed, because quantitative approaches can often become somewhat rigid, and labour markets can rapidly change (think of the likely impact of the COVID-19 pandemic), increased focus has also been placed on the validation process of the list. These learnings, along with additional contributions by the MAC and OECD methodologies, are summarised in Figure 4.

**FIGURE 4:** Literature synopsis



Source: MAC (2013); DHET (2016); OECD (2017)



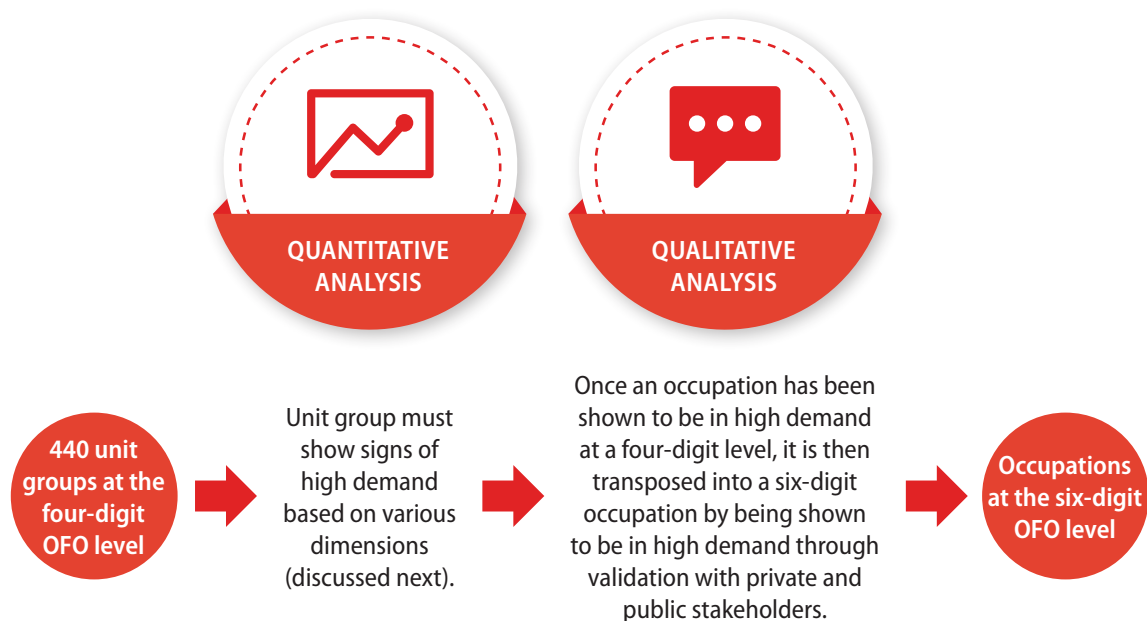
**PART 4**

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# **Methodology**

As with the 2018 methodology, the 2020 methodology consists of a two-stage approach consisting of a bottom-up quantitative component and a top-down qualitative component.

**FIGURE 5:** High-level view of the list of OIHD methodology



The data used for the analysis are at the four-digit OFO level. Therefore, the quantitative analysis aims to rank the 440 unit groups of the OFO according to demand. The highest-ranking unit groups are then further analysed using the qualitative analysis. Here, the methodology unpacks which of the six-digit occupations under the four-digit unit group could be driving the result. Those occupations are then put through a process of validation to produce a final list. The process presented in Figure 5 is explained in more detail in the following sub-sections.

## 4.1 Quantitative methodology

The multidimensional index of the 2020 list of OIHD relies on nine indicators of occupational demand drawn from the literature and adapted to the South African context. As per the MAC methodology and building on the 2018 methodology, the indicators can be categorised into dimensions of (1) employment pressure, (2) wage pressure, (3) vacancy pressure, and (4) strategic demand. Table 3 describes the rationale for the inclusion of each of these dimensions, along with their associated indicators. The source of the information and the “statistical threshold” is also presented. The meaning and implication of the “statistical threshold” is discussed below.

**TABLE 3:** Quantitative methodology indicator list and description

DIMENSION	REASON FOR INCLUSION OF DIMENSION	INDIVIDUAL INDICATORS	DATA SOURCE	STATISTICAL THRESHOLD
Employment pressure	An increase in the number of people employed, the hours worked by employees, or the duration of employment tenure could all be associated with an increase in the demand for work of a particular nature when analysed simultaneously.	Employment growth	QLFS	Change in employment growth above the median between 2010 and 2017.
		Employment intensity growth	QLFS	Change in employment intensity above the median between 2010 and 2017 (hours worked by full-time workers).
		Employment duration	QLFS	Change in the proportion of employees with tenure of less than one year above the median between 2010 and 2017.
Wage pressure	Upward pressure on wages could signal that employers are willing to pay more for labour than they were previously, making the case that their demand for labour has increased relative to the supply of that labour.	Mean wage growth	QLFS/LMDS	Change in mean hourly earnings above the median between 2010 and 2017.
		Median wage growth	QLFS/LMDS	Change in median hourly earnings above the median between 2010 and 2017.
		Conditional mean wage growth <sup>3</sup>	QLFS/LMDS	Change in the conditional mean hourly wage above the median between 2010 and 2017.
Vacancy pressure	An increase in the number of vacancies or the duration of vacancies advertised signals that the demand for labour is not being met within a particular occupation, and vacancies may be increasing as a result.	Vacancy growth	JOI/CJ	Change in vacancy growth above the median in the JOI or CJ listings.
		Vacancy duration	CJ	Change in vacancy renewals ("hard-to-fill") above the median in the CJ listings.
Strategic demand	Occupations identified in strategic priority documents signal that governments are expected to invest in the relevant sectors linked to those occupations in the future. Investment in an industry is positively associated with an increase in the demand for labour of a particular kind.	Strategic sectoral priority	SETA PIVOTAL lists	Occupations for which a quantity over the median is needed.

<sup>3</sup> Conditional on age and province

The index score for a particular unit group is constructed by assigning either a zero or one to each of the indicators based on whether the unit group satisfies the **statistical threshold**. In most cases, this threshold is the median value across all unit groups. The only exception is the “strategic sectoral priority” indicator for which the unit group is assigned one if it appears in the SETA PIVOTAL lists, and a zero if it does not. The formula below shows how the index score for each unit group is calculated.

**EQUATION 1:** Formula for calculating multidimensional index of occupational demand

$$\text{Index score for each unit group} = \sum_{\substack{\text{Strategic sectorial priority} \\ i = \text{employment growth}}} w_i s_i$$

$w_i$  = weight assigned to indicator  $i$

$s_i = 1$  if **statistical threshold** of indicator  $i$  satisfied

$s_i = 0$  if **statistical threshold** of indicator  $i$  not satisfied

Besides the statistical threshold, the formula for calculating the index score has one more variable – the weight. This weight is directly related to the importance placed on each indicator as it pertains to the relationship of the indicator to occupational demand. The 2018 list of OIHD methodology put forward two techniques to determine the appropriate weight for each indicator:

1. **Equal weighting within and across dimensions.** Each of the four dimensions (employment pressure, wage pressure, vacancy pressure, and strategic priority) were equally weighted by  $\frac{1}{4}$ . If there were three indicators in a dimension, each indicator was then weighted equally, with weights summing up to  $\frac{1}{4}$  (all three indicators would then obtain a weight of  $\frac{1}{12}$ ). The approach assumes each dimension has equal importance in terms of determining occupational demand.
2. **Subjective weighting across indicators.** Some research also points to the fact that some indicators of occupational demand are more critical than others. If, for instance, labour demand was driven specifically by the government of a particular country, weighting strategic demand more highly than other indicators would be reasonable.

An additional statistical weighting technique was employed in the 2020 iteration of the list of OIHD to make results more robust, namely:

3. **Principal components analysis (PCA).** PCA is a statistical technique that uses the relationships between the variables (indicators) to estimate the most appropriate weights. It does this in a way that reduces the impact of high correlations between indicators on our estimation of relative occupational demand. Therefore, in addition to being an objective method for weighting indicators, this methodology creates weights that correct for the relationship between variables (ensuring that the index estimated does not rely too heavily on one type of indicator or one dimension).<sup>4</sup>

<sup>4</sup> For example, both mean and median wage growth are highly correlated with one another.

These weighting schemes were applied to the data on all indicators in Table 2 to create an index of occupational demand. The higher the index score in each case, the more the occupation signals that it is in high demand relative to all other occupations. If the occupation is ranked in the top 25% (>75<sup>th</sup> percentile) of unit groups, it is deemed to be in high demand – at least in terms of the quantitative analysis.

In order to analyse evidence holistically, all weighting schemes are applied to assess the differences in potential occupations in high demand. If one weighting scheme produces a sufficiently different list to another, the unit groups that differ will be included in the stakeholder validation (explained under Section 4.2 outlining the qualitative methodology). Given the large overlap of occupations across these different weighting methods, the unit group list presented in the analysis section only describes the “equally weighted” list of OIHD.<sup>5</sup>

With the background of OFO codes at hand, it is essential to point out that all data collected from the QLFS are found at the unit group classification (four-digit OFO level). Therefore, index scores of occupational demand apply to all unit groups at the four-digit level only, which provides a less detailed description than its six-digit counterpart.

To assess which six-digit occupations are driving the results at the four-digit level requires a qualitative analysis (i.e., if an economist is seen to be in high demand at a four-digit level, is the six-digit occupation driving that result 2019-263101 – Economist, 2019-263102 – Economic research manager, or are both occupations driving that four-digit result?). This qualitative approach is explained in the next subsection.

## 4.2 Qualitative methodology

The main goals of the qualitative analysis are twofold:

1. To justify the **inclusion** of six-digit occupations that were signalled to be in high demand at the four-digit unit group level; and
2. To justify the **exclusion** of six-digit occupations that were signalled to be in high demand at the four-digit unit group level.

To either include or exclude occupations at the six-digit level, the following sources were reviewed for evidence of high occupational demand:



- SETA PIVOTAL lists across 21 SETAs;
- Submissions to the DHET’s CFE;
- An analysis of other literature published by governments, researchers, or academics (not found in academic journals).

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<sup>5</sup> The remaining lists created from the different weighting methods can be found in the appendices on “robustness checks”.

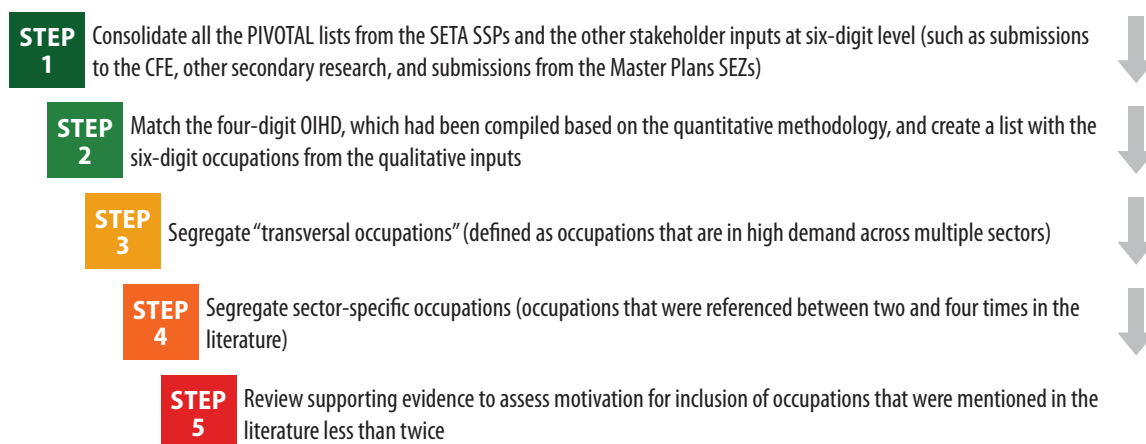
The evidence from the literature review was then overlaid against the evidence from the quantitative analysis using the following inclusion/exclusion criteria:

**FIGURE 6:** Inclusion/exclusion criteria for qualitative analysis

INCLUSION CRITERIA		
	<p><b>Automatic inclusion</b></p> <ul style="list-style-type: none"> <li>Occupation is mentioned five or more times across literature</li> <li>Interview with industry representative provides strong motivation for inclusion</li> </ul>	<p><b>Conditional inclusion based on supporting evidence</b></p> <ul style="list-style-type: none"> <li>Occupation is mentioned two to four times across literature, but demand seems narrowly specified</li> <li>Occupation is mentioned one to two times across literature, but underlying qualitative evidence is robust</li> </ul>
	<p><b>Conditional inclusion based on literature</b></p> <ul style="list-style-type: none"> <li>A literature review of other grey literature or academic sources provides evidence that the occupation in question is in high demand</li> </ul>	
EXCLUSION CRITERIA		
	<p><b>Automatic exclusion</b></p> <ul style="list-style-type: none"> <li>Interview with industry representative provides strong motivation for exclusion</li> <li>Occupation is not sufficiently skilled, not sufficiently in shortage, or not sensible (3S)</li> </ul>	<p><b>Conditional exclusion based on supporting evidence</b></p> <ul style="list-style-type: none"> <li>Occupation is mentioned one to two times, but underlying qualitative evidence is not robust (i.e., principal custodians of said occupation are not the voices behind including particular occupations)</li> </ul>

These criteria, along with the broader qualitative methodology, are applied in the following manner:

**FIGURE 7:** Five-step qualitative methodology approach



Once this five-step process is followed, the draft list of OIHD at the six-digit level is complete. It is then ready for validation.

## 4.3 Validation

### 4.3.1 Why validation is required

The list of OIHD methodology follows best-practice protocols. This is true because:

1. It applies a “mixed-methods” approach (i.e., it mixes relevant quantitative and qualitative evidence);
2. It is transparent (i.e., there is an available argument for the inclusion and exclusion of any occupation included in the list);
3. It uses relative measurements of demand (as per the suggestion of the OECD’s Skills for Jobs approach);
4. It covers the dimensions of occupational demand used by the UK’s MAC methodology; and
5. It uses cumulative evidence to identify occupations in high demand.

An important sixth way in which the methodology endeavours to adhere to best practice, and thereby produce an accurate list of OIHD, is validation. As mentioned before, the labour market is always moving and shifting demand from one occupation to the next as economic forces play out and strategic directions change. Furthermore, it is also accepted that the data used (both qualitative and quantitative) have their shortcomings. These realities make the validation process essential. More specifically, the following shortcomings exist:

#### Bias and time-lag in quantitative data

In terms of the quantitative analysis, data are relatively imperfect. Some data sources (specifically CJ) tend to be biased towards occupations that are more professional, managerial, and technical. This tendency has the potential impact of biasing the index of occupational demand towards those occupations in major groups 1, 2, and 3 according to the OFO. Added to this, some data from the QLFS have a two-year lag and is only available up until 2018.

The inherent weaknesses in the quantitative data makes the qualitative analysis all the more important. Occupations were, therefore, either excluded from or included in the list of OIHD based on qualitative evidence, decreasing the reliance on quantitative evidence to a degree, while also introducing some future-orientated outlooks (OECD, 2016, 2018, 2020).<sup>6</sup>

#### Effectiveness of qualitative analysis

The qualitative analysis is highly dependent on the quality, specificity, and coverage of the qualitative evidence. In this context, qualitative evidence refers to strategic documents. If these documents have not been officially published, they cannot not be included in the qualitative review process. This could mean that occupations in sectors and industries of paramount importance to the South African economy that have not developed plans will not necessarily be included in the draft list.

While the stakeholder engagement process has been vastly widened and improved since the 2018 iteration of the list, if stakeholders have not submitted any evidence, the occupations will not appear. Although the quantitative evidence might mitigate this problem to some degree, the validation process is the only meaningful way to fill these gaps.

<sup>6</sup> It should also be noted that the indicators themselves have not been forecasted in any way. Government strategic priority documents are, themselves, forward-looking. However, research starting at the end of September 2020 seeks to forecast various aspects of labour demand and supply from, inter alia, the QLFS and CJ databases.



### 4.3.2 Validation

Technically, the validation process can be considered part of the qualitative analysis. The goal is to review evidence for the purpose of including or excluding an occupation from the list of OIHD. To produce the present list, three channels of validation were employed:

#### 1 Social partners of the Jobs Summit

On 25 June 2020, the DHET presented the methodology to the social partners of the Jobs Summit with representation from business, labour, government, and community. After the workshop, the list of OIHD was provided to the partners for comments. The formal request was that partners would validate the list by identifying occupations that had been included but should not have been, and those that had not been included but should have been. Reliable evidence and a strong argument were required in any instance where occupations were identified for either inclusion or exclusion.

#### 2 Public comment

The list of OIHD, along with a description of the methodology was gazetted for public comment on 18 August 2020. The public was given three weeks to respond. The request to the public was the same as the one made to the social partners of the Jobs Summit, and the strength of the argument or evidence provided by any particular entity or individual was evaluated according to the same criteria applied to the initial qualitative analysis. The number of times an occupation was mentioned, as well as the position of the individual commentator or entity relative to the occupation's primary industry was, therefore, also considered.

#### 3 Telephonic follow up with industry representatives

The researchers' understanding of the South African economy and labour landscape assisted them in identifying anomalies in the draft list. For these occupations, telephonic interviews were organised with industry representative bodies to understand whether these occupations should indeed be included. These interviews consisted of the researcher explaining the exact purpose of the list, asking the interviewee whether the inclusion of a particular occupation on the list was appropriate and, finally, seeking a satisfactory explanation for the answers the interviewee provided.

#### 4 Sensible, skilled, and in shortage

As per the MAC methodology and the 2018 list of OIHD methodology, the occupations on the final list of OIHD must pass three logical tests – the so-called three S's (3S):

- i. The occupation needs to be **sensible**: i.e., it must not rely too heavily on innate talent, relate to government managerial positions or niche industries, nor potentially require post-school qualification under the ambit of the DHET;
- ii. The occupation must be in **shortage**: i.e., the Department of Employment and Labour's (DEL) Employment Services South Africa (ESSA) database must not show meaningful numbers of unemployed qualified individuals for the occupation, while the DEL's Job Opportunities Index (JOI) database should show relatively high levels of job vacancies; and
- iii. The occupation must require considerable **skill**: i.e., it must not be categorised under major group 8 of the OFO (elementary occupations).

The detailed approach to employing each of these logical tests is described along with its results in section 5.3.2.

### 4.3.3 The impact of the COVID-19 pandemic

While the limitations described above have been mitigated, the largest limitation to the development of the list of OIHD has been an exogenous shock to the economic system due to COVID-19.

The COVID-19 pandemic will have a paradigm-shifting impact on the South African economy. Besides its overall economic shock, the pandemic is likely to fundamentally change the composition of the South African economy. This means that previously strong industries might struggle while previously weaker industries might thrive. Exactly how this will happen is still highly uncertain. The best we can do at this point is to provide some indication of the high-level impact on sub-sectors in the economy. However, there is not enough certainty to remove or add any occupations purely based on the potential changes the pandemic might bring about. Indeed, until the pandemic is over, the jury is still out. The impact of COVID-19 was, therefore, not explicitly used to compile the list. Except for cases in which industry representatives specifically argued for an occupation's inclusion or exclusion based on COVID-19 considerations, the methodology itself did not consider it.

The potential impact of the pandemic cannot, however, be ignored. It is possible to trace every occupation down to its primary (and secondary, if the occupation is transversal) economic sector(s). While the impact of demand at an occupational level is difficult to determine, myriad research points out that sectoral growth has a direct and positive association with sectoral employment. (See for example Mistra & Suresh, 2014, or Deepankar & Das, 2015, who estimate the linkage between output growth and employment growth in India and the US. For a similar discussion for South Africa, see Onakoya & Seyingbo, 2020.) We have therefore opted to colour-code occupations according to the potential impact of the pandemic on the occupation's primary sector. The user of the list should, therefore, only see this colour-coding as a signal within the context of significant economic uncertainties. The following literature analysis breaks down the potential economic impact of COVID-19 at a sectoral level:

**TABLE 4:** Impact of COVID-19 at a sectoral level in South Africa

ECONOMIC SUB-SECTOR	DEMAND IMPACT	SUPPLY IMPACT	ABILITY TO RECOVER POST-PANDEMIC
<p><b>Accommodation and food services</b></p>	<p>A significant decline in demand for accommodation and food services is expected, given stifled international travel (Mail &amp; Guardian, 2020).</p>	<p>Supply of accommodation and food services is heavily restricted during all levels of lockdown, under pandemic safety regulations (Moodley, 2020).</p>	<p><b>Slow to recover, if at all, to pre-COVID levels.</b> The negative impact of the COVID-19 pandemic is expected to last up to 18 months for this industry. Both GDP and labour demand stemming from this sector is expected to decline drastically (Moodley, 2020).</p>
<p><b>Agriculture, forestry and fishing</b></p>	<p>Domestic demand will be relatively unchanged, given that the food value chain remains fully operational (Mail &amp; Guardian, 2020), and the demand for food is price inelastic (Lin, 2019). However, this sector is not impervious to a change in consumption habits brought on by lower levels of disposable income, which is a probable result of the general slow-down in economic activity. There may, therefore, be a slight dip in domestic demand for this sector's services and goods (Parkin, Kohler, Lakay, Rhodes, Saayman, Schoer, Thompson, 2012).</p>	<p>The entire food value chain remained at full capacity during the national lockdown, including the export and import of critical agriculture commodities (Ministry of Agriculture, Land Reform and Rural Development Republic of South Africa, 2020). The benefits from the decrease in fuel prices (supply price effect) may, however, be offset by lowered levels of domestic demand (demand income effect) (Parkin et al., 2012).</p>	<p><b>A relatively quick recovery is expected subject to supply and demand constraints, given South Africa's self-sufficient food supply</b> (Ministry of Agriculture, Land Reform and Rural Development Republic of South Africa, 2020). GDP and employment contributions from this sector are expected to remain relatively unchanged.</p>
<p><b>Construction</b></p>	<p>Labour and consumption demand for this sector is expected to decrease persistently as construction services are set to resume post-lockdown in South Africa. It is also likely that depressed income reduces the demand for infrastructure development in the country (Cokayne, 2020).</p>	<p>Supply of construction services is restricted severely during the first three levels of lockdown, under pandemic safety regulations (Cokayne, 2020).</p>	<p><b>The sector is forecasted to remain at a negative growth rate for two to three years post lockdown.</b> COVID-19 is, therefore, likely to have a lasting negative impact on employment levels (Cokayne, 2020). However, South Africa's economic recovery plan is likely to give infrastructure projects high priority. If implementation is successful, a faster recovery is possible.<sup>7</sup></p>

<sup>7</sup> The details of the Economic Recovery Plan have not been made public and the current recovery time projection, therefore, is not changed.



ECONOMIC SUB-SECTOR	DEMAND IMPACT	SUPPLY IMPACT	ABILITY TO RECOVER POST-PANDEMIC
<p><b>Education</b></p>	<p>The education sector will be negatively affected in terms of quality, access, and investments during the pandemic (Nyariki, 2020). In instances where electronic learning can be achieved, demand will remain relatively unchanged for educational services. However, vulnerable communities will be most likely deprived of their socio-economic right to education, depressing their demand inadvertently (Veriava, 2020).</p>	<p>In instances where electronic learning can be achieved, supply should remain relatively unchanged. However, some institutions of education negatively impacted by COVID-19 might not be able to re-open unless backed by the state (Ozili &amp; Arun, 2020).</p>	<p><b>A moderate to fast recovery is expected, given that this sector is still partly operational during the lockdown.</b> Job security will be relatively high because education is deemed a necessity purchase, and interventions into the education space will likely be backed by the state to ensure that places of learning do not close down or shed jobs unnecessarily.</p>
<p><b>Financial and insurance activities</b></p>	<p>From one perspective, the banking and insurance industries are in a stronger position to combat the perverse effects of the COVID-19 pandemic given their policy response to the 2008 financial crisis, which has resultantly led to an increase in capital and liquidity buffers (Lee, 2020). On the other hand, the financial sector is not wholly withdrawn from collapse. The overall macro-economic slow-down is expected to increase the number of non-performing loans, exposing financial institutions to higher credit risks. The decline in banking transactions during the lockdown compromises sector revenue, and unfortunately the increased demand for online purchases is not sufficient to compensate for this loss given that a significant number of sectors remain less than fully operational (Ozili &amp; Arun, 2020).</p>	<p>The business service sector shows a promising ability to adjust its regular course of business towards a “working from home” solution during the lockdown (Konings, 2020). For this reason, supply may be relatively unchanged.</p>	<p>The financial sector recovery is a function of related sector recovery. Profits are affected by increasing credit impairments, lower interest rates, more moderate client activity, debt relief policies, and subdued loan growth. Asset quality, while being traditionally resilient, is expected to deteriorate in light of widespread industry disruption (Business Tech, 2020). <b>For this reason, recovery is expected to be moderate.</b></p>

ECONOMIC SUB-SECTOR	DEMAND IMPACT	SUPPLY IMPACT	ABILITY TO RECOVER POST-PANDEMIC
Human health and social work	Human demand for healthcare is infinite but driven by health status (Randhawa, 2009). In this light, the need for primary healthcare is expected to increase in response to the global pandemic (Ongole, Rossouw, Fourie, Stoltz, Hugo, & Marcus, 2020).	Undersupply and scarcity of resources generally characterise this sector. The global pandemic will further stretch the limits of these resources. Even though the supply of health goods and services is fixed in the short term, increases in demand will lead to situations of great undersupply (Ongole et al., 2020).	<b>The recovery associated with this sector is expected to be relatively fast, given the nation's reliance on the sub-sector in light of the pandemic.</b> Subject to supply constraints, employment in this sector is expected to increase.
Manufacturing	This sector is faced with an initial decline in demand, which can be expected to recover post-level-four of lockdown, when it is permissible for the sub-sector to operate at capacity (South African Government, 2020).	Supply is decreasing as a result of delays in the amount of raw and intermediate materials being imported. This sector is heavily dependent on inputs from South Korea, Italy, and China. Supply chain disruptions and the decline in demand lead to cost-cutting solutions that extend toward the shortening of working hours and the laying off of staff (Konings, 2020).	<b>A slow recovery is expected for the manufacturing sector.</b> The global pandemic will result in under-employment and declining growth levels for this sector, due to subdued imports.
Mining and quarrying	Lower demand is experienced in this sector despite the increases in demand for gold as an investment haven. There is a decrease in the international demand for Africa's raw materials and commodities due to embargos on various import lines across the world (Global Compliant News, 2020). Demand for platinum has also decreased sharply due to the paralysed automotive industry (CNBC, 2020).	The mining sector was set to operate at a maximum of 50% of productive capacity during the nationwide lockdown. However, income lost from these lockdown activities might likely force some smaller mining and quarrying operations out of the market, decreasing supply (Mining Technology, 2020).	<b>A moderate recovery is expected</b> once related industry demand recovers, and once trade of minerals opens up more substantially.
Other services (gym, personal services, etc.)	The demand for personal services is low, given that items in this sector do not form part of the essential services permitted during the pandemic. This demand is likely to remain suppressed in the future due to the nature of the services being community-based (South African Government, 2020).	Supply of these services has decreased as items in this sector do not form part of the essential services. It is likely that, due to losses of income, some firms within this sector might remain closed, cutting supply at an aggregate level for the sector (South African Government, 2020).	<b>Some services offered in the industry might see a slow recovery</b> , given their communal nature (with some consumers being skittish of, for example, going to a gym with many people).



ECONOMIC SUB-SECTOR	DEMAND IMPACT	SUPPLY IMPACT	ABILITY TO RECOVER POST-PANDEMIC
<p><b>Public administration and defence</b></p>	<p>Critical government services remain operational throughout all levels of the lockdown, and more services will become available as the state eases lockdown restrictions (The ILO, 2020). It is, therefore, likely that demand for government services might initially be slightly lower but will rebound reasonably quickly.</p>	<p>The supply of such services had moderated during the beginning phases of lockdown, but are expected to remain somewhat constant (and will potentially increase, given the country's increased reliance on public policy responses) in the foreseeable future.</p>	<p><b>A moderate to fast recovery is to be expected</b>, given that there is sufficient scope for a rebound and given the nature of essential government services.</p>
<p><b>Real estate, business, and administrative activities</b></p>	<p>This sector was not categorised as an essential service in both levels 4 and 5 of the lockdown. With more and more employees working from home, the demand for corporate property could likely decline. This impact may extend beyond the pandemic. However, heavily slashed interest rates have stimulated demand for home buyers. It is improbable this increased demand will result in many home sales as the epidemic threatens household earning potential. The interest rate cuts allow consumers to keep up with debt repayments rather than pave the way for fresh investments to be made (Eyewitness News, 2020).</p>	<p>Supply of various properties and related property services have declined, due to the lack of businesses operating in the sector before advanced level 3 lockdown regulations (South African Government, 2020).</p>	<p><b>A slow recovery is expected.</b> Growth and employment are expected to decline in this sector, precisely due to subdued national income, which this sector relies on tremendously.</p>
<p><b>Transport, storage, and communication</b></p>	<p>Public transport demand is lowered but not non-existent during the economic lockdown period in the country. This demand is expected to tick up slightly as more services open, although skittish consumers might vie for less public transportation services (South African Government, 2020). However, there will be an increase in the demand for data and data usage, as well as increased demand for various delivery services, with more innovative forms of communication and logistical services being leveraged during the crisis (Business Tech, 2020). This will likely be coupled with an increased demand for courier-based services that leverage, not only on this sector but also on most other economic sectors.</p>	<p>Public transport supply is restricted to a 50–70% loading capacity depending on the mode of transportation during level 4 of the lockdown, cutting into the supply of public transportation services (South African Government, 2020). However, the supply of communication services has remained unchanged.</p>	<p>Although communications employees are unable to work from home during the lockdown, <b>there is substantial scope for recovery in this sector, and with this, a moderate to a quick improvement is expected</b> (Konings, 2020).</p>

ECONOMIC SUB-SECTOR	DEMAND IMPACT	SUPPLY IMPACT	ABILITY TO RECOVER POST-PANDEMIC
<p><b>Utilities</b></p>	<p>Electricity demand decreased to roughly a quarter of its usual optimal capacity in the first phase of lockdown. However, with more operations continuing in advanced stages of lockdown, demand for utilities will likely rebound (The Conversation, 2020).</p>	<p>Electricity production capacity has remained low, and the challenges of power shortages will remain post-pandemic. This is due more to the weak balance sheets of state owned enterprises rather than to the pandemic (The Conversation, 2020).</p>	<p><b>A slow to moderate recovery can be expected</b> as this sector is dependent on mining and quarrying, specifically in terms of electricity generation. However, the water sub-utility is expected to make a relatively quick recovery, given the commodity's elastic demand and ongoing productive capacity during the lockdown.</p>
<p><b>Wholesale and retail trade</b></p>	<p>Panic-buying had increased the demand for food and other essential goods initially, and it is expected that overall demand for essentials remains elevated. The need for online shopping services has also seen a massive increase (Business Wire, 2020). However, the demand for luxury goods will be severely impacted as consumer spending becomes more constrained as a result of job losses during the pandemic.</p>	<p>The supply of essential items remains mostly unchanged, while the supply of non-essential items remains low during the various stages of lockdown. This is, however, only true for goods that are not embargoed in terms of imports.</p>	<p><b>Necessity goods markets will be quick to recover</b>, versus luxury goods markets, which are expected to decline due to decreased disposable income.</p>

If both demand and supply in a sector are expected to decline due to COVID-19, it is expected that the sector will lay off workers. If demand and supply in a sector both increase, it is expected that the sector will absorb/hire more workers. If there is evidence that suggests that the impact of COVID-19 on a sector's demand and supply growth is uncertain, there is also room to suggest that labour demand will be ambiguously impacted over the short term.

A summary of the economic and labour market impacts, as well as possible recovery times, can be found in Table 5:

**TABLE 5:** Potential sector-level impact of COVID-19 in South Africa

SUB-SECTOR	IMPACT OF COVID-19 ON DEMAND IN SECTOR	IMPACT OF COVID-19 ON SUPPLY IN SECTOR	POTENTIAL IMPACT OF COVID-19 ON LABOUR DEMAND	RECOVERY TIMEFRAME
Accommodation and food services	– (negative)	– (negative)	– (negative)	>3 years
Agriculture, forestry, and fishing	+/- (neutral)	+/- (neutral)	+/- (neutral)	1–2 years
Construction	– (negative)	– (negative)	– (negative)	2–3 years
Education	? (ambiguous)	+/- (neutral)	+/- (neutral)	1–2 years
Financial and insurance activities	+/- (neutral)	+/- (neutral)	? (ambiguous)	1–2 years
Human health and social work	+ (positive)	– (negative)	+ (positive)	6–12 months
Manufacturing	– (negative)	– (negative)	– (negative)	2–3 years
Mining and quarrying	– (negative)	– (negative)	– (negative)	2–3 years
Other services (gym, personal services, etc.)	– (negative)	– (negative)	– (negative)	1–2 years
Public administration and defence	? (ambiguous)	? (ambiguous)	+/- (neutral)	6–12 months
Real estate, business, and administrative activities	– (negative)	– (negative)	– (negative)	2–3 years
Transport, storage, and communication	? (ambiguous)	? (ambiguous)	+ (positive)	1–2 years
Utilities	– (negative)	– (negative)	+/- (neutral)	2–3 years
Wholesale and retail trade	+ (positive)	? (ambiguous)	? (ambiguous)	6–12 months

Source: For a list of references used to create this tabular summary, see the Bibliography



In some instances, there is insufficient evidence from the literature to conclude whether a sector will demand more or less labour in the wake of the COVID-19 pandemic. However, given the available evidence, it appears likely that (except for the health and ICT industries) the demand for labour will decrease due to COVID-19. This is potentially due to cost-cutting measures such as retrenchments, which are relied upon by various entities as a means to stave off bankruptcy.

It is, however, the “speed of recovery” per sub-sector that dictates how long the change in labour demand is likely to last for:

- If a sector is stated as being **quick** to recover, recovery in labour demand to pre-COVID levels (or thereabouts) will take between 6 to 12 months;
- If a sector is stated as taking a **moderate to quick** amount of time to recover, the recovery of labour demand to pre-COVID levels is estimated to take between one and two years;
- If a sector is deemed to take a **slow to moderate** amount of time to recover, the industry (and labour demand within that sector) would only reach pre-COVID levels in two to three years;
- If a sector is shown to have a **slow** recovery, labour demand is likely to only recover partially in the short term, with pre-COVID levels of labour demand only occurring after three years.

This information is utilised in presenting the final list of OIHD through the use of colour codes. An occupation is:

Highlighted in **green** if the sector within which an occupation is housed is expected to:

- Recover relatively quickly from the impact of COVID-19; or
- Show signals of increased labour demand due to COVID-19.

Highlighted in white/not highlighted if the sector within which an occupation is housed is expected to:

- Recover from the impact of COVID-19 in a moderate timeframe; or
- Labour demand is expected to be ambiguously affected by COVID-19 in the sector; or
- Labour demand is not expected to change due to the impact of COVID-19.

Highlighted in **red** if the sector within which an occupation is housed is expected to:

- Recover slowly from the impact of COVID-19; or
- Show signals of decreased labour demand due to COVID-19.

The next section will present first the quantitative and then the qualitative analysis. The colour-coding indicated above will only be employed in the presentation of the final list in section 6.



**PART 5**

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# **Analysis of results**

## 5.1 Quantitative analysis

As discussed above, the quantitative analysis creates an index of nine indicators, each potentially signalling occupational demand. Applying various weighting methods will naturally yield differing index results.<sup>8</sup>

In this case, unit groups with index scores above the 75<sup>th</sup> percentile are those deemed to be in “high demand”. Those unit groups that received an index score above the 75<sup>th</sup> percentile using “equal-weighting” are summarised in Table 6:

**TABLE 6:** List of OIHD at four-digit level (equally weighted within dimensions, ordered by OFO code)

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION
2019-1111	Legislators
2019-1113	Traditional chiefs and heads of villages
2019-1212	Human resource managers
2019-1219	Business services and administration managers not elsewhere classified
2019-1221	Sales and marketing managers
2019-1223	Research and development managers
2019-1311	Agricultural and forestry production managers
2019-1321	Manufacturing managers
2019-1323	Construction managers
2019-1324	Supply, distribution, and related managers
2019-1331	Information and communications technology service managers
2019-1342	Health service managers
2019-1345	Education managers
2019-1349	Professional services managers not elsewhere classified
2019-1411	Hotel managers
2019-1421	Retail and wholesale trade managers
2019-2113	Chemists
2019-2132	Farming, forestry, and fisheries advisors
2019-2141	Industrial and production engineers
2019-2142	Civil engineers
2019-2144	Mechanical engineers
2019-2145	Chemical engineers
2019-2146	Mining engineers, metallurgists, and related professionals

<sup>8</sup> However, it should be said that, in most cases, unit groups/occupations simply shift position rather than ceasing to be in relatively high demand at the four-digit level. A more comprehensive discussion around this issue can be found in the appendices.

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION
2019-2152	Electronics engineers
2019-2161	Building architects
2019-2211	Generalist medical practitioners
2019-2221	Nursing professionals
2019-2261	Dentists
2019-2262	Pharmacists
2019-2263	Environmental and occupational health and hygiene professionals
2019-2311	University and higher education teachers
2019-2321	Vocational or further education teachers
2019-2331	Secondary or intermediate and senior education teachers
2019-2341	Primary school or foundational phase teachers
2019-2342	Early childhood educators
2019-2351	Education methods specialists
2019-2352	Special needs teachers
2019-2412	Financial and investment advisors
2019-2413	Financial analysts
2019-2421	Management and organisation analysts
2019-2422	Policy administration professionals
2019-2423	Personnel and careers professionals
2019-2511	Systems analysts
2019-2512	Software developers
2019-2513	Web and multimedia developers
2019-2519	Software and applications developers and analysts not elsewhere classified
2019-2521	Database designers and administrators
2019-2523	Computer network professionals
2019-2611	Lawyers
2019-2612	Judges
2019-2619	Legal professionals not elsewhere classified
2019-2622	Librarians and related information professionals
2019-2634	Psychologists
2019-2635	Social work and counselling professionals
2019-2636	Religious professionals
2019-2641	Authors and related writers
2019-2651	Visual artists
2019-2652	Musicians, singers, and composers

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION
2019-3111	Chemical and physical science technicians
2019-3112	Civil engineering technicians
2019-3113	Electrical engineering technicians
2019-3114	Electronics engineering technicians
2019-3118	Draughtspersons
2019-3122	Manufacturing supervisors
2019-3123	Construction supervisors
2019-3131	Power production plant operators
2019-3132	Incinerator and water treatment plant operators
2019-3141	Life science technicians (excluding medical)
2019-3142	Agricultural technicians
2019-3212	Medical and pathology laboratory technicians
2019-3241	Veterinary technicians and assistants
2019-3255	Physiotherapy technicians and assistants
2019-3258	Ambulance workers
2019-3314	Statistical, mathematical, and related associate professionals
2019-3321	Insurance representatives
2019-3322	Commercial sales representatives
2019-3323	Buyers
2019-3332	Conference and event planners
2019-3334	Real estate agents and property managers
2019-3421	Athletes and sports players
2019-3431	Photographers
2019-3432	Interior designers and decorators
2019-3434	Chefs
2019-3439	Artistic and cultural associate professionals not elsewhere classified
2019-3512	Information and communications technology user support technicians
2019-4111	General office clerks
2019-4212	Bookmakers, croupiers, and related gaming workers
2019-4213	Pawnbrokers and money-lenders
2019-4221	Travel consultants and clerks
2019-4412	Mail carriers and sorting clerks
2019-4413	Coding, proofreading, and related clerks
2019-5111	Travel attendants and travel stewards
2019-5113	Travel guides

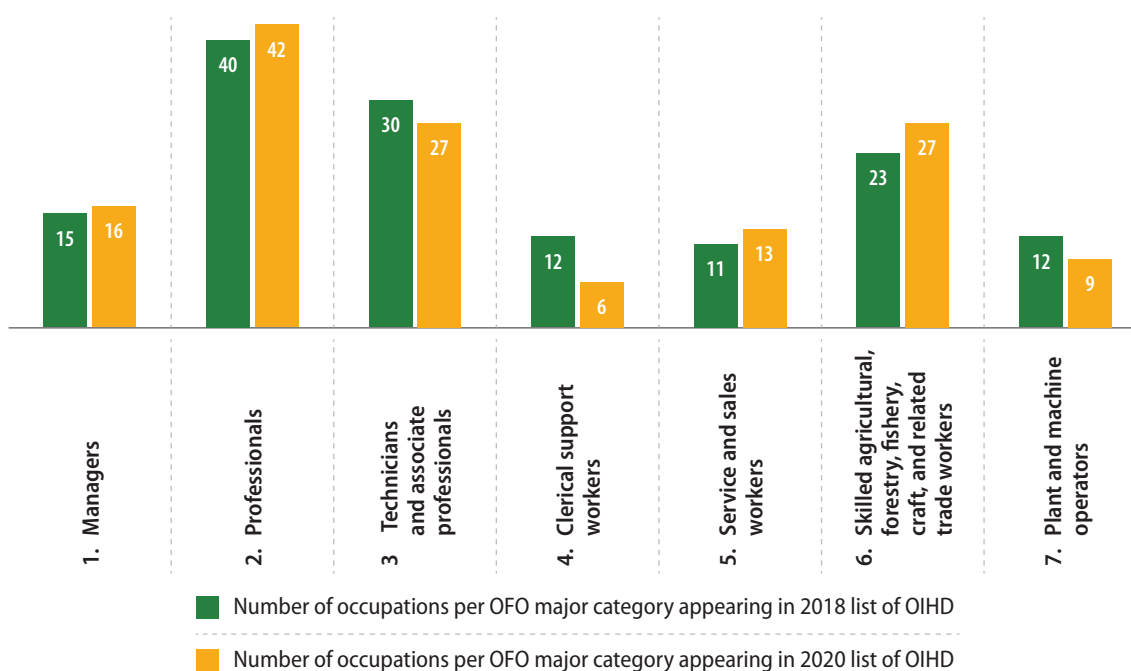
4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION
2019-5141	Hairdressers
2019-5222	Shop supervisors
2019-5223	Shop sales assistants
2019-5242	Sales demonstrators
2019-5311	Child care workers
2019-5321	Healthcare assistants
2019-5322	Home-based personal care workers
2019-5329	Personal care workers in health services not elsewhere classified
2019-5411	Fire fighters
2019-5412	Police officers
2019-5414	Security guards
2019-6111	Field crop and vegetable growers
2019-6112	Tree and shrub crop growers
2019-6131	Mixed crop and animal producers
2019-6211	Forestry and related workers
2019-6413	Stonemasons, stone cutters, splitters, and carvers
2019-6422	Floor layers and tile setters
2019-6431	Painters and related workers
2019-6512	Welders and flame cutters
2019-6513	Sheet metal workers
2019-6522	Toolmakers and related workers
2019-6523	Metal working machine tool setters and operators
2019-6524	Metal polishers, wheel grinders, and tool sharpeners
2019-6531	Motor vehicle mechanics and repairers
2019-6533	Agricultural and industrial machinery mechanics and repairers
2019-6613	Jewellery and precious metal workers
2019-6614	Potters and related workers
2019-6615	Glass makers, cutters, grinders, and finishers
2019-6711	Building and related electricians
2019-6712	Electrical mechanics and fitters
2019-6713	Electrical line installers and repairers
2019-6721	Electronics mechanics and servicers
2019-6811	Butchers, fishmongers, and related food preparers
2019-6812	Bakers, pastry cooks, and confectionery makers
2019-6831	Tailors, dressmakers, furriers, and hatters

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION
2019-6832	Garment and related patternmakers and cutters
2019-6842	Shotfirers and blasters
2019-6843	Product graders and testers (except foods and beverages)
2019-7114	Cement, stone, and other mineral products machine operators
2019-7141	Rubber products machine operators
2019-7151	Fibre preparing, spinning, and winding machine operators
2019-7152	Weaving and knitting machine operators
2019-7159	Textile, fur, and leather products machine operators not elsewhere classified
2019-7219	Assemblers not elsewhere classified
2019-7311	Locomotive engine drivers
2019-7331	Bus and tram drivers
2019-7341	Mobile farm and forestry plant operators

Source: Own analysis of data from CJ and the QLFS databases

The breakdown of these unit groups, based on their respective major group, is summarised in Figure 8.

**FIGURE 8:** Distribution of unit groups in the 2018 four-digit list of OIHD compared to distribution of unit groups in the 2020 four-digit list of OIHD, broken down by OFO major category



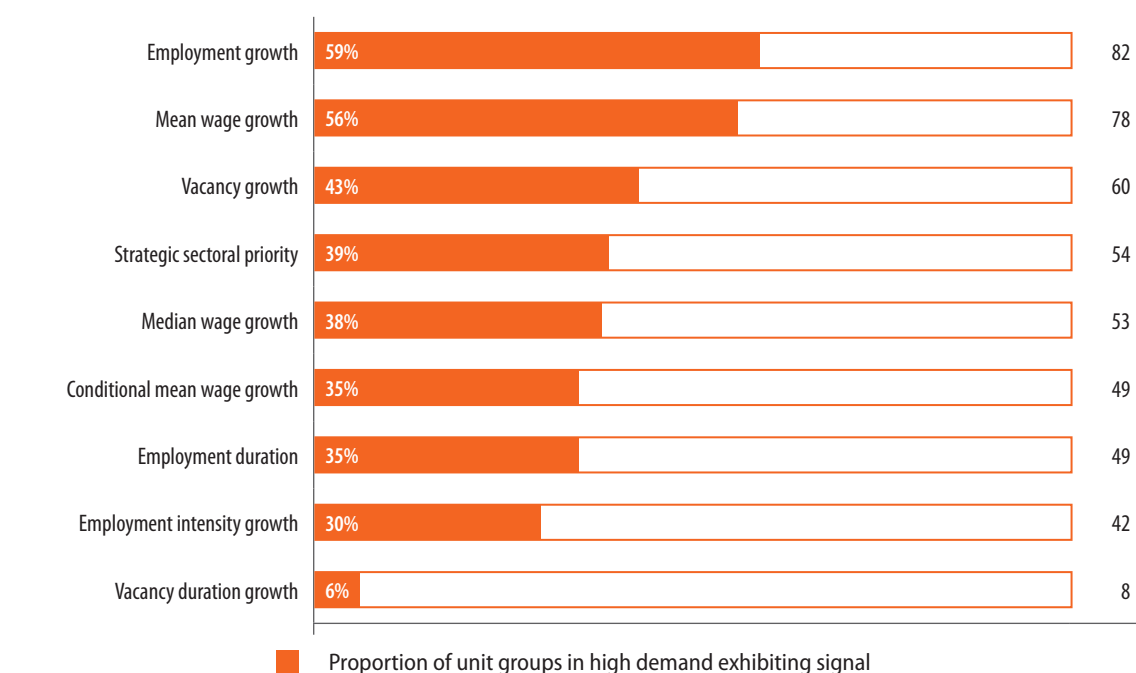
Source: Own analysis of data from CJ and the QLFS databases

In comparison to the 143 occupations found at the four-digit level in 2018's list of OIHD, the number of occupations in relatively high demand at the four-digit level in 2020 was 140. Most OFO categories were represented similarly across the two iterations of the four-digit list of OIHD. However, more artisanal occupations (housed in OFO category 6) were identified as being in high demand in 2020. In comparison, OFO category 4 (clerical support workers) saw the largest absolute and proportional drop-off from 2018 to 2020. Nevertheless, given similar distributions of occupations across most categories, it is likely that the similar approach in estimating the 2020 list has fostered consistency over time, making the lists more directly comparable henceforth.<sup>9</sup>

This information regarding changes to unit group demand will be extremely useful when future iterations of the list of OIHD come out. With this information, it is possible to conduct trend analyses on the types of unit groups that are being dropped off of the list, versus which unit groups seem to be represented more over time. This evidence will help to provide a clearer picture of the evolution of the South African labour market and might be used as an indicator of various skills needs in the country.<sup>10</sup>

These unit groups each exhibited particular labour demand signals. Decomposition of these signals is found in Figure 9:

**FIGURE 9:** Decomposition of demand signals



Source: Own analysis of data from CJ and the QLFS databases

Note: The number on the right-hand-side of the graphic indicates the number of unit groups that were indicated to exhibit each of the signals.

<sup>9</sup> Comparability over time is extremely useful in that it is possible to track changes in occupational demand over time, which can then be used as a further indicator of whether demand for that occupation is decreasing or not.

<sup>10</sup> If a unit group is in high demand over many lists of OIHD, this might signal that a skills gap is occurring in the labour market. This means that employers are wanting candidates of a particular type, but the candidates in the country might not be able to meet the needs of employers, especially if the occupation is in demand for an extremely extended period of time.

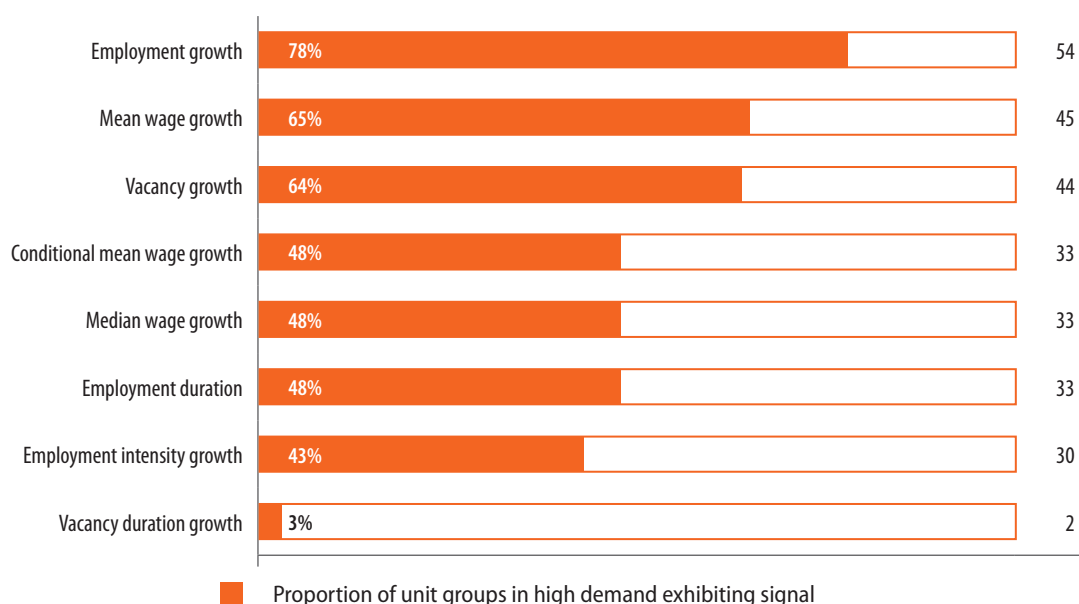


The signal that is most commonly found across the in-demand unit groups is employment growth (occurring in 82 of the 140 unit groups found on the list of OIHD at the four-digit level),<sup>11</sup> with vacancy duration signals occurring in only 8 of the 140 unit groups (roughly 6 percent).

This decomposition of signals reinforces the notion that one single signal is insufficient to determine whether a unit group or occupation is in high demand or not. If only focusing on the nine unit groups that displayed a signal of long vacancy duration, for example, the list of unit groups in high demand would be far too short and would not take into account other factors that fed into high labour demand.

However, to ensure that the unit groups identified by this process are not biased in any way, it is important to see whether similar signals are highlighted in the occupations not highlighted by the literature (i.e., by excluding those occupations that were shown to be of strategic priority). This ensures that the quantitative evidence is not, for example, biasing results in favour of some occupations.

**FIGURE 10:** Decomposition of demand signals (excluding strategic priority/literature-based signal)



Source: Own analysis of data from CJ and the QLFS databases

Note: The number on the right-hand-side of the graphic indicates the number of unit groups that were indicated to exhibit each of the signals.

For the 69 unit groups that passed this re-weighted scheme, it is clear that all signals remain consistent. The signal that occurred most frequently across these unit groups was employment growth (occurring in 54 of the 69 unit groups). By contrast, the signal that occurred the least was vacancy duration. These 69 unit groups all appeared in the list of 140 unit groups identified by equally weighting all indicators (inclusive of the strategic priority indicator). This evidence indicates that the list of 140 unit groups is robust, and not biased due to any one indicator.

11 In 92 out of the 140 unit groups, unit groups satisfied the statistical threshold for employment growth.

However, as mentioned in the methodology, there are multiple ways in which the indicators can be weighted. It is, therefore, still important to conduct robustness checks to ensure that the results remain relatively consistent even when other approaches are employed. These robustness checks are presented in Appendix 2.

At this point, it is important to note that this presentation of unit groups is not sufficiently detailed and this lack of granular detail necessitates a deeper dive into the unit groups to tease out which occupations (at the six-digit OFO level instead of the four-digit level) are in high demand in the labour market. This detail is brought about by qualitative analysis techniques, which are discussed in the following section.

## 5.2 Qualitative analysis

### 5.2.1 Transversal occupational demand

Occupations referenced here as “transversal” are those occupations that are in high demand across most sectors, based on the literature analysed. Put differently, **at least five different literature sources must have mentioned the particular occupation as being in demand.**

This list of “transversally demanded” occupations is presented at the six-digit level in Table 7:

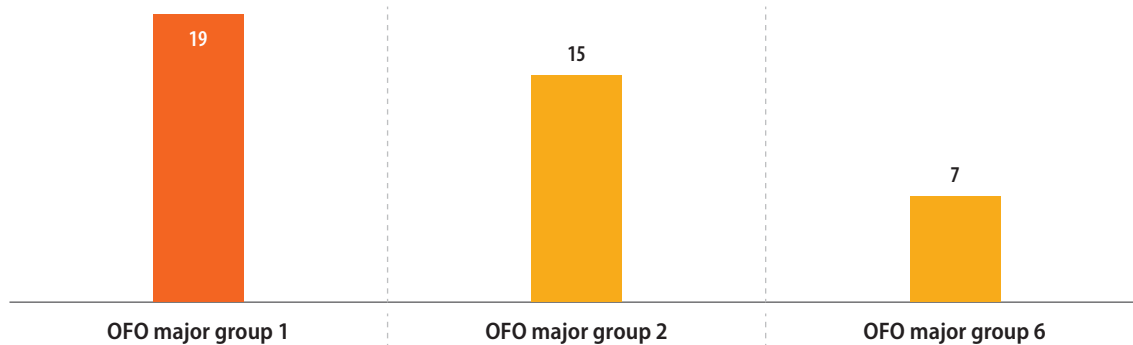
**TABLE 7:** Occupations that are transversally demanded

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	NUMBER OF CITATIONS
2019-121901	Corporate general manager	12
2019-121903	Physical asset manager	12
2019-121905	Programme or project manager	12
2019-121908	Quality systems manager	12
2019-122101	Sales and marketing manager	11
2019-122102	Sales manager	11
2019-122105	Customer service manager	11
2019-131101	Agricultural farm manager	5
2019-131103	Forestry operations supervisor	5
2019-132101	Manufacturer	11
2019-132102	Manufacturing operations manager	11
2019-132104	Engineering manager	11
2019-132107	Quality manager	11
2019-132401	Supply and distribution manager	6
2019-132404	Warehouse manager	6
2019-132407	Airport or harbour manager	6
2019-133103	Data management manager	6
2019-133105	Information technology manager	6

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	NUMBER OF CITATIONS
2019-142103	Retail general manager	11
2019-213201	Agriculture consultant	5
2019-213202	Agricultural scientist <sup>12</sup>	5
2019-213205	Food and beverage scientist	5
2019-214401	Mechanical engineer	8
2019-214402	Mechanical engineering technologist	8
2019-214405	Naval architect	8
2019-231101	University lecturer	5
2019-231102	University tutor	5
2019-242101	Management consultant	8
2019-242102	Organisation and methods analyst	8
2019-251101	ICT systems analyst	8
2019-251201	Software developer	10
2019-251202	Programmer analyst	10
2019-251203	Developer programmer	10
2019-252101	Database designer and administrator	6
2019-653303	Mechanical fitter	9
2019-653306	Diesel mechanic	9
2019-653307	Heavy equipment mechanic	9
2019-671101	Electrician	11
2019-671202	Millwright	13
2019-671204	Lift mechanic	13
2019-671208	Transportation electrician	13

The distribution of these occupations is focused on OFO major categories 1 and 2, although some artisanal occupations are also transversally demanded, as shown in Figure 11:

**FIGURE 11:** Distributional breakdown of occupations in transversal demand in South Africa



<sup>12</sup> Although the OFO makes little distinction within the “agricultural scientist” occupation, the Grassland Society of Southern Africa has recommended that two separate specialisations for this occupation exist: grassland scientist and pasture scientist, respectively.

There is an apparent high transversal demand for occupations that are in the “professionals” category of the OFO,<sup>13</sup> (with 19 occupations in transversally high demand), which is more demand than there is for the “managers” (15 occupations) or “skilled workers” (7 occupations) categories.

While many sectors in the economy are represented by the occupations in transversal demand, a slight focus on ICT, manufacturing, and agriculture-related occupations signals the way in which these industries’ expertise are needed throughout the entire labour market.

## 5.2.2 Moderate occupational demand

Occupations referenced as being in “moderate” demand are those occupations that are in high demand across some sectors and, as such, might be relatively specialised in comparison to those that are transversally demanded (i.e., cut across sectors). These **occupations have been referenced in the literature between two to four times**, and are summarised in Table 6:

**TABLE 8:** Occupations that are moderately demanded

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	NUMBER OF CITATIONS
2019-121202	Business training manager	4
2019-121206	Health and safety manager	4
2019-132301	Construction project manager	3
2019-214101	Industrial engineer	3
2019-214102	Industrial engineering technologist	3
2019-214201	Civil engineer	4
2019-216101	Architect	2
2019-222104	Registered nurse (community health)	2
2019-222108	Registered nurse (medical)	2
2019-222112	Registered nurse (surgical)	2
2019-222114	Nurse educator	2
2019-226201	Hospital pharmacist	4
2019-226202	Industrial pharmacist	4
2019-226203	Retail pharmacist	4
2019-235201	Special needs teacher	2
2019-241201	Investment analyst	3
2019-241202	Investment manager	3
2019-241203	Investment advisor	3

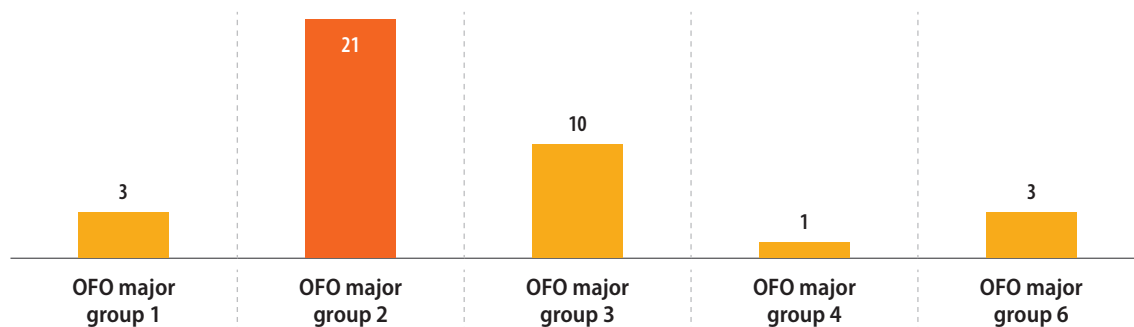
<sup>13</sup> As a reminder, each major group category is designated by a title:

OFO major category/group	1	2	3	4	5	6	7	8
Category	Managers	Professionals	Technicians and associate professionals	Clerical support workers	Service and sales workers	Skilled agricultural, forestry, fishery, craft, and other related trade workers	Plant and machine operators and assemblers	Elementary occupations

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	NUMBER OF CITATIONS
2019-241204	Financial markets practitioner	3
2019-242302	Skills development practitioner	2
2019-242303	Human resource advisor	2
2019-252301	Computer network and systems engineer	3
2019-261101	Attorney	2
2019-261106	Advocate	2
2019-311201	Civil engineering technician	2
2019-311203	Town planning technician	2
2019-312201	Production/operations supervisor (manufacturing)	3
2019-332101	Insurance agent	2
2019-332102	Insurance broker	2
2019-332201	Commercial sales representative	3
2019-332203	Sales representative (personal and household goods)	3
2019-332301	Retail buyer	4
2019-332302	Purchasing officer	4
2019-343401	Chef	2
2019-411101	General clerk	2
2019-611202	Horticultural farmer	4
2019-651202	Welder	2
2019-653101	Automotive motor mechanic	4

The distribution of these moderately demanded occupations now also includes some occupations in OFO major groups 3 and 4:

**FIGURE 12:** Distributional breakdown of occupations in moderate demand in South Africa



The majority of occupations found to be in moderate demand are those in the “professionals” major category (21 occupations appear in major group 2). In comparison, only one occupation finds itself in moderate demand from the 4<sup>th</sup> major group.

### 5.2.3 Sector-specific demand

While some occupations might be in demand across various sectors, there are other occupations that only operate within one sector. These occupations experience demand that cannot be transversal or moderate and, instead, demand for these occupations is “sector-specific”. These occupations are usually only referenced once,<sup>14</sup> by either the relevant SETA or professional body that is the custodian of a particular sector within an economy.

These occupations are broken down below:

**TABLE 9:** Occupations in sector-specific demand

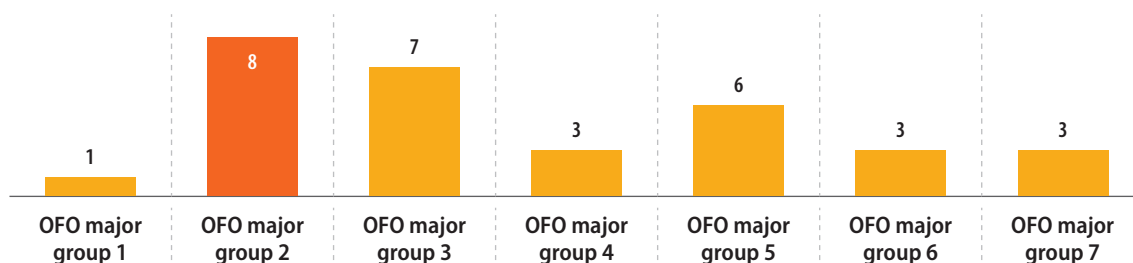
6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	CUSTODIAL SETA OR SECTOR PROFESSIONAL BODY
2019-141101	Hotel or motel manager	CATHSSETA
2019-211301	Chemist	CHIETA
2019-221101	General medical practitioner	HWSETA
2019-232130	TVET educator	ETDP SETA
2019-233107	FET phase school teacher (Grades 10–12)	ETDP SETA
2019-233108	Senior phase school teacher (Grades 7–9)	ETDP SETA
2019-234101	Foundation phase school teacher	ETDP SETA
2019-234102	Intermediate phase school teacher (Grades 4–6)	ETDP SETA
2019-234201	Early childhood development practitioner	ETDP SETA
2019-311101	Chemistry technician	CHIETA
2019-311801	Draughtsperson	South African Council for the Architectural Professions
2019-312301	Building associate	CETA
2019-312301	Building associate	CETA
2019-313106	Concentrated solar power (CSP) plant process controller	EW SETA
2019-333401	Property manager	SERVICES
2019-333402	Real estate agent	SERVICES
2019-421202	Gaming worker	CATHSSETA
2019-421204	Bookmaker’s clerk	CATHSSETA
2019-422102	Travel consultant	CATHSSETA
2019-511302	Tour guide	CATHSSETA
2019-514101	Hairdresser	SERVICES
2019-522301	Sales assistant (general)	W&R SETA
2019-541201	Traffic officer	SASSETA
2019-541401	Security officer	SASSETA

<sup>14</sup> In the most recent SETA PIVOTAL list that corresponds to the occupation and its relevant economic sector, or by other sector-specific authorities as outlined in the table.

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	CUSTODIAL SETA OR SECTOR PROFESSIONAL BODY
2019-541402	Alarm, security, or surveillance monitor	SASSETA
2019-613101	Mixed crop and livestock farmer	AgriSETA
2019-621101	Tree feller	FP&M SETA
2019-681103	Butcher	W&R SETA
2019-721901	Product assembler	merSETA
2019-733101	Bus driver	TETA
2019-734101	Agricultural mobile plant (equipment) operator	AgriSETA

The distribution of these occupations is shown in Figure 13:

**FIGURE 13:** Distributional breakdown of occupations in sector-specific demand in South Africa



Again, occupations in major group 2 tend to be represented as being in sector-specific demand. Occupations falling into the education sector of the economy tend to be represented the most in this instance (ETDP SETA has pointed to 6 of the 37 occupations as being in high sector-specific demand).

The distribution shown in Figure 13 also shows the importance of including this category as it compensates for the bias of the other categories by including proportionately more occupations from the latter major groups.

#### 5.2.4 List of Priority Occupations (LPO) and Critical Skills List (CSL)

Thus far, occupations have been included in the list of OIHD based on whether they exhibited quantitative and qualitative signals of high demand across South Africa's labour market based on the methodology highlighted above.

However, there are two other occupational lists being developed in parallel to the list of OIHD – the Department of Home Affairs' (DHA) Critical Skills List (CSL) and the DHET's List of Priority Occupations (LPO). These lists serve different purposes and, therefore, employ different methodologies to identify occupations in demand. However, they are related through common criteria: occupations on all three lists are in high demand and, therefore, strategically important. The LPO and CSL have additional criteria specifically related to their respective functions. Although there is substantial overlap across the three lists, some occupations on the LPO and CSL might not appear on the preliminary list of OIHD. Because these two lists are evidence of occupational shortage in the country, the list of OIHD needs to be updated to include occupations that appear on those two lists as well.

The occupations added to the list of OIHD from the CSL and LPO once their methodologies have been applied<sup>15</sup> is seen in Table 10:

**TABLE 10:** Occupations included in the list of OIHD based on the CSL and LPO findings

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-121301	Policy and planning manager	X	
2019-121905	Programme or project manager		X
2019-122301	Research and development manager	X	X
2019-131101	Agricultural farm manager	X	X
2019-132101	Manufacturer	X	
2019-132102	Manufacturing operations manager	X	X
2019-132104	Engineering manager	X	X
2019-132107	Footwear quality assurance managers		X
2019-132301	Construction project manager	X	X
2019-132407	Airport or harbour manager	X	X
2019-133101	Chief information officer	X	X
2019-133102	ICT project manager	X	X
2019-133103	Data management manager	X	X
2019-133104	Application development manager	X	X
2019-133105	Information technology manager	X	X
2019-133106	Information systems director	X	X
2019-134502	FET college principal	X	X
2019-143905	Call or contact centre manager	X	X
2019-143906	Caravan park and camping ground manager	X	
2019-143907	Dockmaster	X	
2019-143908	Travel accommodation inspector	X	X
2019-143909	Travel agency manager	X	X
2019-211401	Geologist	X	X
2019-211402	Geophysicist	X	X
2019-211403	Materials scientist	X	X
2019-211405	Mineralogist	X	
2019-211406	Hydrologist	X	
2019-211407	Oceanographer	X	
2019-212101	Actuary	X	X
2019-213107	Marine biologist		X

<sup>15</sup> It is important to note that the finalised CSL and LPO, which will be validated by the DHA and the DHET, respectively, later on in the year, might be shorter than the list of occupations found in Table 10. However, the occupations found in Table 10 have already gone through each reports' formal methodology, as well as the validation processes to obtain both the LPO and CSL. Given this, the occupations found in Table 10 might not be reflected in the final versions of the CSL and LPO once the DHET and DHA have gone through their internal processes for narrowing down the lists.



6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-213204	Wine makers		X
2019-213205	Food and beverage scientist	X	
2019-214101	Industrial engineer	X	X
2019-214102	Industrial engineering technologist	X	X
2019-214201	Civil engineer	X	X
2019-214202	Civil engineering technologist	X	X
2019-214401	Mechanical engineer	X	X
2019-214402	Mechanical engineering technologist	X	X
2019-214403	Aeronautical engineer	X	X
2019-214404	Aeronautical engineering technologist	X	
2019-214405	Naval architect	X	X
2019-214904	Quantity surveyor	X	X
2019-214905	Agricultural engineer	X	X
2019-214906	Agricultural engineering technologist	X	X
2019-216101	Architect	X	X
2019-216304	Footwear designers		X
2019-216601	Digital artist	X	X
2019-216602	Illustrator	X	
2019-216603	Multimedia designer	X	X
2019-216604	Web designer	X	X
2019-221101	General medical practitioner	X	X
2019-222103	Registered nurse (child and family health)	X	X
2019-222104	Registered nurse (community health)	X	X
2019-222105	Registered nurse (critical care and emergency)		X
2019-222108	Registered nurse (medical)	X	X
2019-222109	Registered nurse (medical practice)	X	X
2019-222110	Registered nurse (mental health)	X	X
2019-222112	Registered nurse (surgical)		X
2019-222114	Nurse educator	X	X
2019-226201	Hospital pharmacist	X	X
2019-226202	Industrial pharmacist	X	X
2019-226203	Retail pharmacist	X	X
2019-231101	University lecturer	X	
2019-241101	General accountant	X	X
2019-241102	Management accountant	X	X
2019-241103	Tax professional	X	X

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-241104	External auditor	X	X
2019-241106	Accountant in practice	X	X
2019-241107	Financial accountant	X	X
2019-241108	Forensic accountant	X	X
2019-241201	Investment analyst	X	X
2019-241202	Investment manager	X	X
2019-241203	Investment advisor	X	X
2019-241301	Financial investment advisor	X	X
2019-242101	Management consultant	X	X
2019-242102	Organisation and methods analyst	X	X
2019-242103	Business development officer	X	X
2019-242202	Policy analyst	X	X
2019-242203	Company secretary	X	
2019-242208	Organisational risk manager	X	X
2019-242209	Accounting officer	X	
2019-242210	Business administrator	X	
2019-242211	Internal auditor	X	X
2019-242213	Regulatory affairs officer	X	X
2019-242214	Intellectual property special advisor	X	
2019-242215	Fraud examiner	X	X
2019-242302	Skills development practitioner		X
2019-243101	Advertising specialist	X	X
2019-243102	Market research analyst	X	X
2019-243103	Marketing practitioner	X	X
2019-243104	Market campaign analyst	X	X
2019-243201	Communication co-ordinator	X	X
2019-243202	Communication strategist	X	X
2019-243203	Corporate communication manager	X	X
2019-251101	ICT systems analyst	X	X
2019-251102	Data scientist	X	X
2019-251201	Software developer	X	X
2019-251202	Programmer analyst	X	X
2019-251203	Developer programmer	X	X
2019-251301	Multimedia specialist	X	X
2019-251302	Web developer	X	X
2019-251401	Applications programmer	X	X

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-251901	Computers quality assurance analyst	X	X
2019-252101	Database designer and administrator	X	X
2019-252201	Systems administrator		X
2019-252301	Computer network and systems engineer		X
2019-252302	Network analyst	X	X
2019-252901	ICT security specialist	X	X
2019-262202	Information services manager	X	X
2019-311301	Electrical engineering technician		X
2019-311501	Mechanical engineering technician	X	X
2019-311502	Pressure equipment inspector	X	
2019-311503	Aeronautical engineering technician	X	
2019-311801	Draughtsperson	X	X
2019-311905	Industrial engineering technician		X
2019-312201	Production/operations supervisor (manufacturing)	X	X
2019-312301	Building associate		X
2019-324101	Veterinary nurse		X
2019-324102	Veterinary technician		X
2019-324103	Veterinary technologist		X
2019-325702	Marine safety officer		X
2019-331401	Statistical and mathematical assistant	X	X
2019-331501	Valuer		X
2019-332101	Insurance agent		X
2019-332102	Insurance broker		X
2019-332402	Finance broker		X
2019-333401	Property manager	X	
2019-343203	Visual merchandiser		X
2019-343401	Chef	X	X
2019-351201	ICT communications assistant	X	X
2019-351301	Computer network technician	X	X
2019-351302	Geographic information systems technicians		X
2019-351303	Marine geographic information system (GIS) technician	X	X
2019-413201	Data entry operator		X
2019-422201	Inbound contact centre consultant		X
2019-422202	Outbound contact centre consultant		X
2019-422203	Contact centre real time advisor		X
2019-422204	Contact centre resource planner	X	X

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-422205	Contact centre forecast analyst	X	X
2019-422206	Call or contact centre agent		X
2019-422501	Enquiry clerk		X
2019-431101	Accounts clerk		X
2019-431102	Cost clerk		X
2019-431103	Taxation clerk		X
2019-432201	Production co-ordinator		X
2019-511103	Marine steward		X
2019-532203	Community healthcare worker		X
2019-541403	Retail loss prevention officer		X
2019-641501	Carpenter and joiner	X	
2019-641502	Carpenter	X	X
2019-641503	Joiner	X	
2019-642201	Wall and floor tiler		X
2019-642202	Floor finisher		X
2019-651403	Steel fixer		X
2019-652201	Toolmaker		X
2019-652205	Master toolmaker		X
2019-652301	Metal machinist	X	X
2019-652302	Fitter and turner	X	X
2019-653301	Industrial machinery mechanic	X	X
2019-653302	Mechanical equipment repairer		X
2019-653304	Diesel fitter		X
2019-653305	Small engine mechanic		X
2019-653306	Diesel mechanic	X	X
2019-653307	Heavy equipment mechanic		X
2019-653308	Tractor mechanic		X
2019-653309	Forklift mechanic		X
2019-653310	Lubrication equipment mechanic		X
2019-671102	Electrical installation inspector		X
2019-671203	Mechatronics technician	X	X
2019-671204	Lift mechanic	X	X
2019-671205	Weapon systems mechanic	X	X
2019-671206	Electrical equipment mechanic	X	X
2019-671207	Armature winder	X	X
2019-671208	Transportation electrician	X	X

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL	LPO
2019-681103	Butcher		X
2019-681201	Confectionary baker		X
2019-682201	Cabinet maker		X
2019-682301	Furniture finisher		X
2019-683401	Upholsterer		X
2019-684301	Crop produce analyst		X
2019-684302	Tobacco grader		X
2019-684303	Cotton grader		X
2019-684304	Wool classer/grader		X
2019-684305	Quality controller (manufacturing)	X	X
2019-684908	Shipwright		X
2019-715501	General leather goods production machine operators		X
2019-715601	Footwear production machine operators		X

### 5.2.5 Summary list of occupations

The process followed up until this point has resulted in a preliminary pre-validation list of 230 occupations. These occupations show signs of high demand, based on both the quantitative evidence and the qualitative evidence reviewed. This list of occupations is found in Table 11:

**TABLE 11:** List of OIHD prior to validation

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-121202	Business training manager			X	
2019-121206	Health and safety manager			X	
2019-121301	Policy and planning manager	X			
2019-121901	Corporate general manager		X		
2019-121903	Physical asset manager		X		
2019-121905	Programme or project manager	X	X		
2019-121908	Quality systems manager		X		
2019-122101	Sales and marketing manager		X		
2019-122102	Sales manager		X		
2019-122105	Customer service manager		X		
2019-122301	Research and development manager	X			
2019-131101	Agricultural farm manager	X	X		
2019-131103	Forestry operations supervisor		X		
2019-132101	Manufacturer	X	X		

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-132102	Manufacturing operations manager	X	X		
2019-132104	Engineering manager	X	X		
2019-132107	Footwear quality assurance managers	X	X		
2019-132301	Construction project manager	X		X	
2019-132401	Supply and distribution manager		X		
2019-132404	Warehouse manager		X		
2019-132407	Airport or harbour manager	X	X		
2019-133101	Chief information officer	X			
2019-133102	ICT project manager	X			
2019-133103	Data management manager	X	X		
2019-133104	Application development manager	X			
2019-133105	Information technology manager	X	X		
2019-133106	Information systems director	X			
2019-134502	FET college principal	X			
2019-141101	Hotel or motel manager				X
2019-142103	Retail general manager		X		
2019-143905	Call or contact centre manager	X			
2019-143906	Caravan park and camping ground manager	X			
2019-143907	Dockmaster	X			
2019-143908	Travel accommodation inspector	X			
2019-143909	Travel agency manager	X			
2019-211301	Chemist				X
2019-211401	Geologist	X			
2019-211402	Geophysicist	X			
2019-211403	Materials scientist	X			
2019-211405	Mineralogist	X			
2019-211406	Hydrologist	X			
2019-211407	Oceanographer	X			
2019-212101	Actuary <sup>16</sup>	X			
2019-213107	Marine biologist	X			
2019-213201	Agriculture consultant		X		

<sup>16</sup> The occupation title "actuary", beyond being on either the CSL or the LPO draft lists, was also included based on evidence submitted by the Actuarial Society of South Africa. Given the high global demand for actuaries, South African actuaries tend to emigrate, leaving a shortage of fully qualified (fellow) actuaries in the country, thereby ensuring that they should remain on the list of OIHD.

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-213202	Agricultural scientist		X		
2019-213204	Wine makers	X			
2019-213205	Food and beverage scientist	X	X		
2019-214101	Industrial engineer	X		X	
2019-214102	Industrial engineering technologist	X		X	
2019-214201	Civil engineer	X		X	
2019-214202	Civil engineering technologist	X			
2019-214401	Mechanical engineer	X	X		
2019-214402	Mechanical engineering technologist	X	X		
2019-214403	Aeronautical engineer	X			
2019-214404	Aeronautical engineering Technologist	X			
2019-214405	Naval architect	X	X		
2019-214904	Quantity surveyor	X			
2019-214905	Agricultural engineer	X			
2019-214906	Agricultural engineering technologist	X			
2019-216101	Architect	X		X	
2019-216304	Footwear designers	X			
2019-216601	Digital artist	X			
2019-216602	Illustrator	X			
2019-216603	Multimedia designer	X			
2019-216604	Web designer	X			
2019-221101	General medical practitioner	X			X
2019-222103	Registered nurse (child and family health)	X			
2019-222104	Registered nurse (community health)	X		X	
2019-222105	Registered nurse (critical care and emergency)	X			
2019-222108	Registered nurse (medical)	X		X	
2019-222109	Registered nurse (medical practice)	X			
2019-222110	Registered nurse (mental health)	X			
2019-222112	Registered nurse (surgical)	X		X	
2019-222114	Nurse educator	X		X	
2019-226201	Hospital pharmacist	X		X	

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-226202	Industrial pharmacist	X		X	
2019-226203	Retail pharmacist	X		X	
2019-231101	University lecturer	X	X		
2019-231102	University tutor		X		
2019-232130	TVET educator				X
2019-233107	FET phase school teacher (Grades 10–12)				X
2019-233108	Senior phase school teacher (Grades 7–9)				X
2019-234101	Foundation phase school teacher				X
2019-234102	Intermediate phase school teacher (Grades 4–6)				X
2019-234201	Early childhood development practitioner				X
2019-235201	Special needs teacher			X	
2019-241101	General accountant	X			
2019-241102	Management accountant	X			
2019-241103	Tax professional	X			
2019-241104	External auditor	X			
2019-241106	Accountant in practice	X			
2019-241107	Financial accountant	X			
2019-241108	Forensic accountant	X			
2019-241201	Investment analyst	X		X	
2019-241202	Investment manager	X		X	
2019-241203	Investment advisor	X		X	
2019-241204	Financial markets practitioner			X	
2019-241301	Financial investment advisor	X			
2019-242101	Management consultant	X	X		
2019-242102	Organisation and methods analyst	X	X		
2019-242103	Business development officer	X			
2019-242202	Policy analyst	X			
2019-242203	Company secretary	X			
2019-242208	Organisational risk manager	X			
2019-242209	Accounting officer	X			
2019-242210	Business administrator	X			
2019-242211	Internal auditor	X			



6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-242213	Regulatory affairs officer	X			
2019-242214	Intellectual property special advisor	X			
2019-242215	Fraud examiner	X			
2019-242302	Skills development practitioner	X		X	
2019-242303	Human resource advisor			X	
2019-243101	Advertising specialist	X			
2019-243102	Market research analyst	X			
2019-243103	Marketing practitioner	X			
2019-243104	Market campaign analyst	X			
2019-243201	Communication co-ordinator	X			
2019-243202	Communication strategist	X			
2019-243203	Corporate communication manager	X			
2019-251101	ICT systems analyst	X	X		
2019-251102	Data scientist	X			
2019-251201	Software developer	X	X		
2019-251202	Programmer analyst	X	X		
2019-251203	Developer programmer	X	X		
2019-251301	Multimedia specialist	X			
2019-251302	Web developer	X			
2019-251401	Applications programmer	X			
2019-251901	Computers quality assurance analyst	X			
2019-252101	Database designer and administrator	X	X		
2019-252201	Systems administrator	X			
2019-252301	Computer network and systems engineer	X		X	
2019-252302	Network analyst	X			
2019-252901	ICT security specialist	X			
2019-261101	Attorney			X	
2019-261106	Advocate			X	
2019-262202	Information services manager	X			
2019-311101	Chemistry technician				X
2019-311201	Civil engineering technician			X	
2019-311203	Town planning technician			X	

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-311301	Electrical engineering technician	X			
2019-311501	Mechanical engineering technician	X			
2019-311502	Pressure equipment inspector	X			
2019-311503	Aeronautical engineering technician	X			
2019-311801	Draughtsperson	X			X
2019-311905	Industrial engineering technician	X			
2019-312201	Production/operations supervisor (manufacturing)	X		X	
2019-312301	Building associate	X			X
2019-313106	CSP plant process controller				X
2019-324101	Veterinary nurse	X			
2019-324102	Veterinary technician	X			
2019-324103	Veterinary technologist	X			
2019-325702	Marine safety officer	X			
2019-331401	Statistical and mathematical Assistant	X			
2019-331501	Valuer	X			
2019-332101	Insurance agent	X		X	
2019-332102	Insurance broker	X		X	
2019-332201	Commercial sales representative			X	
2019-332203	Sales representative (personal and household goods)			X	
2019-332301	Retail buyer			X	
2019-332302	Purchasing officer			X	
2019-332402	Finance broker	X			
2019-333401	Property manager	X			X
2019-333402	Real estate agent				X
2019-343203	Visual merchandiser	X			
2019-343401	Chef	X		X	
2019-351201	ICT communications assistant	X			
2019-351301	Computer network technician	X			
2019-351302	Geographic information systems technicians	X			
2019-351303	Marine GIS technician	X			
2019-411101	General clerk			X	

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-413201	Data entry operator	X			
2019-421202	Gaming worker				X
2019-421204	Bookmaker's clerk				X
2019-422102	Travel consultant				X
2019-422201	Inbound contact centre consultant	X			
2019-422202	Outbound contact centre consultant	X			
2019-422203	Contact centre real-time advisor	X			
2019-422204	Contact centre resource planner	X			
2019-422205	Contact centre forecast analyst	X			
2019-422206	Call or contact centre agent	X			
2019-422501	Enquiry clerk	X			
2019-431101	Accounts clerk	X			
2019-431102	Cost clerk	X			
2019-431103	Taxation clerk	X			
2019-432201	Production co-ordinator	X			
2019-511103	Marine steward	X			
2019-511302	Tour guide				X
2019-514101	Hairdresser				X
2019-522301	Sales assistant (general)				X
2019-532203	Community healthcare worker	X			
2019-541201	Traffic officer				X
2019-541401	Security officer				X
2019-541402	Alarm, security, or surveillance monitor				X
2019-541403	Retail loss prevention officer	X			
2019-611202	Horticultural farmer			X	
2019-613101	Mixed crop and livestock farmer				X
2019-621101	Tree feller				X
2019-641501	Carpenter and joiner	X			
2019-641502	Carpenter	X			
2019-641503	Joiner	X			
2019-642201	Wall and floor tiler	X			
2019-642202	Floor finisher	X			
2019-651202	Welder			X	
2019-651403	Steel fixer	X			

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-652201	Toolmaker	X			
2019-652205	Master toolmaker	X			
2019-652301	Metal machinist	X			
2019-652302	Fitter and turner	X			
2019-653101	Automotive motor mechanic			X	
2019-653301	Industrial machinery mechanic	X			
2019-653302	Mechanical equipment repairer	X			
2019-653303	Mechanical fitter		X		
2019-653304	Diesel fitter	X			
2019-653305	Small engine mechanic	X			
2019-653306	Diesel mechanic	X	X		
2019-653307	Heavy equipment mechanic	X	X		
2019-653308	Tractor mechanic	X			
2019-653309	Forklift mechanic	X			
2019-653310	Lubrication equipment mechanic	X			
2019-671101	Electrician		X		
2019-671102	Electrical installation inspector	X			
2019-671202	Millwright		X		
2019-671203	Mechatronics technician	X			
2019-671204	Lift mechanic	X	X		
2019-671205	Weapon systems mechanic	X			
2019-671206	Electrical equipment mechanic	X			
2019-671207	Armature winder	X			
2019-671208	Transportation electrician	X	X		
2019-681103	Butcher	X			X
2019-681201	Confectionary baker	X			
2019-682201	Cabinet maker	X			
2019-682301	Furniture finisher	X			
2019-683401	Upholsterer	X			
2019-684301	Crop produce analyst	X			
2019-684302	Tobacco grader	X			
2019-684303	Cotton grader	X			
2019-684304	Wool classer/grader	X			
2019-684305	Quality controller (manufacturing)	X			

6-DIGIT OFO	6-DIGIT DESCRIPTION	CSL/ LPO	TRANSVERSAL DEMAND	MODERATE DEMAND	SECTOR- SPECIFIC DEMAND
2019-684908	Shipwright	X			
2019-715501	General leather goods production machine operators	X			
2019-715601	Footwear production machine operators	X			
2019-721901	Product assembler				X
2019-733101	Bus driver				X
2019-734101	Agricultural mobile plant (equipment) operator				X

Section 4.3.2 presented reasons for why the list in Table 11 should not be considered final. The next section shows the results of the validation process consequently required. Through engagement with stakeholders and further scrutiny through a desktop-based analysis, various occupations are added to the list while some are removed based on the evidence available.

## 5.3 Validation

The validation process was broken down into two processes:

1. Stakeholder engagements; and
2. Sensibility checks.

The stakeholder engagement process involved the research team, with support and guidance from the DHET, engaging with various custodians of occupations and representative bodies. These engagements took various forms including:

- Workshops in which the methodology was presented and the lists were provided for comment;<sup>17</sup>
- Semi-structured telephonic interviews in which the purpose of the list was put forward and the rationality for inclusion or exclusion of an occupation was considered; and
- A request for public comments through a government gazette, in response to which many stakeholders provided written responses.

After assessing the stakeholder submissions, the remaining occupations (those that the quantitative analysis showed to be in high demand, but for which neither the qualitative analysis nor the validation process had produced substantiating evidence) were finally put through the “3S” logical test outlined by the MAC (2013) and in section 4.3.2 of this report.

The findings from the engagements and desktop-based validation process are presented in the following sub-sections.

<sup>17</sup> A list of workshops in this format is provided in Appendix 3.

## 5.3.1 Stakeholder inputs

### Semi-structured interviews with occupation custodians

The occupations included in the list of OIHD based on the semi-structured interviews were as follows:

**TABLE 12:** Occupations included from semi-structured interviews

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	VALIDATING AGENT
2019-311401	Electronic engineering technician	The South African Institute for Electronic Engineers
2019-324101	Veterinary nurse	The South African Veterinary Council (SAVC)
2019-324102	Veterinary technician	
2019-324103	Veterinary technologist <sup>18</sup>	
2019-331504	Insurance risk manager	The Institute of Risk Management of South Africa
2019-532203	Community healthcare worker (CHW)	St John's Community Health Training
2019-541403	Retail loss prevention officer	The Security Association of South Africa
2019-541404	Close protector	
2019-642201	Wall and floor tiler	The Flooring Industry Training Association
2019-642202	Floor finisher	The South African Wood, Laminate, and Flooring Association
2019-681201	Confectionary baker	The South African Chamber of Baking
2019-681202	Pastry cook	
2019-681203	Confectionery maker	

Some responses in need of highlighting are listed below:

- The SAVC suggested that there was an extremely insufficient supply of veterinary support staff in the country, and that this insufficient supply has been historically present in the country's veterinary space. The representative from the SAVC went further, adding that the applicants who had previously been hired from foreign countries often did not meet the standards of South African veterinary practices and that a more robust solution to this shortage needs to be created within the country.
- From the perspective of CHWs, representatives from St John's made it clear that the state will require more CHWs to assist in their rollout of universal healthcare. This demand for well-trained CHWs, and healthcare workers in general, will only increase over time. Important to note, however, is that an actual increase in demand in the future is highly dependent on the state's fiscal capacity. The current fiscal constraints are unlikely to ease over the short to medium term.

<sup>18</sup> A representative from the University of Cape Town responded to the gazette set out for public comment and requested that an additional occupation – not reflected in the OFO currently – be added to unit group 3,241. This occupation would be entitled "laboratory animal technologist", but until such time as this is formalised in the OFO, the occupation can, in the interim, be included as a potential specialisation.

- A representative from the Security Association of South Africa has pointed out that both retail loss prevention officers and close protectors (specialising in major events security) are in short supply in South Africa. The representative further alluded to the fact that these candidates, when registered through the correct bodies, will only come from the pool of South African nationals, and no foreign nationals should be considered for these positions, based on legislation.
- The South African Chamber of Bakers representative suggested that, at the upper end of the baking skills base, those who were trained in major culinary capitals in the world had comparable skills levels to professional confectionary makers who were trained in private culinary schools in South Africa. However, because most of these private culinary schools require large amounts of student funding, the problem of access to high-quality, affordable culinary training in South Africa ensures that various baking occupations are in short supply in the country.

Beyond these various occupations, whose inclusion in the list of OIHD was proposed, it should also be pointed out that the Artisans Movement of South Africa made various representations to exclude the following occupations from the list of OIHD:

**TABLE 13:** Occupations excluded from the list of OIHD by the South African Artisans Movement

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-651202	Welder
2019-651302	Boilermaker
2019-653303	Mechanical fitter
2019-671101	Electrician
2019-671202	Millwright

These five occupations were quoted as having a large number of unemployed South African citizens available who were not finding job placements. Given the evidence from the South African Artisans Movement, therefore, these occupations will not find a place on the finalised list of OIHD.

It bears mentioning, though, that “electricians” and “millwrights” were occupations highlighted as being transversally demanded across many sources of literature. Given the representation that there are many unemployed electricians and millwrights in the country, further study should be made to assess whether the mismatch between the number of qualified electricians and millwrights and the demand for electricians is due to a skills mismatch (i.e., employers requiring electricians and millwrights with certain skills that those electricians and millwrights do not possess), or whether something else is driving this low absorption of electricians and millwrights into the country’s labour force. To that effect, there is a dedicated research project within the Labour Market Intelligence research programme to look at the issue of the supply and demand of artisans in the country, and to begin to unpack the reasons research would suggest, on the one hand, that we need more artisans, whereas certain organisations are saying, on the other hand, that we have enough artisans for certain artisanal trades with many qualified candidates for work being unemployed.

## Responses to the government gazette publication and workshop presentations

Many responses were sent through to give support for why various occupations should be either included in or excluded from the final list of OIHD.

**Business Processes Enabling South Africa (BPESA)** submitted evidence to include 15 occupations on the final list of OIHD. Of those, eight had already been included in the report, while one occupation (2019-811201: commercial cleaner) is contained in major group 8 and cannot be included in the list.<sup>19</sup> However, the remaining occupations were included, as they have all exhibited signs of shortage in the labour market that the quantitative analysis may not have picked up on. These occupations are highlighted below:

**TABLE 14:** Occupations included in the list of OIHD based on BPESA submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-265206	Book or script editor
2019-352101	Interior designer
2019-441302	Proofreader
2019-513102	Coding clerk
2019-515102	Bus hostess
2019-541102	Hazardous materials removal workers

Special mention was made of the interior design occupation, which is exhibiting increased demand due to COVID-19, given that offices throughout the country now require more ergonomic and smartly designed workspaces.

Next, representations from the **tertiary education sector** have noted that “2019-231101: University lecturer” should be excluded. It bears mentioning that evidence on whether academics are in shortage in the country is ambiguous. While representations point to a surplus of South African PhD graduates who can fill lecturing positions (supported by the high number of unemployed graduates registered in the JOI database), other studies suggest that South Africa is amid a lecturer shortage.

For instance, Heather Dugmore (2019) from the *Weekend Post* points out that South Africa’s 23 universities will be short of 7,000 academics by 2020. This shortage is somewhat being curtailed by the New Generation of Academics Programme (nGAP), which employs young university lecturers yet to complete their master’s or PhD.

However, desktop research into student headcounts per full-time equivalent (FTE) staff ratios shows that, for some categories in the South African classification of educational subject matter (CESM), student numbers are outgrowing lecturing staff by a substantial margin. Indeed, in all but 7 of the 23 CESM, student growth has exceeded lecturing staff growth.

<sup>19</sup> It is important to note the contribution on ICT-related occupations by Institute of Information Technology Professionals of South Africa (IITPSA), all of which appear on the finalised version of the list of OIHD up to this point. These occupations contained a large overlap with those occupations referenced in the Media, Information and Communication Technologies Sector Education and Training Authority (MICTSETA) and Banking Sector Education and Training Authority (BANKSETA) PIVOTAL lists. Following a discussion with representatives from BPESA and the Department of Communication and Digital Technology on 10 September 2020, it was noted that occupations related to the Fourth Industrial Revolution (4IR) might not find true representation in the OFO at this point – a point that is reiterated by the IITPSA submission as well.



**TABLE 15:** Student headcount per FTE staff member across CESM classification in South Africa

CESM	2015 (STUDENTS PER FTE STAFF MEMBER)	2018 (STUDENTS PER FTE STAFF MEMBER)	GROWTH (2015–2018)
Psychology	44	57	30%
Music	14	17	21%
Law	56	67	20%
Other visual/performance arts	32	38	19%
Physical sciences	22	26	18%
Agriculture, agricultural operations, and related sciences	34	39	15%
Architecture and the built environment	37	42	14%
Visual arts	17	19	12%
Languages, linguistics, and literature	18	20	11%
Life sciences	20	22	10%
Family ecology and consumer sciences	21	23	10%
Engineering	53	58	9%
Computer and information sciences	40	43	8%
Education	98	105	7%
Philosophy, religion, and theology	19	20	5%
Social sciences	44	45	2%
Health professions and related clinical sciences (human)	26	26	0%
Health professions and related clinical sciences (other)	16	16	0%
Military sciences	1	1	0%
Public management and services	74	72	-3%
Mathematics and statistics	19	18	-5%
Business, economics, and management studies	71	53	-25%
Communication, journalism, and related studies	52	25	-52%

*Source: Researchers' analysis of data collected from IDSC (2019), which details, per CESM, the total number of students enrolled and the total number of FTE staff members available across 26 South African universities (private and public, as well as universities of technology)*

Further evidence was also provided by **Universities South Africa (USAf)**. Based on the responses it received from a cross-section of university representatives, USAf was able to illuminate some of the reasons that universities have trouble recruiting suitable candidates. These include:

- Minimum appointment criteria (more than just academic qualification);
- Lecturers often require interdisciplinary qualification (i.e., accounting and education);
- Not registered with the required statutory body;
- Insufficient teaching experience;
- Strongest candidates often opting for private sector; and
- Insufficient research and administrative experience.

Furthermore, as suggested by Table 15, the supply shortage is not equal across all fields. It is, therefore, essential that the inclusion of “University lecturer” does not mean that all lecturers, regardless of field, should be included. Fortuitously, the responses from the universities also included a list of the specific academic fields in which shortages are most prominent (see Appendix 4). Only these are therefore included under the “University lecturer” occupation for this list.

**The Education, Training, and Development Practices Sector Education and Training Authority (ETDP SETA)** submitted evidence to include a further 22 occupations on the list of OIHD, based on their elevated levels of demand within the education space specifically. Of these, 11 have already been mentioned. The remaining 11 occupations are summarised below:

**TABLE 16:** Occupations included in the list of OIHD based on the ETDP SETA submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-122301	Research and development manager
2019-134501	School principal
2019-134502	FET college principal
2019-134503	Faculty head
2019-134504	District education manager
2019-134505	Educational rector
2019-134506	Educational registrar
2019-134507	Departmental head
2019-235101	Education or training advisor
2019-235502	Private tuition dance teacher
2019-251102	Data scientist

**The W&R SETA** submitted evidence to suggest that 23 occupations were in high demand, based on their sector skills plans and on hard-to-fill vacancy data in the wholesale and retail space. Of these, 13 have already been included in the list of OIHD. A further one (2019-821601: fishing hand) is an occupation housed in major group category 8, therefore excluding it from the finalised list of OIHD. The remaining occupations motivated for by W&R SETA are as follows:

**TABLE 17:** Occupations included in the list of OIHD based on the W&R SETA submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-121201	Human resource manager
2019-226302	Safety, health, environment, and quality (SHE&Q) practitioner
2019-315303	Aeroplane pilot
2019-343203	Visual merchandiser
2019-351301	Computer network technician
2019-522201	Retail supervisor
2019-652302	Fitter and turner
2019-733103	Passenger coach driver
2019-733201	Truck driver (general)

Next, **representatives from the Saldanha Bay Industrial Development Zone (SBIDZ)** submitted evidence on 24 occupations (and many specialised skills) to include in the finalised list of OIHD. Of the 24, 9 had already been included thus far. The remaining occupations are included in Table 18:

**TABLE 18:** Occupations included in the list of OIHD based on the SBIDZ submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-132402	Logistics manager
2019-211201	Meteorologist
2019-211402	Geophysicist
2019-211403	Materials scientist
2019-211407	Oceanographer
2019-213107	Marine biologist
2019-214501	Chemical engineer
2019-215101	Electrical engineer
2019-311502	Pressure equipment inspector
2019-651201	Pressure welder
2019-661101	Precision instrument maker and repairer
2019-684101	Diver
2019-684908	Shipwright
2019-711301	Driller
2019-711302	Rock drill operator

In relation to the actual SBIDZ, it is important to note that these occupations require specialised maritime-related skills:

- Instead of general welding skills, the representatives from the SBIDZ noted that underwater and coded welding skills were required.
- With respect to engineering skills, hydraulic engineering and mooring engineering skills featured prominently as being in shortage for the SBIDZ. Beyond this, all rig-related operations skills that might fall under various fields of engineering were also in short supply and are needed going forward with the development of the SBIDZ.

Representatives from the **Forest-Based Industry Board** have also put forward that three occupations (and a further two specialisations) be placed on the list of OIHD, none of which have yet been included. These relate directly to specialised furniture making, which require skilled individuals for which there is a shortage of supply in South Africa:

**TABLE 19:** Occupations included in the list of OIHD based on the Forest-Based Industry Board submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-682201	Cabinet maker
2019-682301	Furniture finisher
2019-683401	Upholsterer

As pointed out by the representatives, these specialisations include:

- Master furniture craftsmen and craftswomen;
- Furniture seamsters and seamstresses; and
- Hand-skilled furniture makers.

Representatives from the **Clothing, Textiles, Footwear, and Leather (CTFL) goods industry** made the case to include a further ten occupations. Of those, one has already been included in the list of OIHD thus far. The remaining nine occupations are summarised below:

**TABLE 20:** Occupations included in the list of OIHD based on the CTFL industry representative submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-216304	Footwear designer
2019-313903	Clothing, textile, and footwear manufacturing process control technician
2019-715302	Clothing, textile, and leather goods production operator
2019-715501	Leather processing machine operator
2019-715601	Footwear cutting production machine operator
2019-715602	Footwear closing production machine operator
2019-715603	Footwear bottom stock production machine operator
2019-715604	Footwear lasting production machine operator
2019-715605	Footwear finishing production machine operator

These occupations have been included due to the lack of candidates who are able to utilise technology in their processes (either from a design or a manufacturing perspective). It was also mentioned that these occupations are in high demand due to the expansion that is occurring in the textiles industry.

**The National Association of Automotive Component and Allied Manufacturers (NAACAM)** made a representation to include six occupations on the finalised list of OIHD. Of these, three had already been included up to this point. These three occupations are presented below and have been included due to the historical shortage of skilled individuals who can fulfil these occupational roles:

**TABLE 21:** Occupations included in the list of OIHD based on the NAACAM submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-651403	Steel fixer
2019-652201	Toolmaker
2019-652205	Master toolmaker

**The Council for Scientific and Industrial Research (CSIR)** has argued for the inclusion of one occupation only (2019-213105: Biotechnologist), which is a particularly relevant occupation in high demand due to the role that biotechnologists play in assisting the health system during the COVID-19 pandemic.

The South African Blanket Manufacturers Employers Organisation (SABMEO) has argued for the inclusion of a further ten occupations from the OFO guidelines into the finalised list of OIHD. Of these, seven have already been included up until this point. The inclusion of these occupations relates to the increased demand for labourers who are proficient at operating various textile-related machinery given the move towards a more technology-intensive textiles industry:

**TABLE 22:** Occupations included in the list of OIHD based on the SABMEO submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-661801	Textile, leather, and related materials handicraft workers
2019-715103	Man-made fibre production machine operator
2019-715401	Textile wet process production operator

From the perspective of the Southern African Institute for Business Accountants (SAIBA), submissions from representatives suggested that 20 occupations be included in the list of OIHD, based on evidence that they are in high demand in the country. Of these 20, 11 have already been included up until this point, with the remaining nine being included below:

**TABLE 23:** Occupations included in the list of OIHD based on the SAIBA submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-121101	Finance manager
2019-121103	Credit manager
2019-121104	Internal audit manager
2019-331301	Bookkeeper
2019-331302	Accounting technician
2019-331303	Tax technician
2019-431101	Accounts clerk
2019-431102	Cost clerk
2019-431103	Taxation clerk

Representation made by the National Bargaining Council for the Clothing Manufacturing Industry (NBC CMI) put forward a total of 17 additional occupations that were in high demand based on their own sector skills plans, of which eight have already been included in the list of OIHD up until this point. The remaining occupations are highlighted overleaf:

**TABLE 24:** Occupations included in the list of OIHD based on the NBC CMI submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-122104	Interactive and direct marketing strategist
2019-132106	Manufacturing quality manager
2019-214104	Production engineering technologist
2019-216301	Fashion designer
2019-216302	Industrial designer
2019-243203	Corporate communication manager
2019-311102	Physical science technician
2019-333905	Supply chain practitioner
2019-683303	Textile produce mender and embroiderer

Penultimately, the **Department of Tourism (DoT)** highlighted three occupations that warrant inclusion in the finalised list of OIHD (one of which has already been included up until this point). These occupations, summarised below, are in high demand due to a lack of human capital or sufficiently skilled individuals within the country, along with the absence of targeted training programmes that can qualify such individuals:

**TABLE 25:** Occupations included in the list of OIHD based on the DoT submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-226304	Food inspector
2019-243103	Tourism officer

Finally, **representations made by the Department of Transport (DOT)** suggest that the demand for rail services is set to increase. Given the discussion with the DOT and its various stakeholders, it is clear that infrastructure development in the transportation space is set to increase the demand for various built environment and engineering skills in the future. These sorts of occupations are already well-represented on the list up to this point, and as such, are not in need of inclusion based on the DOT's response.

However, occupations relating to airport, railway, and road-related services themselves have not been represented up to this point. Because plans to develop transportation infrastructure and services are already in motion, and will be over the foreseeable future, these occupations will be in high demand in the coming years:

**TABLE 26:** Occupations included in the list of OIHD based on the DOT submissions

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION
2019-132403	Road transport manager
2019-132406	Railway station manager
2019-134919	Traffic and law enforcement manager
2019-216402	Transport analyst
2019-315203	Ship's surveyor
2019-315301	Aircraft navigator
2019-315401	Traffic controller
2019-315501	Airborne electronics analyst
2019-315502	Airworthiness surveyor
2019-325702	Marine safety officer
2019-325705	Safety inspector
2019-335914	Train examiner
2019-511104	Railway steward
2019-653402	Non-motorised transport equipment repairer
2019-731101	Train driver
2019-731102	Tram driver
2019-731201	Railway signal operator
2019-731202	Train controller
2019-734212	Railway track master

The feedback discussed above is specifically focused on the comments from stakeholders that resulted in changes to the list. Comments were, however, also received from other representatives that did not lead to changes, but still provided invaluable information. This information is summarised in Table 27.

**TABLE 27:** Other responses to the request for public comment that provided valuable information

INDUSTRY BODY/ REPRESENTATIVE	6/4-DIGIT OFO CODE	OCCUPATION/ UNIT GROUP	ARGUMENT PROVIDED	RESULT
Actuarial Society of South Africa	2019-212101	Actuary	Given the global demand for actuaries, South African actuaries tend to emigrate, leaving a shortage of fully qualified (fellow) actuaries in the country, and ensuring that they should remain on the list of OIHD.	Occupation remains included.
Research Animal Facility, Faculty of Health Sciences, University of Cape Town	2019-3241	Veterinary technicians and assistants	Requested that an additional occupation – not reflected in the OFO currently – be added to unit group 3,241. This occupation should be entitled “laboratory animal technologist”.	Recommended that suggestion be taken forward for review.
Grassland Society of Southern Africa	2019-213202	Agricultural scientist	Although the OFO makes little distinction within the “agricultural scientist” occupation, the Grassland Society of Southern Africa has recommended that two separate specialisations for this occupation exist – grassland scientist and pasture scientist, respectively.	Recommended that suggestion be taken forward for review.
IITPSA	n.a.	n.a.	Suggests a review of the OFO to simplify the identification and monitoring of South Africa’s critical skills needs.	The OFO is reviewed and updated periodically.



INDUSTRY BODY/ REPRESENTATIVE	6/4-DIGIT OFO CODE	OCCUPATION/ UNIT GROUP	ARGUMENT PROVIDED	RESULT
IITPSA <i>continued</i>	n.a.	n.a.	Suggests that some valuable information is lost due to the focus on occupation titles rather than core skills and competencies.	<p>Further investigation is suggested starting with this recommendation put forward by IITPSA:</p> <ul style="list-style-type: none"> <li>• Skills Framework for the Information Age;</li> <li>• EU e-Competency Framework.</li> </ul> <p>The 2018 <i>List of Occupations in High Demand Technical Report</i> did, however, provide an in-depth discussion on distinguishing between skills and occupations. This suggestion should, therefore, be considered within the context of that discussion.</p>
Drone Council of South Africa	n.a.	n.a.	<p>Requested for the inclusion of the following occupations:</p> <ul style="list-style-type: none"> <li>• Drone pilots;</li> <li>• Drone spotters;</li> <li>• Drone maintenance technicians;</li> <li>• Drone operations managers;</li> <li>• Drone safety officers;</li> <li>• Drone quality officers;</li> <li>• Drone pilot instructors.</li> </ul>	<p>According to the Drone Council of South Africa, all these have been included in the president's 4IR council. These do not, however, fit neatly into the current OFO.</p> <p>During the next review of the OFO, given the emergence of drone technology, consideration should be given to include these under either occupations or specialisations.</p>

### 5.3.2 Sensible, skilled, and in shortage

Unfortunately, representation from every corner of the economy during the stakeholder engagement was not feasible. Although the researchers did not deny any requests, it was not possible to engage with every necessary stakeholder. This was made especially difficult during the various levels of the national lockdown, during which most potential interviewees were not in their offices. This hindrance has made the sense-check requirement even more important.

The sense-check employed here is informed by the approach of the MAC (2013) and was also used for the 2018 list of OIHD. Section 4.3.2 provided a quick overview of the three logical tests an occupation has to pass to be included in the final list. These tests are explained in more detail below, with the results provided in Table 28.

#### 1 The occupation needs to be sensible if it is to be included in the list in question.

While sensibility is very subjective, some broad criteria applied to the 2018 list of OIHD report can be applied in this context as well. For an occupation to be deemed “sensible”, it should:

- Not rely heavily on the innate talent of an individual (for instance, although an artist has trained in their craft, there is an element of innate ability that aids them to become successful in their ventures). Because this innate talent cannot be created by an education system, these occupations are eliminated from the list of OIHD;
- Not relate to government managerial experience, which is not able to be bred by the education system alone, but rather by years of experience in the political and administration space;
- Not fit into a custom/niche industry for which very limited labour market interventions can be planned; and
- Relate directly to some form of post-school qualification that falls under the ambit of the DHET.

#### 2 The occupation needs to be in shortage

Once it is deemed sensible to include an occupation given the purposes of the list of OIHD, evidence that said occupation is indeed in shortage needs to exist. To assess the shortage of such occupations, the DEL's JOI and ESSA databases were used in tandem. More specifically, if an occupation simultaneously showed low job vacancy numbers according to the JOI,<sup>20</sup> and a large number of unemployed South African qualified candidates to fill a post according to the ESSA,<sup>21</sup> said occupation was excluded from the final list of OIHD.

It should be noted here that these databases, although useful, paint an incomplete picture of the South African labour market. This incompleteness is due primarily to self-selection: these databases only reflect those individuals who have identified themselves as belonging to a particular occupation and who have come forward to be counted as part of the databases. As such, the findings from the JOI were overlaid by assessing whether the unit group under which a particular occupation falls exhibited signals of shortage from the quantitative analysis done previously.

<sup>20</sup> Less than 21 vacancies at the unit group level (the median of the dataset).

<sup>21</sup> Because the ESSA data was only requested for 422 of the 1,510 occupations found in the OFO, the median of this dataset was not used as a cut-off. Instead, because using the median might be seen as arbitrary in a partial dataset such as the ESSA data collected, the cut-off for the number of unemployed South African candidates was set at 500. While this is also somewhat arbitrary, this figure was chosen by looking at the number of candidates in the ESSA database across the 422 occupations and making a judgement on what might be considered a reasonable cut-off.

Therefore, for an occupation to show sufficient evidence of shortage, an occupation needed to meet two criteria:

1. The number of unemployed South African citizens found in the ESSA database attached to a particular occupation would have to be below 500, while the number of vacancies attached to a unit group in the JOI would have to be above the median number (21) of recorded vacancies across the entire JOI database; **and**
2. The quantitative analysis would need to show some signal of high demand or acute shortage for a particular unit group (which was then assumed to be representative of the index score at the occupational level).

### 3 The occupation needs to be skilled

Occupations that are both sensible and in shortage are then required to meet the final logical test. If an occupation requires a sufficient level of skill (technical, artisanal, or professional), then the occupation is able to be placed on the finalised list of OIHD. Although a definition of “skilled” is difficult to pin down, the concept of the list of OIHD revolves directly around including occupations in every major group except for elementary occupations. Therefore, all occupations that are sensible and confirmed to be in shortage will be placed on the finalised list of OIHD if they appear in the OFO major groups 1–7.

Given these three criteria, the following table summarises all occupations that have previously been left out of the analysis and whether they are included in or excluded from the final list of OIHD according to those three criteria.

Two things are important to note:

1. All occupations highlighted in this process were already exclusive of occupations in the OFO major group 8, ensuring that each occupation at least passed the “skilled” logical test. There is consequently no need for a column to be included for this test;
2. Occupations highlighted in **green** passed all three logical tests and as such were included in the final version of the list of OIHD.

**TABLE 28:** List of occupations being scrutinised under the 3S methodology

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-111101	Local or provincial government legislator	Fail	Fail
2019-111102	Parliamentarian	Fail	Fail
2019-111202	General manager public service	Fail	Fail
2019-111204	Senior government official	Fail	Fail
2019-111207	Senior government manager	Fail	Fail
2019-111301	Traditional leader	Fail	Fail
2019-121204	Recruitment manager	Pass	Fail
2019-121205	Employee wellness manager	Pass	Fail
2019-121207	Personnel manager	Pass	Fail
2019-132403	Road transport manager	Pass	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-134201	Medical superintendent	Pass	Fail
2019-134202	Nursing clinical director	Pass	Fail
2019-134203	Primary healthcare manager	Pass	Fail
2019-134204	Secondary health services manager	Pass	Fail
2019-134205	Health service specialised clinic manager	Pass	Fail
2019-134206	Sport science manager	Fail	Fail
2019-134207	Community health manager	Pass	Fail
2019-134901	Environmental manager	Pass	Fail
2019-134902	Laboratory manager	Pass	Fail
2019-134903	Small business manager	Fail	Fail
2019-134904	Office manager	Fail	Fail
2019-134905	Judicial court manager	Pass	Fail
2019-134906	Practice manager	Pass	Fail
2019-134907	Archives manager	Pass	Fail
2019-134908	Library manager	Fail	Fail
2019-134909	Museum manager	Pass	Fail
2019-134911	Insurance policy administration manager	Pass	Fail
2019-134912	Commissioned fire and rescue officer	Pass	Fail
2019-134913	Commissioned police officer	Pass	Fail
2019-134914	Correctional services manager	Pass	Fail
2019-134915	Non-manufacturing operations manager	Pass	Fail
2019-134916	Non-manufacturing operations foreman	Pass	Fail
2019-134917	Publisher	Fail	Fail
2019-134918	Water production and supply manager	Pass	Fail
2019-134919	Traffic and law enforcement manager	Pass	Fail
2019-134920	Community correctional manager	Pass	Fail
2019-134921	Disaster management manager	Pass	Fail
2019-142101	Importer or exporter	Fail	Fail
2019-142102	Wholesaler	Fail	Fail
2019-142104	Post Office manager	Fail	Fail
2019-143902	Cleaning services manager	Fail	Fail
2019-143903	Boarding kennel or cattery manager	Pass	Fail
2019-143904	Security services manager	Pass	Fail
2019-143905	Call or contact centre manager	Pass	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-143906	Caravan park and camping ground manager	Pass	Fail
2019-143907	Dockmaster	Pass	Fail
2019-143908	Travel accommodation inspector	Pass	Fail
2019-215201	Electronics engineer	Pass	Fail
2019-215202	Electronics engineering technologist	Pass	Fail
2019-226101	Dental specialist	Pass	Fail
2019-226102	Dentist	Pass	Fail
2019-226905	Biokineticist	Pass	Fail
2019-242103	Business development officer	Pass	Fail
2019-242104	AML surveillance analyst	Pass	Fail
2019-242201	Intelligence officer	Pass	Fail
2019-242202	Policy analyst	Pass	Fail
2019-242203	Company secretary	Fail	Fail
2019-242204	Corporate treasurer	Pass	Fail
2019-242207	Compliance officer	Pass	Fail
2019-242208	Organisational risk manager	Pass	Fail
2019-242209	Accounting officer	Pass	Fail
2019-242210	Business administrator	Pass	Fail
2019-242211	Internal auditor	Pass	Fail
2019-242212	Diplomat	Fail	Fail
2019-242213	Regulatory affairs officer	Pass	Fail
2019-242214	Intellectual property special advisor	Pass	Fail
2019-242215	Fraud examiner	Pass	Fail
2019-242304	Industrial relations advisor	Pass	Fail
2019-243101	Advertising specialist	Pass	Fail
2019-243102	Market research analyst	Pass	Fail
2019-243103	Marketing practitioner	Pass	Fail
2019-243104	Market campaign analyst	Pass	Fail
2019-243201	Communication co-ordinator	Pass	Fail
2019-243202	Communication strategist	Pass	Fail
2019-243204	Event producer	Fail	Fail
2019-243301	Industrial products sales representative	Fail	Fail
2019-243302	Medical and pharmaceutical products sales representative	Fail	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-243303	Educational products and services sales representative	Fail	Fail
2019-243304	Printing and publishing equipment sales representative	Fail	Fail
2019-243403	ICT sales representative	Fail	Fail
2019-252201	Systems administrator	Pass	Fail
2019-252302	Network analyst	Pass	Fail
2019-261201	Judge	Pass	Pass
2019-261202	Magistrate	Pass	Pass
2019-261901	Skills development facilitator	Pass	Fail
2019-261902	Legislation facilitator	Pass	Fail
2019-261903	Master of the court	Pass	Fail
2019-261904	Family court registrar	Pass	Fail
2019-261905	Notary	Pass	Fail
2019-263401	Psychologist	Pass	Fail
2019-263601	Minister of religion	Fail	Fail
2019-264101	Author	Fail	Fail
2019-264102	Book or script editor	Fail	Fail
2019-264103	Technical writer	Fail	Fail
2019-265101	Painter (visual arts)	Fail	Fail
2019-265102	Potter or ceramicist	Fail	Fail
2019-265103	Sculptor	Fail	Fail
2019-265104	Ephemeral artist	Fail	Fail
2019-265201	Composer	Fail	Fail
2019-265202	Music director	Fail	Fail
2019-265203	Musician (instrumental)	Fail	Fail
2019-265204	Singer	Fail	Fail
2019-265205	Music researcher	Fail	Fail
2019-311904	Manufacturing technician	Pass	Fail
2019-312101	Mining production supervisor	Pass	Fail
2019-313201	Water plant operator	Pass	Fail
2019-313202	Waste materials plant operator	Pass	Fail
2019-313203	Water process controller	Pass	Fail
2019-314101	Life science technician	Pass	Pass
2019-314201	Agricultural technician	Pass	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-321201	Medical technician	Pass	Fail
2019-321206	Medical technologist	Pass	Fail
2019-325501	Massage therapist	Fail	Fail
2019-325502	Hydrotherapist	Pass	Fail
2019-325503	Electrotherapist	Pass	Fail
2019-325504	Physiotherapy technician	Pass	Fail
2019-331201	Credit or loans officer	Pass	Fail
2019-331204	False worker	Pass	Fail
2019-331205	Business banker	Pass	Fail
2019-332202	Sales representative (building and plumbing supplies)	Fail	Fail
2019-332204	Commercial services sales agent	Fail	Fail
2019-332206	Sales representative (photographic equipment and supplies)	Fail	Fail
2019-332207	Chemical sales representative	Fail	Fail
2019-332208	Pharmacy sales assistant	Fail	Fail
2019-333201	Events manager	Fail	Fail
2019-333905	Supply chain practitioner	Pass	Fail
2019-334301	Secretary bargaining council	Fail	Fail
2019-334302	Personal assistant	Fail	Fail
2019-335916	Gaming operations compliance officer	Pass	Fail
2019-341110	Associate legal professional	Pass	Fail
2019-342101	Footballer	Fail	Fail
2019-342102	Golfer	Fail	Fail
2019-342103	Jockey	Fail	Fail
2019-342104	Cricketer	Fail	Fail
2019-342105	Athlete	Fail	Fail
2019-342106	Boxer	Fail	Fail
2019-342107	Cyclist	Fail	Fail
2019-342108	Racing driver	Fail	Fail
2019-342109	Surfer	Fail	Fail
2019-342110	Swimmer	Fail	Fail
2019-342111	Tennis player	Fail	Fail
2019-342112	Wrestler	Fail	Fail
2019-342113	Yachtsman	Fail	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-342114	Other sportsperson	Fail	Fail
2019-343101	Photographer	Fail	Fail
2019-343102	Air observer	Fail	Fail
2019-343201	Interior designer	Pass	Fail
2019-343202	Interior decorator	Pass	Fail
2019-343204	Set designer	Pass	Fail
2019-343901	Tattoo artist	Fail	Fail
2019-343902	Light technician	Fail	Fail
2019-343903	Stage manager	Fail	Fail
2019-343904	Theatrical dresser	Fail	Fail
2019-343905	Stunt person	Fail	Fail
2019-343906	Special effects person	Pass	Fail
2019-343907	Continuity person	Fail	Fail
2019-343908	Film technician	Pass	Fail
2019-343909	Microphone boom operator	Fail	Fail
2019-343910	Performing arts road manager	Fail	Fail
2019-413201	Data entry operator	Fail	Fail
2019-421102	Bank worker	Fail	Fail
2019-421301	Pawnbrokers and money-lenders	Fail	Pass
2019-422101	Tourist information officer	Fail	Fail
2019-422201	Inbound contact centre consultant	Pass	Fail
2019-422202	Outbound contact centre consultant	Pass	Fail
2019-422203	Contact centre real time advisor	Pass	Fail
2019-422204	Contact centre resource planner	Pass	Fail
2019-422205	Contact centre forecast analyst	Pass	Fail
2019-422206	Call or contact centre agent	Pass	Fail
2019-422501	Enquiry clerk	Pass	Fail
2019-432301	Transport clerk	Pass	Fail
2019-441201	Courier	Fail	Fail
2019-441202	Postal delivery officer	Fail	Fail
2019-441203	Mail clerk	Fail	Fail
2019-441601	Human resources clerk	Pass	Fail
2019-441903	Programme or project administrators	Pass	Fail
2019-511103	Marine steward	Pass	Pass



6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-516301	Funeral director	Fail	Fail
2019-522302	Motorised vehicle or caravan salesperson	Fail	Fail
2019-522303	Automotive parts salesperson	Fail	Fail
2019-522304	ICT sales assistant	Fail	Fail
2019-524201	Sales demonstrator	Fail	Pass
2019-524401	Call centre salesperson	Fail	Fail
2019-531101	Child care worker	Pass	Pass
2019-531102	Family day care worker	Pass	Pass
2019-531103	Nanny	Pass	Pass
2019-531104	Out-of-school-hours care worker	Pass	Pass
2019-531105	Child or youth residential care assistant	Pass	Pass
2019-531106	Hostel parent	Pass	Fail
2019-532201	Residential care officer	Pass	Pass
2019-532202	Aged or disabled carer	Pass	Pass
2019-532901	First aid attendant	Pass	Fail
2019-532902	Hospital orderly	Pass	Fail
2019-532903	Nursing support worker	Pass	Fail
2019-532904	Personal care assistant	Pass	Fail
2019-532905	Therapy aide	Pass	Fail
2019-532906	Natural remedy consultant	Fail	Fail
2019-541101	Fire fighter	Pass	Pass
2019-541202	Non-commissioned police official	Pass	Fail
2019-541203	Military police official	Pass	Fail
2019-611101	Agronomy farmer	Pass	Fail
2019-611302	Landscape contractor	Pass	Fail
2019-641301	Stonemason	Pass	Fail
2019-641302	Granite cutter	Pass	Fail
2019-641303	Refractory mason	Pass	Fail
2019-641402	Fibre-cement moulder	Pass	Fail
2019-641403	Civil engineering constructor	Pass	Fail
2019-643101	Painter	Pass	Fail
2019-652202	Gunsmith	Pass	Fail
2019-652203	Locksmith	Pass	Fail
2019-652204	Patternmaker	Pass	Fail

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	PASSES SENSIBILITY TEST	PASSES SHORTAGE TEST
2019-652206	Die-sinker	Pass	Fail
2019-652402	Tool grinder and sharpener	Pass	Fail
2019-652403	Saw maker and repairer	Pass	Fail
2019-652404	Grinder	Pass	Fail
2019-661301	Goldsmith	Pass	Fail
2019-661302	Diamond and gemstone setter	Pass	Fail
2019-661303	Jewellery evaluator	Pass	Fail
2019-661304	Diamond sorter and evaluator	Pass	Fail
2019-661401	Potter or ceramic artist	Pass	Fail
2019-661501	Glass maker	Pass	Fail
2019-661502	Optical mechanic	Pass	Fail
2019-662202	Small offset lithography operator	Pass	Fail
2019-671302	Cable jointer	Pass	Pass
2019-683101	Tailor	Pass	Pass
2019-683103	Hat maker	Pass	Fail
2019-683201	Clothing, home textiles, and general goods cutter	Pass	Fail
2019-683202	Apparel and related pattern maker	Pass	Fail
2019-684201	Mining blaster	Pass	Fail
2019-684202	Blaster	Pass	Fail
2019-711101	Mining operator	Pass	Fail
2019-711401	Concrete products machine operator	Pass	Pass
2019-711402	Glass, clay, and stone manufacturing machine setter and minder	Pass	Pass
2019-711403	Plaster machine operator	Pass	Pass
2019-711404	Cement production plant operator	Pass	Pass
2019-711405	Concrete batching plant operator	Pass	Pass
2019-711406	Industrial diamond polishing machine operator	Pass	Fail
2019-714101	Rubber production machine operator	Pass	Fail
2019-714102	Rubber manufacturing machine setter and minder	Pass	Fail
2019-715901	Textile and footwear manufacturing machine minder	Pass	Fail
2019-735101	Deckhand	Pass	Fail

Given these notes, it is clear that this exercise has proved vital for including a further 21 occupations on the finalised list of OIHD. This finalised list is presented in the following section.

**PART 6**

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**Presenting  
the 2020 list  
of OIHD**



The finalised list of OIHD is put forward in this section. Next to each occupation is an indication of the **minimum qualification** required by said occupation. It should be noted that these qualifications represent the bare minimum requirement for obtaining a job position, but further study/training would increase the chances for an individual to gain employment within their chosen field. Therefore, these minimum qualifications must be understood merely as sign-posts, as opposed to prescriptive indicators.

As a reminder prior to the presentation of the list of OIHD, the following colour-coding relates to the possible impacts of the COVID-19 pandemic at an occupational level:

Highlighted in **green** if the sector within which an occupation is housed is expected to:

- Recover relatively quickly from the impact of COVID-19; or
- Show signals of increased labour demand due to COVID-19.

Highlighted in white/not highlighted if the sector within which an occupation is housed is expected to:

- Recover from the impact of COVID-19 in a moderate timeframe; or
- Labour demand is expected to be ambiguously affected by COVID-19 in the sector; or
- Labour demand is not expected to change due to the impact of COVID-19.

Highlighted in **red** if the sector within which an occupation is housed is expected to:

- Recover slowly from the impact of COVID-19; or
- Show signals of decreased labour demand due to COVID-19.

Further notation in the table relates to the asterisk (\*) accompanying several occupations. The asterisk indicates that these occupations also appeared in the DEL's ESSA work seekers database as of 14 September 2020. There are several reasons that there appear to be so many unemployed work seekers in occupations that are in the list of OIHD. These include the following:

- a. Geographical dynamics. Given that the list of OIHD reflects a national picture of occupational demand and does not therefore take into account provincial or local variations in occupational demand, it is to be expected that work seekers in the ESSA database could be living in geographical areas where occupational demand is lower than national demand.
- b. Timing of data availability. The list of OIHD is based on some data that is two years old (for example, wages data), whereas the ESSA database reflects information as of 14 September 2020. This misalignment in the timing of information regarding occupational supply and demand could explain why an occupation is in demand while there are recorded numbers of unemployed as per the ESSA database.
- c. Impact of COVID-19. The data about work seekers from the ESSA database is very recent; it captures the devastating impact of COVID-19 on employment. On the other hand, the list of OIHD is based on data that goes beyond the immediate and short-term effect of COVID-19.

Bearing this in mind, Table 29 summarises the final list of OIHD, containing a total of 345 occupations. The order of occupations listed has no relation to priority, but rather follows the ordering of the OFO.

**TABLE 29:** Finalised list of OIHD

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-112101	Director (enterprise/organisation)	Diploma or advanced certificate (NQF Level 6)
2019-121101	Finance manager	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-121103	Credit manager	Diploma or advanced certificate (NQF Level 6)
2019-121104	Internal audit manager	Occupational certificate (NQF Level 7)
2019-121201	Human resource manager*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-121202	Business training manager	Diploma or advanced certificate (NQF Level 6)
2019-121206	Health and safety manager	Diploma or advanced certificate (NQF Level 6)
2019-121301	Policy and planning manager	Diploma or advanced certificate (NQF Level 6)
2019-121901	Corporate general manager	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-121903	Physical asset manager	Diploma or advanced certificate (NQF Level 6)
2019-121905	Programme or project manager*	Occupational certificate (NQF Level 5)
2019-121908	Quality systems manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-122101	Sales and marketing manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-122102	Sales manager	Diploma or advanced certificate (NQF Level 6)
2019-122104	Interactive and direct marketing strategist	Diploma or advanced certificate (NQF Level 6)
2019-122105	Customer service manager	Diploma or advanced certificate (NQF Level 6)
2019-122301	Research and development manager	Diploma or advanced certificate (NQF Level 6)
2019-131101	Agricultural farm manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-131103	Forestry operations supervisor	Bachelor's degree or advanced diploma (NQF Level 7)
2019-132101	Manufacturer	Diploma or advanced certificate (NQF Level 6)
2019-132102	Industrial production manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-132104	Engineering manager*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-132106	Manufacturing quality manager	Diploma or advanced certificate (NQF Level 6)
2019-132107	Quality manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-132301	Construction project manager	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-132401	Supply and distribution manager	Occupational certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-132402	Logistics manager*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-132403	Road transport manager	Occupational certificate (NQF Level 5)
2019-132404	Warehouse manager	Diploma or advanced certificate (NQF Level 6)
2019-132406	Railway station manager	National certificate (NQF Level 4)
2019-132407	Airport or harbour manager	Diploma or advanced certificate (NQF Level 6)
2019-133101	Chief information officer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-133102	ICT project manager	Diploma or advanced certificate (NQF Level 6)
2019-133103	Data management manager	Diploma or advanced certificate (NQF Level 6)
2019-133104	Application development manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-133105	Information technology manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-133106	Information systems director*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-134501	School principal	Bachelor's degree or advanced diploma (NQF Level 7)
2019-134502	FET college principal*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-134503	Faculty head	Doctoral degree or professional doctoral degree (NQF Level 10)
2019-134504	District education manager	Diploma or advanced certificate (NQF Level 6)
2019-134505	Educational rector	Doctoral degree or professional doctoral degree (NQF Level 10)
2019-134506	Educational registrar	Doctoral degree or professional doctoral degree (NQF Level 10)
2019-134507	Departmental head	Diploma or advanced certificate (NQF Level 6)
2019-134919	Traffic and law enforcement manager	Diploma or advanced certificate (NQF Level 6)
2019-141101	Hotel or motel manager	Diploma or advanced certificate (NQF Level 6)
2019-142103	Retail general manager*	Occupational certificate (NQF Level 6)
2019-143905	Call or contact centre manager	Diploma or advanced certificate (NQF Level 6)
2019-143906	Caravan park and camping ground manager	Diploma or advanced certificate (NQF Level 6)
2019-143907	Dockmaster	Diploma or advanced certificate (NQF Level 6)
2019-143908	Travel accommodation inspector	Diploma or advanced certificate (NQF Level 6)
2019-143909	Travel agency manager	Occupational certificate (NQF Level 5)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-211201	Meteorologist	Bachelor's degree or advanced diploma (NQF Level 7)
2019-211301	Chemist	Bachelor's degree or advanced diploma (NQF Level 7)
2019-211401	Geologist	Bachelor's degree, occupational certificate or advanced diploma (NQF Level 7)
2019-211402	Geophysicist	Bachelor's degree, occupational certificate or advanced diploma (NQF Level 7)
2019-211403	Materials scientist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-211405	Mineralogist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-211406	Hydrologist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-211407	Oceanographer	Diploma or advanced certificate (NQF Level 6)
2019-212101	Actuary*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-213105	Biotechnologist	Diploma or advanced certificate (NQF Level 6)
2019-213107	Marine biologist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-213201	Agriculture consultant	Diploma or advanced certificate (NQF Level 6)
2019-213202	Agricultural scientist	Diploma or advanced certificate (NQF Level 6)
2019-213204	Wine maker*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-213205	Food and beverage scientist*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214101	Industrial engineer*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214102	Industrial engineering technologist*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214104	Production engineering technologist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214201	Civil engineer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214202	Civil engineering technologist	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214401	Mechanical engineer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214402	Mechanical engineering technologist*	Diploma or advanced certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-214403	Aeronautical engineer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214404	Aeronautical engineering technologist	Diploma or advanced certificate (NQF Level 6)
2019-214405	Naval architect	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214501	Chemical engineer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214904	Quantity surveyor*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-214905	Agricultural engineer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-214906	Agricultural engineering technologist*	Diploma or advanced certificate (NQF Level 6)
2019-215101	Electrical engineer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-216101	Architect	Bachelor's degree or advanced diploma (NQF Level 7)
2019-216301	Fashion designer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-216302	Industrial designer	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-216304	Footwear designer	Diploma or advanced certificate (NQF Level 6)
2019-216402	Transport analyst	Diploma or advanced certificate (NQF Level 6)
2019-216601	Digital artist	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-216603	Multimedia designer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-216604	Web designer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-221101	General medical practitioner*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-222103	Registered nurse (child and family health)*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-222104	Registered nurse (community health)	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-222105	Registered nurse (critical care and emergency)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-222108	Registered nurse (medical)	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-222109	Registered nurse (medical practice)	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)



6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-222110	Registered nurse (mental health)*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-222112	Registered nurse (surgical)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-222114	Nurse educator	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-226201	Hospital pharmacist	Occupational certificate (NQF Level 6)
2019-226202	Industrial pharmacist	Occupational certificate (NQF Level 6)
2019-226203	Retail pharmacist	Occupational certificate (NQF Level 6)
2019-226302	Safety, health, environment and quality (SHE&Q) practitioner	Occupational certificate (NQF Level 5)
2019-226304	Food inspector	Intermediate certificate (NQF Level 3)
2019-231101	University lecturer <sup>22</sup>	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-231102	University tutor	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-232130	TVET educator	Bachelor's degree or advanced diploma (NQF Level 7)
2019-233107	FET phase school teacher (Grades 10–12)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-233108	Senior phase school teacher (Grades 7–9)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-234101	Foundation phase school teacher	Bachelor's degree or advanced diploma (NQF Level 7)
2019-234102	Intermediate phase school teacher (Grades 4–6)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-234201	Early childhood development practitioner	Occupational certificate (NQF Level 5)
2019-235101	Education or training advisor*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-235201	Special needs teacher	Bachelor's degree or advanced diploma (NQF Level 7)
2019-235502	Private tuition dance teacher*	Diploma or advanced certificate (NQF Level 6)
2019-241101	General accountant	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241102	Management accountant	Occupational certificate (NQF Level 6)
2019-241103	Tax professional	Bachelor's degree or advanced diploma (NQF Level 7)

<sup>22</sup> See Appendix 4 for specific fields included.

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-241104	External auditor	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241106	Accountant in practice	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241107	Financial accountant	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241108	Forensic accountant*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241201	Investment analyst	Occupational certificate (NQF Level 6)
2019-241202	Investment manager*	Occupational certificate (NQF Level 6)
2019-241203	Investment advisor	Occupational certificate (NQF Level 6)
2019-241204	Financial markets practitioner*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-241301	Financial investment advisor	Occupational certificate (NQF Level 6)
2019-242101	Management consultant	Diploma or advanced certificate (NQF Level 6)
2019-242102	Organisation and methods analyst	Bachelor honours degree, postgraduate diploma, occupational certificate or bachelor's degree (NQF Level 8)
2019-242103	Business development officer	Diploma or advanced certificate (NQF Level 6)
2019-242202	Policy analyst*	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-242203	Company secretary	Occupational certificate (NQF Level 8)
2019-242208	Organisational risk manager	Bachelor honours degree, postgraduate diploma, occupational certificate or bachelor's degree (NQF Level 8)
2019-242209	Accounting officer	Bachelor's degree or advanced diploma (NQF Level 7)
2019-242210	Business administrator*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-242211	Internal auditor	Bachelor's degree or advanced diploma (NQF Level 7)
2019-242213	Regulatory affairs officer	Diploma or advanced certificate (NQF Level 6)
2019-242214	Intellectual property special advisor	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-242215	Fraud examiner	Bachelor honours degree, postgraduate diploma, occupational certificate or bachelor's degree (NQF Level 8)
2019-242302	Skills development practitioner*	Higher certificate (NQF Level 5)
2019-242303	Human resource advisor	Diploma or advanced certificate (NQF Level 6)
2019-243101	Advertising specialist	Diploma or advanced certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-243102	Market research analyst	Diploma or advanced certificate (NQF Level 6)
2019-243103	Tourism officer	Diploma or advanced certificate (NQF Level 6)
2019-243104	Market campaign analyst*	Diploma or advanced certificate (NQF Level 6)
2019-243201	Communication co-ordinator	Diploma or advanced certificate (NQF Level 6)
2019-243202	Communication strategist	Diploma or advanced certificate (NQF Level 6)
2019-243203	Corporate communication manager	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-251101	ICT systems analyst	Bachelor's degree or advanced diploma (NQF Level 7)
2019-251102	Data scientist	Bachelor's degree or advanced diploma (NQF Level 7)
2019-251201	Software developer	Diploma or advanced certificate (NQF Level 6)
2019-251202	Programmer analyst	Diploma or advanced certificate (NQF Level 6)
2019-251203	Developer programmer	Diploma or advanced certificate (NQF Level 6)
2019-251301	Multimedia specialist	Diploma or advanced certificate (NQF Level 6)
2019-251302	Web developer	Diploma or advanced certificate (NQF Level 6)
2019-251401	Applications programmer	Diploma or advanced certificate (NQF Level 6)
2019-251901	Computers quality assurance analyst*	Diploma or advanced certificate (NQF Level 6)
2019-252101	Database designer and administrator	Diploma or advanced certificate (NQF Level 6)
2019-252201	Systems administrator	Diploma or advanced certificate (NQF Level 6)
2019-252301	Computer network and systems engineer*	Bachelor's degree or advanced diploma (NQF Level 7)
2019-252302	Network analyst	Bachelor's degree or advanced diploma (NQF Level 7)
2019-252901	ICT security specialist	Diploma or advanced certificate (NQF Level 6)
2019-261101	Attorney	Bachelor's degree or advanced diploma (NQF Level 7)
2019-261106	Advocate	Bachelor's degree or advanced diploma (NQF Level 7)
2019-261201	Judge	Bachelor's degree or advanced diploma (NQF Level 7)
2019-261202	Magistrate	Bachelor's degree or advanced diploma (NQF Level 7)
2019-262202	Information services manager	Bachelor's degree or advanced diploma (NQF Level 7)
2019-264102	Book or script editor*	Higher certificate (NQF Level 5)
2019-264103	Technical writer*	Higher certificate (NQF Level 5)
2019-311101	Chemistry technician	Diploma or advanced certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-311102	Physical science technician	Diploma or advanced certificate (NQF Level 6)
2019-311201	Civil engineering technician	Diploma or advanced certificate (NQF Level 6)
2019-311203	Town planning technician	Diploma or advanced certificate (NQF Level 6)
2019-311301	Electrical engineering technician*	Diploma or advanced certificate (NQF Level 6)
2019-311401	Electronic engineering technician	Diploma or advanced certificate (NQF Level 6)
2019-311501	Mechanical engineering technician	Diploma or advanced certificate (NQF Level 6)
2019-311502	Pressure equipment inspector	Diploma or advanced certificate (NQF Level 6)
2019-311503	Aeronautical engineering technician	Diploma or advanced certificate (NQF Level 6)
2019-311801	Draughtsperson	Diploma or advanced certificate (NQF Level 6)
2019-311905	Industrial engineering technician	Diploma or advanced certificate (NQF Level 6)
2019-312201	Production/operations supervisor (manufacturing)	Bachelor's degree or advanced diploma (NQF Level 7)
2019-312301	Building associate	National certificate (NQF Level 4)
2019-313106	Concentrated solar power (CSP) plant process controller	Occupational certificate (NQF Level 4)
2019-313903	Clothing, textile, and footwear manufacturing process control technician	No formal qualification required
2019-314101	Life science technician	Diploma or advanced certificate (NQF Level 6)
2019-315203	Ship's surveyor	Diploma or advanced certificate (NQF Level 6)
2019-315301	Aircraft navigator	Diploma or advanced certificate (NQF Level 6)
2019-315401	Air traffic controller	Diploma or advanced certificate (NQF Level 6)
2019-315501	Airborne electronics analyst	Diploma or advanced certificate (NQF Level 6)
2019-315502	Airworthiness surveyor	Diploma or advanced certificate (NQF Level 6)
2019-324101	Veterinary nurse	Diploma or advanced certificate (NQF Level 6)
2019-324102	Veterinary technician*	Diploma or advanced certificate (NQF Level 6)
2019-324103	Veterinary technologist	Diploma or advanced certificate (NQF Level 6)
2019-325702	Marine safety officer	Diploma or advanced certificate (NQF Level 6)
2019-325705	Safety inspector	National certificate (NQF Level 4)
2019-331301	Bookkeeper	Occupational certificate (NQF Level 5)
2019-331302	Accounting technician*	National certificate (NQF Level 4)
2019-331303	Tax technician	Occupational certificate (NQF Level 6)
2019-331401	Statistical and mathematical assistant	Bachelor honours degree, postgraduate diploma, or bachelor's degree (NQF Level 8)
2019-331501	Valuer	Occupational certificate (NQF Level 5)
2019-331504	Insurance risk manager	Diploma or advanced certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-332101	Insurance agent*	Occupational certificate (NQF Level 5)
2019-332102	Insurance broker	National certificate (NQF Level 4)
2019-332201	Commercial sales representative	Occupational certificate (NQF Level 4)
2019-332203	Sales representative (personal and household goods)	Occupational certificate (NQF Level 4)
2019-332301	Retail buyer	Occupational certificate (NQF Level 5)
2019-332302	Purchasing officer	Occupational certificate (NQF Level 5)
2019-332402	Finance broker	Bachelor's degree or advanced diploma (NQF Level 7)
2019-333401	Property manager	Diploma or advanced certificate (NQF Level 6)
2019-333402	Real estate agent	National certificate (NQF Level 4)
2019-333905	Supply chain practitioner*	Diploma or advanced certificate (NQF Level 6)
2019-335914	Train examiner	No formal qualification required
2019-343201	Interior designer	Diploma or advanced certificate (NQF Level 6)
2019-343203	Visual merchandiser	Occupational certificate (NQF Level 4)
2019-343401	Chef	Diploma or advanced certificate (NQF Level 6)
2019-351201	ICT communications assistant	Diploma or advanced certificate (NQF Level 6)
2019-351301	Computer network technician	Diploma or advanced certificate (NQF Level 6)
2019-351302	Geographic information systems (GIS) technicians	Higher certificate (NQF Level 5)
2019-351303	Marine GIS technician	Higher certificate (NQF Level 5)
2019-411101	General clerk	Diploma or advanced certificate (NQF Level 6)
2019-413201	Data entry operator*	Diploma or advanced certificate (NQF Level 6)
2019-421202	Gaming worker	Higher certificate (NQF Level 5)
2019-421204	Bookmaker's clerk	Higher certificate (NQF Level 5)
2019-422102	Travel consultant	Diploma or advanced certificate (NQF Level 6)
2019-422201	Inbound contact centre consultant	Elementary certificate (NQF Level 2)
2019-422202	Outbound contact centre consultant	Diploma or advanced certificate (NQF Level 6)
2019-422203	Contact centre real-time advisor	National certificate (NQF Level 4)
2019-422204	Contact centre resource planner	Diploma or advanced certificate (NQF Level 6)
2019-422205	Contact centre forecast analyst	National certificate (NQF Level 4)
2019-422206	Call or contact centre agent	National certificate (NQF Level 4)
2019-422501	Enquiry clerk*	National certificate (NQF Level 4)
2019-431101	Accounts clerk	Higher certificate (NQF Level 5)
2019-431102	Cost clerk	Occupational certificate (NQF Level 2)
2019-431103	Taxation clerk*	Diploma or advanced certificate (NQF Level 6)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-432201	Production co-ordinator*	National certificate (NQF Level 4)
2019-441203	Mail clerk*	Diploma or advanced certificate (NQF Level 6)
2019-441301	Coding clerk	No formal qualification required
2019-441302	Proofreader	Diploma or advanced certificate (NQF Level 6)
2019-511102	Bus hostess	National certificate (NQF Level 4)
2019-511103	Marine steward	Diploma or advanced certificate (NQF Level 6)
2019-511104	Railway steward*	Occupational certificate (NQF Level 4)
2019-511302	Tour guide	National certificate (NQF Level 4)
2019-514101	Hairdresser	Occupational certificate (NQF Level 4)
2019-522201	Retail supervisor	Higher certificate (NQF Level 5)
2019-522301	Sales assistant (general)	Occupational certificate (NQF Level 3)
2019-531101	Child care worker	National certificate (NQF Level 4)
2019-531102	Family daycare worker	National certificate (NQF Level 4)
2019-531103	Nanny	National certificate (NQF Level 4)
2019-531104	Out-of-school-hours care worker	National certificate (NQF Level 4)
2019-531105	Child or youth residential care assistant	National certificate (NQF Level 4)
2019-532201	Residential care officer	National certificate (NQF Level 4)
2019-532202	Aged or disabled carer	National certificate (NQF Level 4)
2019-532203	Community healthcare worker (CHW)	National certificate (NQF Level 4)
2019-541101	Fire fighter	National certificate or occupational certificate (NQF Level 4)
2019-541102	Hazardous materials removal workers	No qualification required
2019-541201	Traffic officer	National certificate (NQF Level 4)
2019-541401	Security officer*	National certificate (NQF Level 4)
2019-541402	Alarm, security, or surveillance monitor	National certificate (NQF Level 4)
2019-541403	Retail loss prevention officer	National certificate (NQF Level 4)
2019-541404	Close protector	National certificate (NQF Level 4)
2019-611202	Horticultural farmer	Diploma or advanced certificate (NQF Level 6)
2019-613101	Mixed crop and livestock farmer	Occupational certificate (NQF Level 3)
2019-621101	Tree feller	Intermediate certificate (NQF Level 3)
2019-641501	Carpenter and joiner	Occupational certificate (NQF Level 4)
2019-641502	Carpenter	Occupational certificate (NQF Level 4)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-641503	Joiner	Occupational certificate (NQF Level 4)
2019-642201	Wall and floor tiler	Occupational certificate (NQF Level 4)
2019-642202	Floor finisher	Occupational certificate (NQF Level 3)
2019-651201	Pressure welder	National certificate (NQF Level 4)
2019-651403	Steel fixer	Intermediate certificate (NQF Level 3)
2019-652201	Toolmaker	Higher certificate (NQF Level 5)
2019-652205	Master toolmaker	Diploma or advanced certificate (NQF Level 6)
2019-652301	Metal machinist*	Occupational certificate (NQF Level 4)
2019-652302	Fitter and turner*	Occupational certificate (NQF Level 4)
2019-653101	Automotive motor mechanic	Occupational certificate (NQF Level 4)
2019-653301	Industrial machinery mechanic	Occupational certificate (NQF Level 4)
2019-653302	Mechanical equipment repairer	No qualification required
2019-653303	Mechanical fitter	Occupational certificate (NQF Level 4)
2019-653304	Diesel fitter	Occupational certificate (NQF Level 4)
2019-653305	Small engine mechanic	Occupational certificate (NQF Level 4)
2019-653306	Diesel mechanic	Occupational certificate (NQF Level 4)
2019-653307	Heavy equipment mechanic*	Occupational certificate (NQF Level 4)
2019-653308	Tractor mechanic	Occupational certificate (NQF Level 4)
2019-653309	Forklift mechanic	Occupational certificate (NQF Level 5)
2019-653310	Lubrication equipment mechanic*	Occupational certificate (NQF Level 4)
2019-653402	Non-motorised transport equipment repairer	No formal qualification required
2019-661101	Precision instrument maker and repairer	National certificate (NQF Level 4)
2019-661801	Textile, leather, and related materials handicraft workers	Elementary certificate (NQF Level 2)
2019-671102	Electrical installation inspector	National certificate (NQF Level 4)
2019-671203	Mechatronics technician	Occupational certificate (NQF Level 4)
2019-671204	Lift mechanic	Occupational certificate (NQF Level 4)
2019-671205	Weapon systems mechanic	Occupational certificate (NQF Level 4)
2019-671206	Electrical equipment mechanic*	Occupational certificate (NQF Level 4)
2019-671207	Armature winder	Occupational certificate (NQF Level 4)
2019-671208	Transportation electrician	Occupational certificate (NQF Level 4)
2019-671302	Cable jointer	National certificate (NQF Level 4)
2019-681103	Butcher	National certificate (NQF Level 4)
2019-681201	Confectionary baker	Occupational certificate (NQF Level 3)

6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-682201	Cabinet maker	National certificate (NQF Level 4)
2019-682301	Furniture finisher	National certificate (NQF Level 4)
2019-683101	Tailor	National certificate (NQF Level 4)
2019-683303	Textile produce mender and embroiderer	Elementary certificate (NQF Level 2)
2019-683401	Upholsterer	National certificate (NQF Level 4)
2019-684101	Diver	No formal qualification required
2019-684301	Crop produce analyst	Occupational certificate (NQF Level 5)
2019-684302	Tobacco grader	National certificate (NQF Level 4)
2019-684303	Cotton grader*	Intermediate certificate (NQF Level 3)
2019-684304	Wool classer/grader*	Elementary certificate (NQF Level 2)
2019-684305	Quality controller (manufacturing)	Higher certificate (NQF Level 5)
2019-684901	Textile, clothing, footwear, and leather processing machine mechanic	National certificate (NQF Level 4)
2019-684908	Shipwright	National certificate (NQF Level 4)
2019-711301	Driller	Occupational certificate (NQF Level 2)
2019-711302	Rock drill operator	Intermediate certificate (NQF Level 3)
2019-711401	Concrete products machine operator	Occupational certificate (NQF Level 4)
2019-711402	Glass, clay, and stone manufacturing machine setter and minder	No qualification required
2019-711403	Plaster machine operator	Intermediate certificate (NQF Level 3)
2019-711404	Cement production plant operator	Intermediate certificate (NQF Level 3)
2019-711405	Concrete batching plant operator	Occupational certificate (NQF Level 4)
2019-714208	Plastics manufacturing machine minder	Occupational certificate (NQF Level 4)
2019-715101	Fibre preparation production machine operator*	Occupational certificate (NQF Level 4)
2019-715102	Yarn production machine operator	Occupational certificate (NQF Level 2)
2019-715103	Man-made fibre production machine operator	Occupational certificate (NQF Level 2)
2019-715201	Weaving machine operator	Elementary certificate (NQF Level 2)
2019-715202	Warping machine operator	Elementary certificate (NQF Level 2)
2019-715203	Braiding machine operator	Elementary certificate (NQF Level 2)
2019-715204	Knitting machine operator	Elementary certificate (NQF Level 2)
2019-715205	Non-woven machine operator	Elementary certificate (NQF Level 2)
2019-715206	Textile dry finishing machine operator	National certificate (NQF Level 4)



6-DIGIT OFO CODE	6-DIGIT OFO DESCRIPTION	MINIMUM QUALIFICATION REQUIRED
2019-715302	Clothing, textile, and leather goods production operator	Elementary certificate (NQF Level 2)
2019-715401	Textile wet process production operator	Elementary certificate (NQF Level 2)
2019-715501	Leather processing machine operator	Elementary certificate (NQF Level 2)
2019-715601	Footwear cutting production machine operator	Elementary certificate (NQF Level 2)
2019-715602	Footwear closing production machine operator	Elementary certificate (NQF Level 2)
2019-715603	Footwear bottom stock production machine operator	Elementary certificate (NQF Level 2)
2019-715604	Footwear lasting production machine operator	Elementary certificate (NQF Level 2)
2019-715605	Footwear finishing production machine operator	Elementary certificate (NQF Level 2)
2019-721901	Product assembler	Occupational certificate (NQF Level 3)
2019-731101	Train driver	Higher certificate (NQF Level 5)
2019-731102	Tram driver	Higher certificate (NQF Level 5)
2019-731201	Railway signal operator	Intermediate certificate (NQF Level 3)
2019-731202	Train controller	National certificate (NQF Level 4)
2019-733101	Bus driver	Professional driving permit (no equivalent NQF Level)
2019-734101	Agricultural mobile plant (equipment) operator	Occupational certificate (NQF Level 4)
2019-734212	Railway track master	National certificate (NQF Level 4)

Note:

Asterisks (\*) indicate that an occupation has more than 500 unemployed graduates across the country, according to the ESSA database as of 14 September 2020.



**PART 7**

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# **Conclusion and way forward**

The development of a list such as the list of OIHD inevitably requires a vision of what the future might look like. This is generally a challenging task, even at the best of times. As the traditional investor will tell you: “The past does not predict the future.” Nevertheless, all decisions are fundamentally made based on a prediction of the future. The accuracy of such a prediction will depend greatly on:

- The coverage and quality of the information used; and
- The way in which the information is employed in the decision-making process.

The primary aim of this report was to present the final list of OIHD. However, for the list to be used appropriately, the user must understand how it was developed. The report, therefore, also described the information used, its quality and coverage, and how it was used to produce the final list. Through this, the report reveals why it is so important for the list to be considered a signal for planning purposes, rather than a prescriptive input.

It is, however, an exceedingly important signal, and one that has the ability to inform some of the most important decisions in the PSET system. The methodology described shows that the list, although not prescriptive, should be viewed as an accurate signal for occupations that are truly in demand across the South African labour market.

## Appendix 1: Review of the OECD and MAC methodologies from the 2018 list of OIHD

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The following appendix is an excerpt taken directly from the 2018 list of OIHD report. According to Reddy et al. (2018, pp. 23–27), the OECD and MAC approaches (that feed heavily into both the 2018 and 2020 iterations of the list of OIHD) are best summarised as follows:

### A 1.1 OECD approach

Perhaps the key similarity between the objectives of the OECD skills indicator project and the South African list of OIHD project is the goal of providing information that can be used to “design incentive mechanisms that encourage prospective students to enrol in subjects where labour market demand is high. Similarly, if needs are identified in specific competences and knowledge types, the information could be used to review school and training curricula” (OECD, 2016, p. 3). In other words, while the approaches are somewhat different and the key concepts being measured (skills versus occupations) are distinct, they are both concerned with planning for the future needs of the (South African) labour market.

The OECD methodology consists of two main steps. The first component is the construction of a multidimensional measure of the surplus and shortage of workers in specific *occupations* (OECD, 2017 – own emphasis). In this first step, sub-indices for hourly wage growth, employment growth, unemployment rate, hours worked, and under-qualification are combined to measure “labour market pressure” at the occupational level (OECD, 2017, p. 30).<sup>23</sup> The occupational shortage (OS) indicator is then constructed through the weighted average of the five sub-indicators. Weights are equal in four of the indicators while a lower weight is assigned to the employment growth indicator to reflect the greater ambiguity of employment growth as a signal of occupational shortage (OECD, 2017).

One important innovation from the OECD methodology is the consideration of larger macro-economic effects that could distort the signals from the sub-indicators of labour market pressure. In order to account for these possible larger macro effects on employment growth, one part of the OECD approach was to “express the growth of employment in a specific occupation (signalling pressure on a specific segment of the labour market) relative to the average growth in employment across all occupations” (OECD, 2016, p. 8). In other words, the OECD’s indicators of labour market pressure are all, to the extent that the data allow, concerned with *relative changes* in, *inter alia*, employment intensity, employment growth, and underemployment.<sup>24</sup>

The second step in the OECD approach is less relevant to the design of the South African list of OIHD methodology. In this second step, specific skills and competencies are mapped onto the occupations identified through the first step. These skills are grouped into three categories: skills, abilities, and knowledge (see <https://www.oecd.org/els/emp/skills-for-jobs-dataviz.htm>). The important point, however, is that the first step in the OECD approach shares some similarities with both the conceptual and methodological development of the South African list of OIHD (both the 2014/6 methodologies as well as the current 2018 list of OIHD) since it is concerned with identifying occupations for which there is evidence of strong demand or shortage.

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<sup>23</sup> For the South African indicators, only data from the QLFs were used. Indicators for other (OECD) countries were derived from Labour Force Surveys and Employer Surveys.

<sup>24</sup> The OECD methodology also makes use of a ‘filter’ to distinguish between labour market pressures that are due to skills shortages and those that are due to broader macro-economic trends.

Key lessons:

- In the OECD's view, rather than relying on individual indicators as proxies for labour market demand, "*composite indicators* should be considered, instead, as a starting point for initiating discussion and attracting public interest and concern." (OECD, 2016, p. 25).
- Therefore, over and above the methodological and conceptual appeal of a composite index, the aggregation and decomposition of indicators of demand can contribute meaningfully towards *policy debates*.
- In terms of the identification of occupations that are in high demand, there is an inherent trade-off in selecting the *level of disaggregation of occupational codes*. The trade-off is between the "granularity of information and its robustness given the underlying sample size" (OECD, 2017, p. 35). This is a particular concern with the South African data, given the relatively small sample sizes of the QLFS and the objective of analysing occupations at the four-digit level of disaggregation.
- The OECD's experience is that *relative changes* in the indicators of interest are likely to be more important than the absolute levels measured. Absolute differences (e.g., in occupational growth, wages, vacancies) may be sending signals that are more strongly related to cyclical changes in the economy or broader macro-changes that are unrelated to sustained demand for a particular occupation.

## A 1.2 MAC approach

Arguably the most transparent approach to identifying occupational demand or shortage is the annual list and accompanying report (*Skilled, Shortage, Sensible*) produced by the MAC. While the objectives of this list are quite distinct from those of the South African list of OIHD,<sup>25</sup> there are some important methodological lessons to be learned from the MAC approach. The rationale behind the MAC approach is that in order to "fully assess labour shortage it is necessary to look at various price indicators (wages), as well as volumes (vacancies, employment, and unemployment)" (MAC, 2013, p. 36). In terms of the methodology itself, the MAC framework for identifying occupational shortages has been described as a "hybrid approach" that consists of the "dovetailing" of a top-down and bottom-up approach (MAC, 2010).

The "top-down" component refers to the data-driven (or statistical) process of identifying occupational shortages while "bottom-up" refers to the process of integrating stakeholder and contextual input into the identification of occupations or skills (MAC, 2008). The top-down or statistical component of the MAC approach is of particular relevance to the 2018 South African list of OIHD since it consists of the transparent, robust, and regularly reviewed construction of a composite indicator of occupational shortage. MAC's (2008, p. 13) key indicators for the top-down approach include "employer-based indicators (e.g. reports of shortage from skill surveys); price-based indicators (e.g. relatively rapid earnings growth); volume-based indicators (e.g. employment or unemployment);<sup>26</sup> and other indicators of imbalance based on administrative data (e.g. vacancies or vacancy/unemployment ratios)". There is, therefore, clear overlap with the indicators used in the OECD methodology even though the purposes of these two approaches differ considerably.<sup>27</sup>

One of the strengths of the MAC approach is that it devotes substantial attention to the selection (and review) of the indicators used to construct the index. The MAC (2008, p. 105) methodology is quite clear

<sup>25</sup> The main purpose of the MAC list is to identify occupations for which UK work visas (Tier 2) may be granted. In other words, the MAC methodology aims to identify occupations for which there is a shortage in the UK and for which immigration is a more desirable solution than longer-term domestic education and training initiatives.

<sup>26</sup> One potential drawback in South Africa is that a number of methodologies make use of unemployment (by previous occupation) to either contextualise findings (MAC) or as a part of the statistical analysis (OECD). This is not possible in South Africa given the small sample sizes in the QLFSs as well as the small percentage of the unemployed who previously had an occupation (i.e., high levels of long-term or chronic unemployment).

<sup>27</sup> This is an important point to debate in constructing the 2018 list of OIHD and in refining the methodology in later years. The fact that very different conceptualisations of labour market shortage or demand are based on the same proxy indicators has not been adequately addressed in the literature.

that the choice of indicators is based on the “concept of shortage as an imbalance or mismatch between demand and supply”. The MAC’s (2008: p. 250) criteria for the inclusion of a particular indicator include:

- Whether it could be reliably captured at the four-digit Standard Occupational Classification (SOC) level;
- Whether it is a viable proxy for occupational shortages (as opposed to being a “noisy” indicator of other economic or labour market changes); and
- Whether sample sizes would permit statistically reliable estimates at the four-digit occupational level.

In 2010, the MAC methodology underwent a comprehensive review that suggested the following additional considerations in selecting and measuring indicators (MAC, 2010, p. 43):

- More attention should be paid to the distribution of observations when assigning indicator thresholds. There are a number of reasons that the median might be more appropriate than the mean – particularly for smaller sample sizes with large outliers; and
- When including vacancy data, the choice of databases may introduce a bias if some jobs/vacancies are not advertised in ways that are easily captured in online databases (e.g., Jobcentre Plus in the UK).

The MAC methodology, therefore, introduces a useful discussion on both the conceptual (see Campbell, 2016; Keating, 2008) and practical elements of identifying and measuring (sub-) indicators of labour market demand and shortage that can be combined into a single composite indicator. In terms of identifying the thresholds for each indicator there is, however, somewhat less clarity. The stated objective is, where the distribution permits, to assign the threshold of each indicator to the median value plus 50 percent of the median. While this approach seems more data-driven than conceptual or theoretical, it is at least sensitive to the underlying distribution of each indicator. In fact, the MAC reports (e.g., 2008, 2010, and 2013) note that the threshold cannot be determined without first exploring the distribution. The final threshold for each indicator is, therefore, only determined during the data analysis phase and is based on the distribution of each indicator.

The aggregation process in the MAC methodology is also very straightforward and transparent (if not necessarily robust). Twelve different indicators are identified and there is considered to be “good top-down evidence for a potential shortage if an occupation passes [the threshold] on 50 percent or more of the indicators” for which there is data (MAC, 2008, p. 132).<sup>28</sup> In the first version of the MAC list in 2008, there were 20 occupations out of the total of 192 skilled occupations that exceeded the threshold on half of the indicators (MAC, 2008). This aggregation is, therefore, a straightforward counting approach with a clear and obvious (if somewhat arbitrary) cut-off point (MAC, 2010). While transparent, the cut-off point of 50 percent introduces a sudden threshold (or “knife-edge”) in the data without considering how sensitive this choice is, particularly for occupations on either side of the threshold.

In terms of the “bottom-up” or qualitative component of the MAC methodology, the main objective is to “dovetail” information collected from this component with the statistical data described above. Ideally, the bottom-up or qualitative component should include a call for evidence and interviews or focus groups with employers and industry organisations (MAC, 2008). The experience of the MAC research team is that some of this bottom-up evidence results in more detailed descriptions of occupations or job titles than can be captured in the OFO in the statistical datasets (MAC, 2013, p. 31). Such a situation introduces an obvious tension into the methodology that can often only be resolved through a ‘judgement call’. Another point of tension comes from the entirely plausible situation in which the top-down and bottom-up approaches yield different or even contradictory results and this would, again, require some sort of judgement call (MAC, 2010).

<sup>28</sup> The percentage of indicators is used instead of the number of indicators, because some occupations do not have complete data for all 12 indicators.

Key lessons:

- The selection of indicators of shortage or demand should be an *ongoing process* that is regularly reviewed;
- Combining the quantitative and qualitative evidence of shortage should be undertaken in a *transparent way* so that the inevitable use of judgement calls can be clearly rationalised;
- More attention needs to be paid to the relatively *arbitrary way in which the cut-off point* of 50 percent of indicators introduces a “knife edge” outcome to the index;
- More thinking around the *application of weights* is also needed; and
- The estimation of *conditional wage pressure* should be *re-evaluated* to take into consideration a wider range of covariates.

**TABLE A 1:** Framework for the OECD and MAC methodologies

OECD		MAC	
DIMENSION	INDICATOR	DIMENSION	INDICATOR
Wage pressure	Hourly wage growth	Employer-based	Percentage of skill-shortage vacancies/employment by occupation
Employment pressure	Total employment growth		Percentage of skill-shortage vacancies/all vacancies
	Unemployment rate (in previous occupation)		Percentage of skill-shortage vacancies/hard-to-fill vacancies
	Growth in hours worked	Price-based	Percentage change in median hourly pay for all employees
Talent pressure	Underqualification growth		Percentage change in mean hourly pay for all employees
			Relative premium to an occupation, given NQF Level 3, controlling for region and age
Volume-based		Percentage change in unemployed by sought occupation	
		Percentage change in hours worked for full-time employees	
		Percentage change in employment	
		Absolute change in proportion of workers in occupation less than one year	
Administrative-data-based		Absolute change in median vacancy duration	
		Stock of vacancies/claimant count by sought occupation	

Sources: OECD (2017, p. 13); MAC (2008, p. 116)

## Appendix 2: Four-digit list of OIHD robustness checks

Utilising PCA instead of equal weighting within dimensions, the following list of OIHD is estimated:

**TABLE A 2:** Overlap between PCA and equal weighting four-digit unit group list of OIHD

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-1111	Legislators	Occupation in equally and PCA weighted lists
2019-1113	Traditional chiefs and heads of villages	Occupation in equally and PCA weighted lists
2019-1212	Human resource managers	Occupation in equally and PCA weighted lists
2019-1219	Business services and administration managers not elsewhere classified	Occupation in equally and PCA weighted lists
2019-1221	Sales and marketing managers	Occupation in equally and PCA weighted lists
2019-1223	Research and development managers	Occupation in equally and PCA weighted lists
2019-1311	Agricultural and forestry production managers	Occupation in equally and PCA weighted lists
2019-1321	Manufacturing managers	Occupation in equally and PCA weighted lists
2019-1323	Construction managers	Occupation in equally and PCA weighted lists
2019-1324	Supply, distribution, and related managers	Occupation in equally and PCA weighted lists
2019-1331	Information and communications technology service managers	Occupation in equally and PCA weighted lists
2019-1342	Health service managers	Occupation in equally and PCA weighted lists
2019-1345	Education managers	Occupation in equally and PCA weighted lists
2019-1349	Professional services managers not elsewhere classified	Occupation in equally and PCA weighted lists
2019-1411	Hotel managers	Occupation in equally and PCA weighted lists
2019-1421	Retail and wholesale trade managers	Occupation in equally weighted list
2019-2113	Chemists	Occupation in equally weighted list
2019-2132	Farming, forestry, and fisheries advisors	Occupation in equally and PCA weighted lists
2019-2141	Industrial and production engineers	Occupation in equally and PCA weighted lists
2019-2142	Civil engineers	Occupation in equally and PCA weighted lists
2019-2144	Mechanical engineers	Occupation in equally and PCA weighted lists
2019-2145	Chemical engineers	Occupation in equally and PCA weighted lists
2019-2146	Mining engineers, metallurgists, and related professionals	Occupation in equally and PCA weighted lists
2019-2152	Electronics engineers	Occupation in equally and PCA weighted lists
2019-2161	Building architects	Occupation in equally and PCA weighted lists



4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-2211	Generalist medical practitioners	Occupation in equally and PCA weighted lists
2019-2221	Nursing professionals	Occupation in equally and PCA weighted lists
2019-2261	Dentists	Occupation in equally and PCA weighted lists
2019-2262	Pharmacists	Occupation in equally and PCA weighted lists
2019-2263	Environmental and occupational health and hygiene professionals	Occupation in equally weighted list
2019-2311	University and higher education teachers	Occupation in equally and PCA weighted lists
2019-2321	Vocational or further education teachers	Occupation in equally weighted list
2019-2331	Secondary or intermediate and senior education teachers	Occupation in equally and PCA weighted lists
2019-2341	Primary school or foundational phase teachers	Occupation in equally weighted list
2019-2342	Early childhood educators	Occupation in equally weighted list
2019-2351	Education methods specialists	Occupation in equally and PCA weighted lists
2019-2352	Special needs teachers	Occupation in equally weighted list
2019-2412	Financial and investment advisors	Occupation in equally and PCA weighted lists
2019-2413	Financial analysts	Occupation in equally weighted list
2019-2421	Management and organisation analysts	Occupation in equally weighted list
2019-2422	Policy administration professionals	Occupation in equally weighted list
2019-2423	Personnel and careers professionals	Occupation in equally and PCA weighted lists
2019-2511	Systems analysts	Occupation in equally and PCA weighted lists
2019-2512	Software developers	Occupation in equally weighted list
2019-2513	Web and multimedia developers	Occupation in equally weighted list
2019-2519	Software and applications developers and analysts not elsewhere classified	Occupation in equally and PCA weighted lists
2019-2521	Database designers and administrators	Occupation in equally weighted list
2019-2523	Computer network professionals	Occupation in equally weighted list
2019-2611	Lawyers	Occupation in equally and PCA weighted lists
2019-2612	Judges	Occupation in equally and PCA weighted lists
2019-2619	Legal professionals not elsewhere classified	Occupation in equally and PCA weighted lists
2019-2622	Librarians and related information professionals	Occupation in equally and PCA weighted lists
2019-2634	Psychologists	Occupation in equally and PCA weighted lists
2019-2635	Social work and counselling professionals	Occupation in equally and PCA weighted lists
2019-2636	Religious professionals	Occupation in equally and PCA weighted lists
2019-2641	Authors and related writers	Occupation in equally and PCA weighted lists

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-2651	Visual artists	Occupation in equally and PCA weighted lists
2019-2652	Musicians, singers, and composers	Occupation in equally and PCA weighted lists
2019-3111	Chemical and physical science technicians	Occupation in equally and PCA weighted lists
2019-3112	Civil engineering technicians	Occupation in equally and PCA weighted lists
2019-3113	Electrical engineering technicians	Occupation in equally weighted list
2019-3114	Electronics engineering technicians	Occupation in equally weighted list
2019-3118	Draughtspersons	Occupation in equally weighted list
2019-3122	Manufacturing supervisors	Occupation in equally weighted list
2019-3123	Construction supervisors	Occupation in equally weighted list
2019-3131	Power production plant operators	Occupation in equally weighted list
2019-3132	Incinerator and water treatment plant operators	Occupation in equally and PCA weighted lists
2019-3141	Life science technicians (excluding medical)	Occupation in equally weighted list
2019-3142	Agricultural technicians	Occupation in equally and PCA weighted lists
2019-3212	Medical and pathology laboratory technicians	Occupation in equally weighted list
2019-3241	Veterinary technicians and assistants	Occupation in equally weighted list
2019-3255	Physiotherapy technicians and assistants	Occupation in equally and PCA weighted lists
2019-3258	Ambulance workers	Occupation in equally weighted list
2019-3314	Statistical, mathematical, and related associate professionals	Occupation in equally weighted list
2019-3321	Insurance representatives	Occupation in equally and PCA weighted lists
2019-3322	Commercial sales representatives	Occupation in equally weighted list
2019-3323	Buyers	Occupation in equally weighted list
2019-3332	Conference and event planners	Occupation in equally and PCA weighted lists
2019-3334	Real estate agents and property managers	Occupation in equally and PCA weighted lists
2019-3421	Athletes and sports players	Occupation in equally and PCA weighted lists
2019-3431	Photographers	Occupation in equally and PCA weighted lists
2019-3432	Interior designers and decorators	Occupation in equally and PCA weighted lists
2019-3434	Chefs	Occupation in equally and PCA weighted lists
2019-3439	Artistic and cultural associate professionals not elsewhere classified	Occupation in equally and PCA weighted lists
2019-3512	Information and communications technology user support technicians	Occupation in equally and PCA weighted lists
2019-4111	General office clerks	Occupation in equally weighted list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-4212	Bookmakers, croupiers, and related gaming workers	Occupation in equally and PCA weighted lists
2019-4213	Pawnbrokers and money-lenders	Occupation in equally and PCA weighted lists
2019-4221	Travel consultants and clerks	Occupation in equally and PCA weighted lists
2019-4412	Mail carriers and sorting clerks	Occupation in equally weighted list
2019-4413	Coding, proofreading, and related clerks	Occupation in equally and PCA weighted lists
2019-5111	Travel attendants and travel stewards	Occupation in equally and PCA weighted lists
2019-5113	Travel guides	Occupation in equally and PCA weighted lists
2019-5141	Hairdressers	Occupation in equally and PCA weighted lists
2019-5222	Shop supervisors	Occupation in equally weighted list
2019-5223	Shop sales assistants	Occupation in equally weighted list
2019-5242	Sales demonstrators	Occupation in equally weighted list
2019-5311	Child care workers	Occupation in equally and PCA weighted lists
2019-5321	Healthcare assistants	Occupation in equally and PCA weighted lists
2019-5322	Home-based personal care workers	Occupation in equally and PCA weighted lists
2019-5329	Personal care workers in health services not elsewhere classified	Occupation in equally and PCA weighted lists
2019-5411	Fire fighters	Occupation in equally and PCA weighted lists
2019-5412	Police officers	Occupation in equally and PCA weighted lists
2019-5414	Security guards	Occupation in equally and PCA weighted lists
2019-6111	Field crop and vegetable growers	Occupation in equally and PCA weighted lists
2019-6112	Tree and shrub crop growers	Occupation in equally weighted list
2019-6131	Mixed crop and animal producers	Occupation in equally and PCA weighted lists
2019-6211	Forestry and related workers	Occupation in equally and PCA weighted lists
2019-6413	Stonemasons, stone cutters, splitters, and carvers	Occupation in equally and PCA weighted lists
2019-6422	Floor layers and tile setters	Occupation in equally and PCA weighted lists
2019-6431	Painters and related workers	Occupation in equally and PCA weighted lists
2019-6512	Welders and flame cutters	Occupation in equally and PCA weighted lists
2019-6513	Sheet metal workers	Occupation in equally weighted list
2019-6522	Toolmakers and related workers	Occupation in equally and PCA weighted lists
2019-6523	Metal working machine tool setters and operators	Occupation in equally weighted list
2019-6524	Metal polishers, wheel grinders, and tool sharpeners	Occupation in equally and PCA weighted lists
2019-6531	Motor vehicle mechanics and repairers	Occupation in equally weighted list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-6533	Agricultural and industrial machinery mechanics and repairers	Occupation in equally and PCA weighted lists
2019-6613	Jewellery and precious metal workers	Occupation in equally and PCA weighted lists
2019-6614	Potters and related workers	Occupation in equally and PCA weighted lists
2019-6615	Glass Makers, cutters, grinders, and finishers	Occupation in equally and PCA weighted lists
2019-6711	Building and related electricians	Occupation in equally and PCA weighted lists
2019-6712	Electrical mechanics and fitters	Occupation in equally and PCA weighted lists
2019-6713	Electrical line installers and repairers	Occupation in equally and PCA weighted lists
2019-6721	Electronics mechanics and servicers	Occupation in equally and PCA weighted lists
2019-6811	Butchers, fishmongers, and related food preparers	Occupation in equally and PCA weighted lists
2019-6812	Bakers, pastry-cooks, and confectionery makers	Occupation in equally weighted list
2019-6831	Tailors, dressmakers, furriers and hatters	Occupation in equally and PCA weighted lists
2019-6832	Garment and related patternmakers and cutters	Occupation in equally and PCA weighted lists
2019-6842	Shotfirers and blasters	Occupation in equally and PCA weighted lists
2019-6843	Product graders and testers (except foods and beverages)	Occupation in equally weighted list
2019-7114	Cement, stone, and other mineral products machine operators	Occupation in equally and PCA weighted lists
2019-7141	Rubber products machine operators	Occupation in equally and PCA weighted lists
2019-7151	Fibre preparing, spinning and winding machine operators	Occupation in equally and PCA weighted lists
2019-7152	Weaving and knitting machine operators	Occupation in equally and PCA weighted lists
2019-7159	Textile, fur, and leather products machine operators not elsewhere classified	Occupation in equally and PCA weighted lists
2019-7219	Assemblers not elsewhere classified	Occupation in equally and PCA weighted lists
2019-7311	Locomotive engine drivers	Occupation in equally and PCA weighted lists
2019-7331	Bus and tram drivers	Occupation in equally weighted list
2019-7341	Mobile farm and forestry plant operators	Occupation in equally and PCA weighted lists
2019-8112	Cleaners and helpers in offices, hotels, and other establishments	Occupation in equally weighted list
2019-8211	Crop farm workers	Occupation in equally weighted list
2019-8213	Mixed crop and livestock farm labourers	Occupation in equally and PCA weighted lists
2019-8215	Forestry labourers	Occupation in equally and PCA weighted lists
2019-8216	Fishery and aquaculture labourers	Occupation in equally weighted list

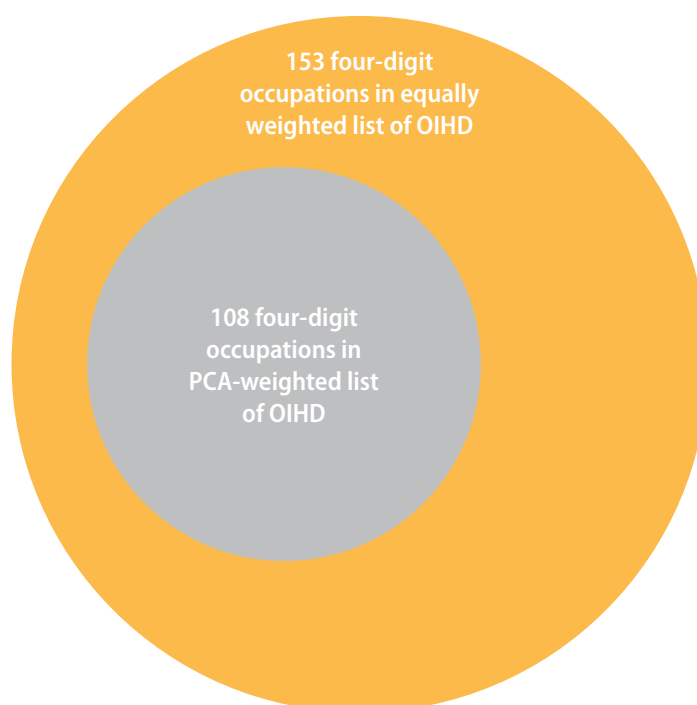
4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OCCURRENCE OF OCCUPATION IN EITHER LIST
2019-8311	Mining and quarrying labourers	Occupation in equally and PCA weighted lists
2019-8313	Building construction labourers	Occupation in equally and PCA weighted lists
2019-8321	Hand packers	Occupation in equally and PCA weighted lists
2019-8329	Manufacturing labourers not elsewhere classified	Occupation in equally weighted list
2019-8333	Freight handlers	Occupation in equally and PCA weighted lists
2019-8511	Street and related service workers	Occupation in equally and PCA weighted lists
2019-8611	Garbage and recycling collectors	Occupation in equally and PCA weighted lists
2019-8629	Elementary workers not elsewhere classified	Occupation in equally weighted list

Note 1: Occupations highlighted in green only appear in the equally weighted list found in section 4 of the report, while the remaining occupations are both in the list using either PCA or equal weighting schemes.

Note 2: Given the definition of the list of OIHD, all unit groups that fall under major category 8 (i.e., elementary occupations) are excluded from analysis at the six-digit level.

Encouragingly, this PCA-weighted list of occupations is wholly subsumed by the occupations found in the equally weighted analysis. Their overlap is described below:

**FIGURE A 1:** Unit group overlap when using PCA or equal weighting methodologies



Given that the PCA is an extraordinarily objective and widely used technique for combining indicators, it is clear that the equal weight methodology is exceptionally robust, precisely because of the overlap between the two lists of OIHD created by these techniques. While the PCA-OIHD is shorter, a wider-spanning list sent through the validation process (i.e., the equal-weight list of OIHD) is likely to provide a more holistic image of occupational demand in South Africa.

However, even though the objective analysis and equal weighting methods produce a very similar list, it is also critical to examine the impact of subjectively weighting indicators on the list of OIHD. While the research team would argue that this would be the least robust/most contentious approach to follow, these reweighted lists should also be discussed as robustness checks.

An additional four lists of OIHD have been estimated with different weighting schemes, as described in Table A 3:

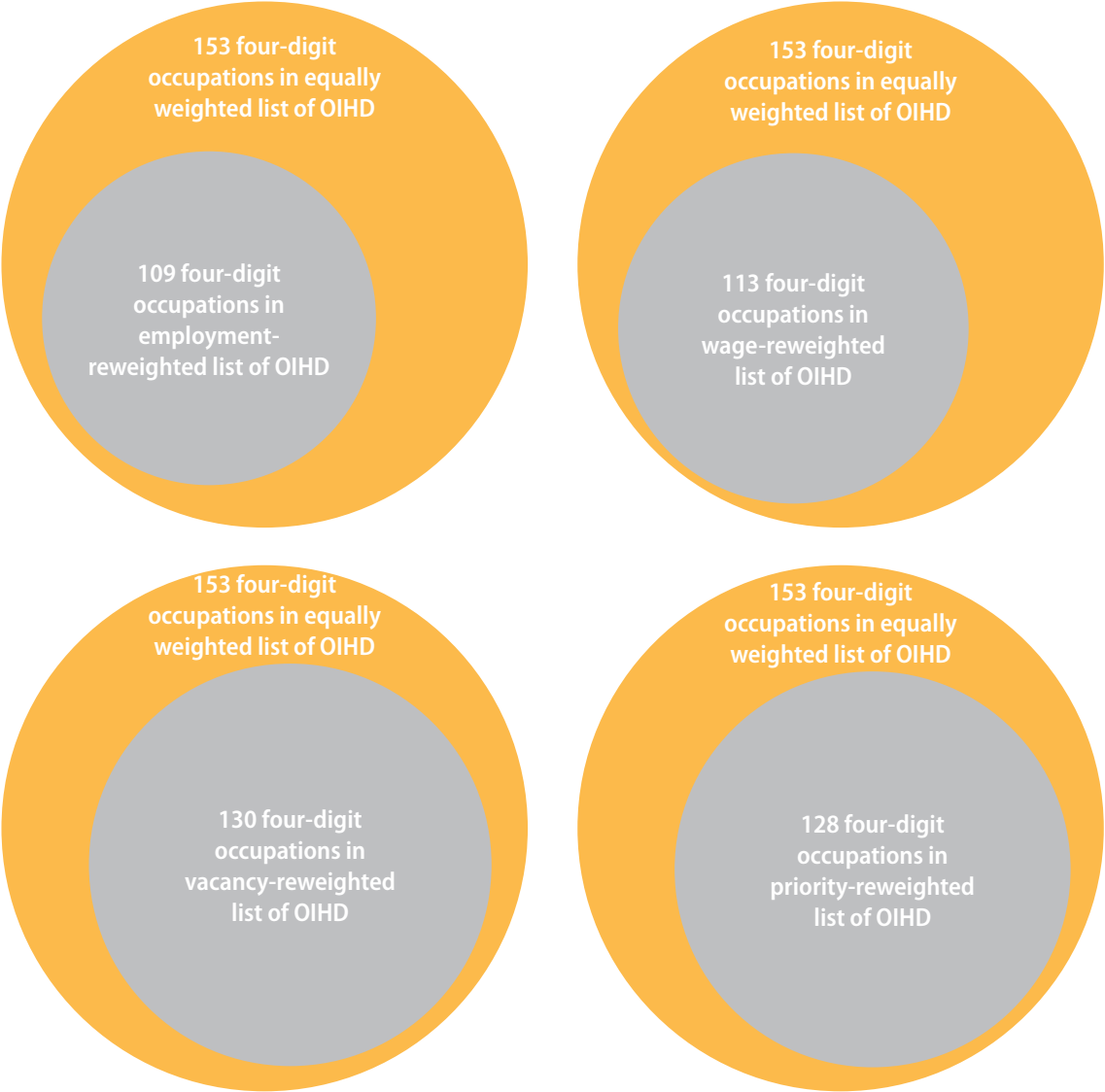
**TABLE A 3:** Weights attached to dimensions and indicators when reweighting to remove potential biases towards an indicator/dimension

DIMENSION	INDICATOR	ORIGINAL WEIGHTS	WEIGHTS WITH DECREASED RELIANCE ON			
			EMPLOYMENT PRESSURE INDICATORS	WAGE PRESSURE INDICATORS	VACANCY PRESSURE INDICATORS	STRATEGIC PRIORITY DEMAND
Employment pressure	Employment growth	0.083	0.033	0.1	0.1	0.1
	Employment intensity growth	0.083	0.033	0.1	0.1	0.1
	Employment duration	0.083	0.033	0.1	0.1	0.1
Wage pressure	Mean wage growth	0.083	0.1	0.033	0.1	0.1
	Median wage growth	0.083	0.1	0.033	0.1	0.1
	Conditional mean wage growth	0.083	0.1	0.033	0.1	0.1
Vacancy pressure	Vacancy growth	0.125	0.15	0.15	0.05	0.15
	Vacancy duration	0.125	0.15	0.15	0.05	0.15
Strategic demand	Strategic sectoral priority	0.25	0.3	0.3	0.3	0.1

In these different iterations of the list of OIHD, each of the dimensions of analysis (wage pressure, employment pressure, vacancy pressure, and strategic priority) are weighted less than the remaining dimensions. This assists in assessing whether any one of the dimensions is skewing the distribution of occupations in any manner.

These lists are presented in terms of their relative overlap with the equally weighted list of OIHD overleaf.

**FIGURE A 2:** Overlap summary between equally weighted unit group list of OIHD and reweighted unit group list of OIHDs



As the overlap analysis shows, all occupations across the various iterations are still subsumed by the equally weighted list of OIHD. This complete overlap implies that no indicator is pulling the list away from the list of 153 (inclusive of elementary occupations) four-digit unit groups created when equally weighting occupations, making this list representative of occupational demand and very robust. This list, broken down by weighting scheme, is shown in Table A 4:

**TABLE A 4:** List of unit groups appearing in reweighted list of OIHD

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-1111	Legislators		X		X
2019-1113	Traditional chiefs and heads of villages		X	X	X
2019-1212	Human resource managers	X			X
2019-1219	Business services and administration managers not elsewhere classified	X	X	X	X
2019-1221	Sales and marketing managers	X	X	X	X
2019-1223	Research and development managers			X	X
2019-1311	Agricultural and forestry production managers	X	X	X	X
2019-1321	Manufacturing managers	X	X	X	X
2019-1323	Construction managers		X		X
2019-1324	Supply, distribution, and related managers	X	X	X	X
2019-1331	Information and communications technology service managers	X	X	X	X
2019-1342	Health service managers		X	X	X
2019-1345	Education managers	X	X	X	
2019-1349	Professional services managers not elsewhere classified			X	X
2019-1411	Hotel managers		X		X
2019-1421	Retail and wholesale trade managers	X	X	X	X
2019-2113	Chemists	X	X	X	
2019-2132	Farming, forestry, and fisheries advisors	X	X	X	X
2019-2141	Industrial and production engineers	X	X	X	X
2019-2142	Civil engineers	X		X	X
2019-2144	Mechanical engineers	X	X	X	X
2019-2145	Chemical engineers	X		X	X
2019-2146	Mining engineers, metallurgists and related professionals		X	X	X
2019-2152	Electronics engineers	X		X	X
2019-2161	Building architects	X	X	X	X
2019-2211	Generalist medical practitioners	X	X	X	X



4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-2221	Nursing professionals	X	X	X	X
2019-2261	Dentists	X		X	X
2019-2262	Pharmacists	X	X	X	X
2019-2263	Environmental and occupational health and hygiene professionals	X	X	X	
2019-2311	University and higher education teachers	X	X	X	X
2019-2321	Vocational or further education teachers	X	X	X	
2019-2331	Secondary or intermediate and senior education teachers	X	X	X	X
2019-2341	Primary school or foundational phase teachers	X	X	X	X
2019-2342	Early childhood educators	X	X	X	
2019-2351	Education methods specialists	X	X	X	X
2019-2352	Special needs teachers	X	X	X	
2019-2412	Financial and investment advisors	X	X	X	X
2019-2413	Financial analysts	X	X		X
2019-2421	Management and organisation analysts	X	X	X	
2019-2422	Policy administration professionals	X	X	X	
2019-2423	Personnel and careers professionals	X		X	X
2019-2511	Systems analysts	X	X	X	X
2019-2512	Software developers	X	X	X	X
2019-2513	Web and multimedia developers	X	X		X
2019-2519	Software and applications developers and analysts not elsewhere classified	X	X	X	X
2019-2521	Database designers and administrators	X	X	X	X
2019-2523	Computer network professionals	X	X	X	
2019-2611	Lawyers	X	X	X	X
2019-2612	Judges	X	X	X	X
2019-2619	Legal professionals not elsewhere classified	X	X	X	X
2019-2622	Librarians and related information professionals			X	X

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-2634	Psychologists	X	X	X	X
2019-2635	Social work and counselling professionals			X	X
2019-2636	Religious professionals			X	X
2019-2641	Authors and related writers	X		X	X
2019-2651	Visual artists	X		X	X
2019-2652	Musicians, singers, and composers	X	X	X	X
2019-3111	Chemical and physical science technicians	X	X	X	X
2019-3112	Civil engineering technicians		X		X
2019-3113	Electrical engineering technicians		X		X
2019-3114	Electronics engineering technicians	X			X
2019-3118	Draughtspersons	X	X		X
2019-3122	Manufacturing supervisors	X	X	X	
2019-3123	Construction supervisors		X		X
2019-3131	Power production plant operators		X		X
2019-3132	Incinerator and water treatment plant operators			X	X
2019-3141	Life science technicians (excluding medical)		X		X
2019-3142	Agricultural technicians			X	X
2019-3212	Medical and pathology laboratory technicians		X		X
2019-3241	Veterinary technicians and assistants	X			X
2019-3255	Physiotherapy technicians and assistants			X	X
2019-3258	Ambulance workers	X	X	X	
2019-3314	Statistical, mathematical, and related associate professionals	X	X		X
2019-3321	Insurance representatives		X		X
2019-3322	Commercial sales representatives	X	X	X	
2019-3323	Buyers	X	X	X	
2019-3332	Conference and event planners			X	X
2019-3334	Real estate agents and property managers	X	X	X	X
2019-3421	Athletes and sports players	X	X	X	X

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-3431	Photographers			X	X
2019-3432	Interior designers and decorators	X	X	X	X
2019-3434	Chefs	X	X	X	X
2019-3439	Artistic and cultural associate professionals not elsewhere classified	X	X	X	X
2019-3512	Information and communications technology user support technicians		X	X	X
2019-4111	General office clerks	X	X	X	X
2019-4212	Bookmakers, croupiers, and related gaming workers		X	X	X
2019-4213	Pawnbrokers and money-lenders	X		X	X
2019-4221	Travel consultants and clerks	X	X	X	X
2019-4412	Mail carriers and sorting clerks	X	X		X
2019-4413	Coding, proofreading, and related clerks	X	X	X	X
2019-5111	Travel attendants and travel stewards	X	X	X	X
2019-5113	Travel guides	X	X	X	X
2019-5141	Hairdressers	X	X	X	X
2019-5222	Shop supervisors	X	X	X	
2019-5223	Shop sales assistants	X	X	X	
2019-5242	Sales demonstrators	X	X		X
2019-5311	Child care workers	X	X	X	X
2019-5321	Healthcare assistants	X	X	X	X
2019-5322	Home-based personal care workers		X	X	X
2019-5329	Personal care workers in health services not elsewhere classified			X	X
2019-5411	Fire fighters	X	X	X	X
2019-5412	Police officers	X	X		X
2019-5414	Security guards	X	X	X	X
2019-6111	Field crop and vegetable growers		X	X	X
2019-6112	Tree and shrub crop growers	X	X	X	X
2019-6131	Mixed crop and animal producers	X	X	X	X
2019-6211	Forestry and related workers	X			X

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-6413	Stonemasons, stone cutters, splitters and carvers			X	X
2019-6422	Floor layers and tile setters	X	X	X	X
2019-6431	Painters and related workers			X	X
2019-6512	Welders and flame cutters	X	X	X	X
2019-6513	Sheet metal workers	X	X	X	
2019-6522	Toolmakers and related workers	X		X	X
2019-6523	Metal working machine tool setters and operators	X	X	X	
2019-6524	Metal polishers, wheel grinders, and tool sharpeners			X	X
2019-6531	Motor vehicle mechanics and repairers	X	X	X	
2019-6533	Agricultural and industrial machinery mechanics and repairers	X	X	X	X
2019-6613	Jewellery and precious metal workers	X		X	X
2019-6614	Potters and related workers			X	X
2019-6615	Glass makers, cutters, grinders, and finishers			X	X
2019-6711	Building and related electricians	X	X	X	X
2019-6712	Electrical mechanics and fitters	X	X	X	X
2019-6713	Electrical line installers and repairers		X	X	X
2019-6721	Electronics mechanics and servicers			X	X
2019-6811	Butchers, fishmongers, and related food preparers	X	X	X	X
2019-6812	Bakers, pastry-cooks, and confectionery makers	X	X	X	
2019-6831	Tailors, dressmakers, furriers and hatters			X	X
2019-6832	Garment and related patternmakers and cutters			X	X
2019-6842	Shotfirers and blasters			X	X
2019-6843	Product graders and testers (except foods and beverages)	X	X	X	
2019-7114	Cement, stone, and other mineral products machine operators	X	X		X
2019-7141	Rubber products machine operators		X	X	X
2019-7151	Fibre preparing, spinning, and winding machine operators	X	X	X	X

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	UNIT GROUP APPEARS IN			
		EMPLOYMENT RE-WEIGHTED LIST OF OIHD	WAGE RE-WEIGHTED LIST OF OIHD	VACANCY RE-WEIGHTED LIST OF OIHD	PRIORITY RE-WEIGHTED LIST OF OIHD
2019-7152	Weaving and knitting machine operators	X		X	X
2019-7159	Textile, fur, and leather products machine operators not elsewhere classified			X	X
2019-7219	Assemblers not elsewhere classified	X	X	X	X
2019-7311	Locomotive engine drivers	X			X
2019-7331	Bus and tram drivers	X	X	X	
2019-7341	Mobile farm and forestry plant operators	X	X	X	X
2019-8112	Cleaners and helpers in offices, hotels, and other establishments	X	X	X	X
2019-8211	Crop farm workers	X	X	X	
2019-8213	Mixed crop and livestock farm labourers	X	X	X	X
2019-8215	Forestry labourers			X	X
2019-8216	Fishery and aquaculture labourers	X	X	X	
2019-8311	Mining and quarrying labourers	X	X	X	X
2019-8313	Building construction labourers	X	X	X	X
2019-8321	Hand packers	X	X	X	X
2019-8329	Manufacturing labourers not elsewhere classified	X	X	X	
2019-8333	Freight handlers			X	X
2019-8511	Street and related service workers			X	X
2019-8611	Garbage and recycling collectors		X	X	X
2019-8629	Elementary workers not elsewhere classified	X	X	X	

Given the large overlap, it is clear that weighting methods produce relatively consistent results given the current indicator set. What may, however, change the composition of the list of OIHD is a change in the indicators used throughout the process.

Because part of the list of OIHD is attempting to unpack shortage in occupations (i.e., where demand is higher than supply), CJ has also provided the research team with a direct indication of shortage *for some occupations at the six-digit level*. This “shortage” indicator is simply the difference between the number of job openings (supply of occupations) and the number of job applicants (demand for occupations).

While it was not included in the main four-digit list presented in the body of the report, it was important for the authors to provide a sense of whether the list of OIHD might change drastically given this indicator's inclusion. This robustness check is weighted as follows:

**TABLE A 5:** Weighting matrix for including direct measure for shortage in the unit group list of OIHD quantitative list

DIMENSION	INDICATOR	WEIGHT
Employment pressure	Employment growth	0.067
	Employment intensity growth	0.067
	Employment duration	0.067
Wage pressure	Mean wage growth	0.067
	Median wage growth	0.067
	Conditional mean wage growth	0.067
Vacancy pressure	Vacancy growth	0.1
	Vacancy duration	0.1
Strategic demand	Strategic sectoral priority	0.2
Supply–demand	Median shortage in occupational supply	0.2

The ensuing list of unit groups can be found in Table A 6:

**TABLE A 6:** Overlap between unit groups in equally weighted list of OIHD vis-à-vis unit groups in shortage-reweighted list of OIHD

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-1111	Legislators	In equally weighted list and shortage list
2019-1113	Traditional chiefs and heads of villages	In equally weighted list and shortage list
2019-1212	Human resource managers	In equally weighted list and shortage list
2019-1219	Business services and administration managers not elsewhere classified	In equally weighted list and shortage list
2019-1221	Sales and marketing managers	In equally weighted list and shortage list
2019-1223	Research and development managers	In equally weighted list and shortage list
2019-1311	Agricultural and forestry production managers	In equally weighted list and shortage list
2019-1321	Manufacturing managers	In equally weighted list and shortage list
2019-1323	Construction managers	In equally weighted list and shortage list
2019-1324	Supply, distribution, and related managers	In equally weighted list and shortage list
2019-1331	Information and communications technology service managers	In equally weighted list and shortage list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-1342	Health service managers	In equally weighted list and shortage list
2019-1349	Professional services managers not elsewhere classified	In equally weighted list and shortage list
2019-1411	Hotel managers	In equally weighted list and shortage list
2019-1421	Retail and wholesale trade managers	In equally weighted list and shortage list
2019-2113	Chemists	In equally weighted list and shortage list
2019-2132	Farming, forestry, and fisheries advisors	In equally weighted list and shortage list
2019-2141	Industrial and production engineers	In equally weighted list and shortage list
2019-2142	Civil engineers	In equally weighted list and shortage list
2019-2144	Mechanical engineers	In equally weighted list and shortage list
2019-2145	Chemical engineers	In equally weighted list and shortage list
2019-2146	Mining engineers, metallurgists, and related professionals	In equally weighted list and shortage list
2019-2152	Electronics engineers	In equally weighted list and shortage list
2019-2161	Building architects	In equally weighted list and shortage list
2019-2211	Generalist medical practitioners	In equally weighted list and shortage list
2019-2221	Nursing professionals	In equally weighted list and shortage list
2019-2261	Dentists	In equally weighted list and shortage list
2019-2262	Pharmacists	In equally weighted list and shortage list
2019-2311	University and higher education teachers	In equally weighted list and shortage list
2019-2321	Vocational or further education teachers	In equally weighted list and shortage list
2019-2331	Secondary or intermediate and senior education teachers	In equally weighted list and shortage list
2019-2341	Primary school or foundational phase teachers	In equally weighted list and shortage list
2019-2342	Early childhood educators	In equally weighted list and shortage list
2019-2351	Education methods specialists	In equally weighted list and shortage list
2019-2352	Special needs teachers	In equally weighted list and shortage list
2019-2412	Financial and investment advisors	In equally weighted list and shortage list
2019-2421	Management and organisation analysts	In equally weighted list and shortage list
2019-2422	Policy administration professionals	In equally weighted list and shortage list
2019-2423	Personnel and careers professionals	In equally weighted list and shortage list
2019-2511	Systems analysts	In equally weighted list and shortage list
2019-2512	Software developers	In equally weighted list and shortage list
2019-2513	Web and multimedia developers	In equally weighted list and shortage list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-2519	Software and applications developers and analysts not elsewhere classified	In equally weighted list and shortage list
2019-2521	Database designers and administrators	In equally weighted list and shortage list
2019-2523	Computer network professionals	In equally weighted list and shortage list
2019-2611	Lawyers	In equally weighted list and shortage list
2019-2612	Judges	In equally weighted list and shortage list
2019-2619	Legal professionals not elsewhere classified	In equally weighted list and shortage list
2019-2622	Librarians and related information professionals	In equally weighted list and shortage list
2019-2634	Psychologists	In equally weighted list and shortage list
2019-2635	Social work and counselling professionals	In equally weighted list and shortage list
2019-2636	Religious professionals	In equally weighted list and shortage list
2019-2641	Authors and related writers	In equally weighted list and shortage list
2019-2651	Visual artists	In equally weighted list and shortage list
2019-2652	Musicians, singers, and composers	In equally weighted list and shortage list
2019-3111	Chemical and physical science technicians	In equally weighted list and shortage list
2019-3112	Civil engineering technicians	In equally weighted list and shortage list
2019-3113	Electrical engineering technicians	In equally weighted list and shortage list
2019-3114	Electronics engineering technicians	In equally weighted list and shortage list
2019-3118	Draughtspersons	In equally weighted list and shortage list
2019-3122	Manufacturing supervisors	In equally weighted list and shortage list
2019-3123	Construction supervisors	In equally weighted list and shortage list
2019-3131	Power production plant operators	In equally weighted list and shortage list
2019-3132	Incinerator and water treatment plant operators	In equally weighted list and shortage list
2019-3141	Life science technicians (excluding medical)	In equally weighted list and shortage list
2019-3142	Agricultural technicians	In equally weighted list and shortage list
2019-3212	Medical and pathology laboratory technicians	In equally weighted list and shortage list
2019-3241	Veterinary technicians and assistants	In equally weighted list and shortage list
2019-3255	Physiotherapy technicians and assistants	In equally weighted list and shortage list
2019-3312	Credit and loans officers	Included due to shortage
2019-3314	Statistical, mathematical, and related associate professionals	In equally weighted list and shortage list



4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-3321	Insurance representatives	In equally weighted list and shortage list
2019-3322	Commercial sales representatives	In equally weighted list and shortage list
2019-3323	Buyers	In equally weighted list and shortage list
2019-3332	Conference and event planners	In equally weighted list and shortage list
2019-3334	Real estate agents and property managers	In equally weighted list and shortage list
2019-3421	Athletes and sports players	In equally weighted list and shortage list
2019-3431	Photographers	In equally weighted list and shortage list
2019-3432	Interior designers and decorators	In equally weighted list and shortage list
2019-3434	Chefs	In equally weighted list and shortage list
2019-3439	Artistic and cultural associate professionals not elsewhere classified	In equally weighted list and shortage list
2019-3512	Information and communications technology user support technicians	In equally weighted list and shortage list
2019-4111	General office clerks	In equally weighted list and shortage list
2019-4212	Bookmakers, croupiers, and related gaming workers	In equally weighted list and shortage list
2019-4213	Pawnbrokers and money-lenders	In equally weighted list and shortage list
2019-4221	Travel consultants and clerks	In equally weighted list and shortage list
2019-4412	Mail carriers and sorting clerks	In equally weighted list and shortage list
2019-4413	Coding, proofreading and related clerks	In equally weighted list and shortage list
2019-5111	Travel attendants and travel stewards	In equally weighted list and shortage list
2019-5113	Travel guides	In equally weighted list and shortage list
2019-5141	Hairdressers	In equally weighted list and shortage list
2019-5223	Shop sales assistants	In equally weighted list and shortage list
2019-5311	Child care workers	In equally weighted list and shortage list
2019-5321	Healthcare assistants	In equally weighted list and shortage list
2019-5322	Home-based personal care workers	In equally weighted list and shortage list
2019-5329	Personal care workers in health services not elsewhere classified	In equally weighted list and shortage list
2019-5411	Fire fighters	In equally weighted list and shortage list
2019-5412	Police officers	In equally weighted list and shortage list
2019-5414	Security guards	In equally weighted list and shortage list
2019-6111	Field crop and vegetable growers	In equally weighted list and shortage list
2019-6112	Tree and shrub crop growers	In equally weighted list and shortage list
2019-6131	Mixed crop and animal producers	In equally weighted list and shortage list
2019-6211	Forestry and related workers	In equally weighted list and shortage list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-6413	Stonemasons, stone cutters, splitters, and carvers	In equally weighted list and shortage list
2019-6422	Floor layers and tile setters	In equally weighted list and shortage list
2019-6431	Painters and related workers	In equally weighted list and shortage list
2019-6512	Welders and flame cutters	In equally weighted list and shortage list
2019-6522	Toolmakers and related workers	In equally weighted list and shortage list
2019-6524	Metal polishers, wheel grinders, and tool sharpeners	In equally weighted list and shortage list
2019-6531	Motor vehicle mechanics and repairers	In equally weighted list and shortage list
2019-6533	Agricultural and industrial machinery mechanics and repairers	In equally weighted list and shortage list
2019-6613	Jewellery and precious metal workers	In equally weighted list and shortage list
2019-6614	Potters and related workers	In equally weighted list and shortage list
2019-6615	Glass makers, cutters, grinders, and finishers	In equally weighted list and shortage list
2019-6711	Building and related electricians	In equally weighted list and shortage list
2019-6712	Electrical mechanics and fitters	In equally weighted list and shortage list
2019-6713	Electrical line installers and repairers	In equally weighted list and shortage list
2019-6721	Electronics mechanics and servicers	In equally weighted list and shortage list
2019-6811	Butchers, fishmongers, and related food preparers	In equally weighted list and shortage list
2019-6812	Bakers, pastry cooks, and confectionery makers	In equally weighted list and shortage list
2019-6831	Tailors, dressmakers, furriers, and hatters	In equally weighted list and shortage list
2019-6832	Garment and related patternmakers and cutters	In equally weighted list and shortage list
2019-6842	Shotfirers and blasters	In equally weighted list and shortage list
2019-7114	Cement, stone, and other mineral products machine operators	In equally weighted list and shortage list
2019-7141	Rubber products machine operators	In equally weighted list and shortage list
2019-7151	Fibre preparing, spinning, and winding machine operators	In equally weighted list and shortage list
2019-7152	Weaving and knitting machine operators	In equally weighted list and shortage list
2019-7159	Textile, fur, and leather products machine operators not elsewhere classified	In equally weighted list and shortage list
2019-7219	Assemblers not elsewhere classified	In equally weighted list and shortage list
2019-7311	Locomotive engine drivers	In equally weighted list and shortage list

4-DIGIT OFO CODE	4-DIGIT OFO DESCRIPTION	OVERLAP
2019-7331	Bus and tram drivers	In equally weighted list and shortage list
2019-7341	Mobile farm and forestry plant operators	In equally weighted list and shortage list
2019-8112	Cleaners and helpers in offices, hotels, and other establishments	In equally weighted list and shortage list
2019-8213	Mixed crop and livestock farm labourers	In equally weighted list and shortage list
2019-8215	Forestry labourers	In equally weighted list and shortage list
2019-8311	Mining and quarrying labourers	In equally weighted list and shortage list
2019-8313	Building construction labourers	In equally weighted list and shortage list
2019-8321	Hand packers	In equally weighted list and shortage list
2019-8329	Manufacturing labourers not elsewhere classified	In equally weighted list and shortage list
2019-8333	Freight handlers	In equally weighted list and shortage list
2019-8511	Street and related service workers	In equally weighted list and shortage list
2019-8611	Garbage and recycling collectors	In equally weighted list and shortage list

Again, given the extensive evidence analysed to create the equally weighted list of OIHD at the four-digit level, it is not surprising that all occupations except for one are subsumed into the original, “equally weighted” list. However, the following four-digit unit group has been included due to the impact of the “shortage” variable (i.e., the difference between demand and supply):

2019-3312	Credit and loans officers
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This occupation has been fed into the validation database for the list of OIHD and is discussed in the “Stakeholder inputs” sub-section in the body of the report.

## Appendix 3: List of stakeholder meetings, semi-structured interviews, and gazette comments

In order to corroborate the findings of the draft list of OIHD, as well as allow for a wide variety of stakeholder input, DNA Economics and the DHET organised myriad:

1. Stakeholder meetings; and
2. Semi-structured interviews (SSIs).

These qualitative data were enhanced by a call for public comment based on the government gazette publication relating to the draft list of OIHD. The list of stakeholders who assisted in the validation of the list and the manner in which they were contacted are summarised below:

**TABLE A 7:** List of stakeholders contacted by DNA Economics and the DHET, and modalities through which communication was made

STAKEHOLDER	MODALITY OF COMMUNICATION	IF SSI, WERE THE STAKEHOLDERS AVAILABLE FOR COMMENT DURING LEVELS 3 AND 4 LOCKDOWN?
Agri SA	SSI	No
Business Processes Enabling South Africa (BPESA)	Gazette public comment	
Council for Scientific and Industrial Research (CSIR)	Gazette public comment	
Representatives from the clothing, textiles, footwear, and leather goods industry	Gazette public comment	
Saint John's (community healthcare worker training association)	SSI	Yes
The Actuarial Society of South Africa	Gazette public comment	
The Department of Justice (DOJ)	SSI	No
The Department of Tourism (DoT)	Gazette public comment	
The Department of Transportation (DOT)	Stakeholder workshop	
The Education, Training, and Development Practices Sector Education and Training Authority (ETDPSETA)	Gazette public comment	
The Electrical Conformance Board of South Africa	SSI	No
The Fire Protection Association of South Africa	SSI	No
The Flooring Industry Training Association	SSI	Yes
The Forest-Based Industry Board	Gazette public comment	
The Grassland Society of South Africa	Gazette public comment	
The Health Professionals Council of South Africa (HPCSA)	SSI	No

STAKEHOLDER	MODALITY OF COMMUNICATION	IF SSI, WERE THE STAKEHOLDERS AVAILABLE FOR COMMENT DURING LEVELS 3 AND 4 LOCKDOWN?
The Institute of Bankers of South Africa (IOBSA)	SSI	No
The Institute of Information Technology Professionals of South Africa (IITPSA)	Gazette public comment	
The Institute of Risk Management of South Africa (IRMSA)	Stakeholder workshop	
The International Police Association of South Africa (IPASA)	SSI	No
The National Bargaining Council for the Clothing Manufacturing Industry	Gazette public comment	
The National Department of Health (NDOH)	SSI	No
The National Health Laboratory Service (NHLS)	SSI	No
The Office of the Chief Justice (OCJ)	SSI	No
The Psychological Society of South Africa (PsySSA)	SSI	No
The Saldanha Bay Industrial Development Zone (SBIDZ)	Gazette public comment	
The Security Association of South Africa (SASA)	SSI	Yes
The South African Artisan Council	Gazette public comment	
The South African Artisans Movement	Gazette public comment	
The South African Blanket Manufacturers Organisation	Gazette public comment	
The South African Chamber of Baking	SSI	Yes
The South African Council for Educators	SSI	No
The South African Freelance Association (SAFREA)	SSI	No
The South African Institute for Business Accountants (SAIBA)	Gazette public comment	
The South African Institute for Electronic Engineers (SAIEE)	SSI	Yes
The South African Institute of Occupational Health and Safety	SSI	No
The South African Veterinary Council (SAVC)	SSI	Yes
The South African Wood, Laminate, and Flooring Association	SSI	Yes
The Textile Federation of South Africa	SSI	No
The University of Cape Town	Gazette public comment	
The Wholesale and Retail Sector Education and Training Authority (W&R SETA)	Gazette public comment	

## Appendix 4: Fields of study and specialisation included under university lecturer

CESM	SPECIALISATION
<b>Accounting and Informatics</b>	<ul style="list-style-type: none"> <li>accounting (CA, SA)</li> <li>actuarial science</li> <li>auditing</li> <li>financial accounting</li> <li>financial planning – certified financial planner with academic qualifications</li> <li>financial econometrics and technical analysis</li> <li>financial management</li> <li>entrepreneurship</li> <li>management accounting</li> </ul>
<b>Agricultural, Environmental, and Natural Sciences</b>	<ul style="list-style-type: none"> <li>agricultural economist</li> <li>agricultural engineering</li> <li>agricultural policy development</li> <li>agronomy: weed science</li> <li>analytical chemists and hydro metallurgists</li> <li>animal scientist</li> <li>bioinformatics</li> <li>bio-informatics</li> <li>crop science</li> <li>data analytics/statistics/biometry</li> <li>dendrochronology</li> <li>dairy science occupational code</li> <li>disaster management</li> <li>entomology</li> <li>earth system science</li> <li>economic geology</li> <li>exposure biology</li> <li>epidemiology/food microbiology</li> <li>food engineering</li> <li>food scientist</li> <li>food safety</li> <li>forest planner</li> <li>food processing and storage technology</li> <li>forest resource management and planning</li> <li>genetics: applied plant breeding</li> <li>geology</li> <li>geography</li> <li>ground water hydrology</li> <li>hydrogeology</li> <li>mathematics</li> <li>mathematical statistics</li> <li>meat science</li> <li>microbiology and biochemistry</li> <li>mining geology</li> <li>molecular biophysics</li> <li>natural resource economics</li> <li>nematology</li> <li>physics</li> <li>plant science</li> <li>plant breeding</li> <li>plant pathology, especially epidemiology</li> <li>plant taxonomy and systematics</li> <li>plant ecology</li> <li>plant sciences</li> <li>statistics</li> <li>soil science</li> <li>software developers (agricultural)</li> <li>structural biology</li> <li>surface process geochemistry</li> <li>surface and soil water hydrology</li> <li>risk analyst</li> <li>veterinary science</li> <li>viticulturist</li> <li>zoology (aquatic scientist, animal scientist, biological scientist, ecological scientist)</li> </ul>
<b>Arts: Design and Social Sciences</b>	<ul style="list-style-type: none"> <li>arts entrepreneurship</li> <li>communication and media</li> <li>criminology</li> <li>geography and environmental studies</li> <li>git geomatics</li> <li>urban and regional planners (professionally registered)</li> <li>geographical information systems</li> <li>environmental epidemiology</li> <li>graphic design</li> <li>fashion design</li> <li>fashion and textile</li> <li>information science</li> <li>artificial intelligence</li> <li>data science</li> <li>cybersecurity and cyberwarfare</li> <li>socio-informatics</li> <li>information science</li> <li>artificial intelligence</li> <li>data science</li> <li>cybersecurity and cyberwarfare</li> <li>socio-informatics</li> <li>socio-informatics</li> <li>interior design</li> <li>journalism, film and television</li> <li>Afrikaans and Dutch</li> <li>African languages and culture</li> <li>foreign languages (Chinese, French, German, Dutch)</li> <li>general linguistics and modern languages</li> <li>language acquisition in Afrikaans</li> <li>linguistics literature, heritage and culture</li> <li>theory of translation and interpretation</li> <li>theory of lexicography</li> <li>library and information science</li> <li>music</li> <li>music: strings players</li> <li>ethnomusicology experts (especially African music, essential for the renewal of the curriculum)</li> <li>music in the fields of music technology and music therapy and community music</li> <li>political science/international relations</li> <li>sociology</li> <li>social science (research methods and particularly quantitative data analysis)</li> <li>monitoring and evaluation specialists</li> <li>science policy analysts</li> <li>visual arts</li> <li>digital production and/or graphic design</li> <li>communication and media</li> <li>applied virtual/augmented reality</li> </ul>
<b>Business Studies</b>	<ul style="list-style-type: none"> <li>business innovation</li> <li>change management</li> <li>corporate governance</li> <li>development finance</li> <li>HR information systems and technology</li> <li>entrepreneurship management</li> <li>financial planning</li> <li>finance/investment</li> <li>investments</li> <li>local governance</li> <li>international business</li> <li>operations management: productivity</li> <li>ergonomics, operations management</li> <li>project management</li> <li>responsible leadership</li> <li>safety management</li> <li>technology management</li> </ul>
<b>Commerce</b>	<ul style="list-style-type: none"> <li>information systems</li> <li>macro-economic</li> <li>micro-economic</li> <li>professorial staff in accounting</li> <li>senior staff in actuarial science</li> <li>organisational psychology</li> <li>tax</li> </ul>
<b>Economics</b>	<ul style="list-style-type: none"> <li>behavioural and experimental economics</li> <li>cliometrics</li> <li>data analytics</li> <li>econometrics</li> <li>environmental economics</li> <li>health economics</li> <li>industrial policy</li> <li>international trade</li> <li>industrial organisation</li> <li>macro-economics</li> <li>political economy</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>accounting education</li> <li>African languages</li> <li>Afrikaans</li> <li>aeronautical engineering</li> <li>chemistry education</li> <li>critical management education</li> <li>curriculum studies</li> <li>early childhood care and education</li> <li>educational psychology</li> <li>education research</li> <li>English (in faculty of education)</li> <li>geography</li> <li>higher education studies, especially higher education leadership; educational finance and student affairs</li> <li>linguists: formal, forensic, digital</li> <li>mathematics education</li> <li>mechanical engineering</li> <li>mechatronics</li> <li>medical laboratory sciences: in disciplines such as clinical, chemistry, cytology, histology</li> <li>methodology/health/sport/physical education and or sports coaching</li> <li>movement education</li> <li>music (specialised)</li> <li>physical science</li> <li>technology (civil, mechanical, and electrical)</li> <li>science (biology, life science, chemistry, and physics)</li> <li>physics education</li> <li>science and technology education</li> <li>special education</li> <li>social sciences education</li> </ul>

CESM	SPECIALISATION
<b>Management Sciences</b>	<ul style="list-style-type: none"> <li>administration and economics management</li> <li>actuarial science</li> <li>chartered accountants</li> <li>financial risk management</li> <li>general economics</li> <li>hospitality</li> <li>information systems</li> <li>logistics management</li> <li>macro and micro econometrics</li> <li>management</li> <li>mineral economics</li> <li>operation management</li> <li>project management</li> <li>statistics</li> <li>mathematical statistics (including distribution theory)</li> <li>statistical modelling, inference</li> <li>biostatistics/biometrics including spatial statistics/geostatistics and survival analysis</li> <li>extreme value theory</li> <li>statistical process control</li> <li>statistics of data science and machine learning</li> <li>supply chain management</li> <li>transport economics</li> </ul>
<b>Engineering and the Built Environment</b>	<ul style="list-style-type: none"> <li>agricultural engineering</li> <li>architecture</li> <li>bio and water engineering</li> <li>biomedical engineering</li> <li>civil engineering</li> <li>transport engineering</li> <li>structural engineering</li> <li>urban engineering</li> <li>geotechnical engineering</li> <li>water resource engineering</li> <li>construction engineering</li> <li>quantity surveying</li> <li>chemical engineering</li> <li>bioprocessing engineering</li> <li>biochemical engineering</li> <li>biomolecular engineering</li> <li>process modelling</li> <li>simulation engineering</li> <li>clinical engineering</li> <li>computer engineering</li> <li>construction management</li> <li>construction project management</li> <li>control engineering</li> <li>corrosion</li> <li>data science</li> <li>digital construction technology</li> <li>data engineering</li> <li>economic geology</li> <li>electrical engineering</li> <li>electronics engineering</li> <li>electrical power engineering</li> <li>energy engineering</li> <li>engineering management</li> <li>environmental engineering</li> <li>explosive engineering (explosive rock engineering)</li> <li>facilities management</li> <li>geotechnical engineering</li> <li>geomatics</li> <li>mine surveying</li> <li>mineral resources management</li> <li>mineral economics</li> <li>photogrammetry</li> <li>geostatistics</li> <li>geohydrologists and water resource scientist</li> <li>geostatistics (mineral resources and reserves evaluation)</li> <li>geotechnical engineering</li> <li>high voltage engineering</li> <li>hydrometallurgy</li> <li>industrial engineering</li> <li>instrumentation engineering</li> <li>intelligent systems</li> <li>jewellery design</li> <li>land surveyor</li> <li>materials engineer</li> <li>mechatronics engineering</li> <li>mechanical engineering</li> <li>metallurgical engineering</li> <li>mineral economics</li> <li>mining engineering</li> <li>mining surveying</li> <li>mine environmental engineering</li> <li>operation management</li> <li>petroleum engineering</li> <li>physical metallurgy</li> <li>planning programme</li> <li>power and energy</li> <li>process and control engineering</li> <li>production engineers</li> <li>property valuation and management – valuers registered with the South African property valuers profession</li> <li>property studies</li> <li>rock engineering (rock mechanics or geotechnical engineering)</li> <li>pyrometallurgy</li> <li>quantity surveying</li> <li>reactor design</li> <li>real estate and property studies</li> <li>structural engineering</li> <li>technology</li> <li>telecommunication engineering</li> <li>town and regional planning</li> <li>transportation engineering</li> <li>urban and regional planning</li> <li>ventilation engineering</li> <li>water engineering</li> </ul>
<b>Food Service Management</b>	<ul style="list-style-type: none"> <li>dietetics</li> </ul>
<b>Health Sciences</b>	<ul style="list-style-type: none"> <li>pharmacology</li> <li>clinical pharmacy</li> <li>psychology</li> <li>industrial psychology</li> </ul>
<b>Humanities</b>	<ul style="list-style-type: none"> <li>African languages</li> <li>anthropology</li> <li>biology education</li> <li>chemistry education</li> <li>clinical psychology</li> <li>history</li> <li>international relations</li> <li>leadership</li> <li>local languages education</li> <li>philosophy</li> <li>research psychologists</li> <li>political studies</li> <li>sign language linguistics</li> <li>sociology</li> <li>social work</li> </ul>
<b>Information and Communications Technology</b>	<ul style="list-style-type: none"> <li>analysis and projection</li> <li>applied virtual/augmented reality</li> <li>artificial intelligence</li> <li>big data analytics; filtering</li> <li>business information systems</li> <li>business and systems analysts</li> <li>cloud computing</li> <li>cheminformatics</li> <li>computer forensics</li> <li>computer network professionals</li> <li>computer science</li> <li>cryptocurrency</li> <li>cyber security</li> <li>database and systems administrators</li> <li>data science</li> <li>digital government</li> <li>digital media in the fields of game design and animation and interactive media</li> <li>digital platform business models</li> <li>disaster informatics</li> <li>enterprise architecture</li> <li>expert systems</li> <li>cheminformatics</li> <li>health informatics</li> <li>infopreneurial skills</li> <li>ICT and data science: all fields</li> <li>ICT security specialists</li> <li>ICT support and computer science</li> <li>internet of things – 4IR skills</li> <li>information system and strategy</li> <li>IS auditing</li> <li>IS development</li> <li>IS security/cyber security</li> <li>ITS</li> <li>management information systems/information technology management</li> <li>multimedia specialists and web developers</li> <li>project management</li> <li>retail analytics</li> <li>social media management</li> <li>software development</li> <li>software engineering</li> <li>software and applications programmers</li> </ul>
<b>Law</b>	<ul style="list-style-type: none"> <li>accountancy and law</li> <li>banking and finance law</li> <li>company law</li> <li>comparative law</li> <li>corporate finance law</li> <li>corporate law</li> <li>credit law</li> <li>criminal law and criminal procedure</li> <li>customary law</li> <li>cyber law</li> <li>environmental law</li> <li>intellectual property law</li> <li>international trade law</li> <li>international criminal law</li> <li>international law</li> <li>international commercial law</li> <li>international/global environmental law</li> <li>labour law</li> <li>law of evidence</li> <li>legal tech</li> <li>mercantile law</li> <li>mining law</li> <li>private international law</li> <li>procedural law</li> <li>public law</li> <li>public international law</li> <li>tax law</li> <li>technology/internet and the law</li> <li>transnational criminal law</li> </ul>

CESM	SPECIALISATION
<b>Medicine and Health Sciences</b>	<ul style="list-style-type: none"> <li>• academic pharmacy</li> <li>• allied health professions and rehabilitation sciences including disciplines: audiology, hearing therapy, occupational therapy, physical medicine, physiotherapy, rehabilitation sciences, and speech-language therapy)</li> <li>• anaesthesiology and critical care (with disciplines including anaesthesiology and critical care medicine/intensive care medicine)</li> <li>• bioinformatics</li> <li>• biomaterials sciences</li> <li>• biomedical engineering and medical data science (with disciplines including biomedical engineering, medical data science, health informatics, and medical informatics)</li> <li>• biomedical sciences (with disciplines including anatomy/clinical anatomy, andrology, bacteriology, biochemistry/medical biochemistry, bioinformatics and computational biology, biological sciences, biophysics, cancer biology, cell biology, cytology, developmental biology, electron microscopy, enzymology, genetics/human genetics, genomics and proteomics, histology, laboratory medicine, medical laboratory sciences, medical laboratory technology, medicinal chemistry, microbiome sciences, microscopy, molecular biology, morphology/morphological sciences, physiology/medical physiology, reproductive biology, synthetic biology, and vaccinology)</li> <li>• biostatistics</li> <li>• clinical pharmacy</li> <li>• comparative medicine (with disciplines including laboratory animal sciences, animal technology, comparative medicine, and veterinary sciences)</li> <li>• family and emergency medicine (with disciplines including emergency medicine, family medicine, hyperbaric medicine, palliative care and primary healthcare)</li> <li>• global and public health (with disciplines including biostatistics, cancer science, community health, dietetics, environmental health, epidemiology, global surgery, global health, health economics, health systems, human nutrition, occupational health, preventive medicine, public health, and rural health)</li> <li>• educational technology</li> <li>• emergency medical care</li> <li>• environmental health</li> <li>• exposure science</li> <li>• foetal medicine</li> <li>• health professions education</li> <li>• human anatomy and physiology</li> <li>• industrial pharmacy</li> <li>• infertility</li> <li>• maxillofacial</li> <li>• medical ethics and medical law (with disciplines including medical ethics and medical law/legal medicine)</li> <li>• medical imaging and clinical oncology (with disciplines including medical physics, neuroimaging, nuclear medicine, oncology/radiation oncology, radiobiology, and radiodiagnosis)</li> <li>• medicine (with disciplines including allergology, bariatric medicine, cardiology, clinical immunology, clinical pharmacology, dermatology, endocrinology, gastroenterology, general internal medicine, geriatrics and gerontology, haematology, hepatology, infectious diseases, environmental toxicology, metabolism, nephrology, neurology, proctology, pulmonology, rheumatology, toxicology, transfusion sciences, and venereology)</li> <li>• neurosciences</li> <li>• nursing and midwifery – specialised care lecturers in the areas of paediatrics, trauma, forensic nursing, oncology, neonatal ICU, wound care, and infection control, as well as stoma care</li> <li>• obstetrics and gynaecology (with disciplines including gynaecology, gynecologic oncology, medical genetics, and obstetrics)</li> <li>• occupational therapists</li> <li>• occupational medicine</li> <li>• oral medicine and periodontics</li> <li>• paediatrics and child health (with disciplines including adolescent medicine, child health, neonatology, and paediatrics)</li> <li>• pathology (with disciplines including anatomical pathology, chemical pathology, cytopathology, forensic medicine, haematological pathology, histopathology, immunology, microbiology/medical microbiology, parasitology, and virology / medical virology)</li> <li>• paediatric dentistry</li> <li>• pharmaceutical sciences</li> <li>• plastic surgery</li> <li>• psychiatry (with disciplines including addiction science, child and adolescent psychiatry, clinical psychology, forensic psychiatry, geriatric psychiatry, neuroscience, and psychiatry)</li> <li>• physiotherapists</li> <li>• physiology</li> <li>• quality assurance and regulatory pharmacy</li> <li>• radiation oncology</li> <li>• sports science and sports medicine (with disciplines including biokinetics, exercise medicine, sports medicine, sport psychology, and sport science)</li> <li>• surgical sciences (with disciplines including cardiothoracic surgery, general surgery, neurosurgery, ophthalmology, orthopaedic surgery, otorhinolaryngology, paediatric surgery, plastic and reconstructive surgery, podiatric surgery, transplant surgery, urology, vascular surgery</li> <li>• radiography (diagnostic radiology, interventional radiology)</li> <li>• public health biostatistics application</li> <li>• transplant surgery</li> </ul>
<b>Science</b>	<ul style="list-style-type: none"> <li>• archaeobotanical</li> <li>• applied mathematics</li> <li>• astronomy</li> <li>• astrophysics</li> <li>• bioinformatics</li> <li>• climate science</li> <li>• computational geoscientists</li> <li>• chemical sciences</li> <li>• earth observation</li> <li>• geological sciences</li> <li>• geoarchaeology</li> <li>• geographical information science</li> <li>• inorganic chemistry</li> <li>• materials science</li> <li>• mathematics</li> <li>• mathematical statistics</li> <li>• mining geologists</li> <li>• nanotechnology/nanoscience</li> <li>• nuclear and particle physics</li> <li>• oceanography</li> <li>• physics</li> <li>• population genetics</li> <li>• radio astronomy</li> <li>• remote sensing</li> <li>• seismologists</li> <li>• sensory science</li> <li>• systematists/taxonomists in the biological sciences</li> <li>• statistical sciences</li> <li>• theoretical</li> <li>• theoretical and computational sciences physics</li> </ul>
<b>Physics</b>	<ul style="list-style-type: none"> <li>• few-body physics</li> </ul>
<b>Public Management and Administration</b>	<ul style="list-style-type: none"> <li>• disaster and risk management</li> <li>• public administration</li> <li>• public management/co-operatives</li> <li>• supply chain management</li> <li>• research administration</li> <li>• innovation management and administration</li> <li>• digital research management</li> <li>• research management</li> <li>• research administration</li> </ul>
<b>Theology</b>	<ul style="list-style-type: none"> <li>• ancient studies and classics</li> <li>• religion studies</li> </ul>

Source: USAf



**PART 8**

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